King Saud University
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Graduation Project Release-1 Report

Jadeer

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1 Introduction

Recruitment has always been crucial for organizational success, but it has become increasingly complex in today's labor market. Companies are struggling to keep up with the rapid changes in jobs and skills. According to the World Economic Forum's Future of Jobs Report 2023, nearly a quarter of current jobs may be disrupted in the next five years (World Economic Forum, 2023). This highlights the importance of hiring the right people quickly and fairly.

In Saudi Arabia, the need for better recruitment systems is even stronger. Vision 2030 makes workforce empowerment and labor market efficiency a national priority [1]. At the same time, the *Monsha'at HR Thematic Report 2022* shows that many organizations, especially SMEs, still face difficulties in attracting and retaining talent [2]. These challenges highlight why new, technology-based solutions are necessary.

Our project, **Jadeer**, aims to address these issues. It is designed as a dual-sided platform that helps companies filter and evaluate applications with AI tools, while also preparing job seekers with resume improvements and interview practice.

By supporting both sides, **Jadeer** aims to accelerate, equalize, and improve the effectiveness of recruitment.

This report details the development of **Jadeer** and its approach to solving recruitment challenges. It begins by identifying the problems in current recruitment practices, followed by an overview of existing solutions and their limitations. The following sections describe **Jadeer** key features, technical design, and development process, showing how the platform addresses these challenges for both job seekers and Companies.

1.1 The Problem

This section describes the real-world problem that **Jadeer** aims to address by focusing on challenges in the recruitment process for both companies and job seekers.

With the rapid development of the Saudi labor market and the growing demand for qualified talent, significant challenges have emerged for both companies and job seekers during the recruitment process [1]. Companies often receive hundreds of applications for a single position, making it difficult to efficiently:

- Filter and evaluate large volumes of resumes.
- Match candidates' qualifications and skills with job requirements.
- Conduct fair and consistent initial interviews.
- Assess candidate performance objectively and make unbiased decisions.

Many companies rely on traditional Applicant Tracking Systems (ATS), which primarily perform keyword-based screening of resumes. While helpful for reducing manual workload, these systems often fail to capture the deeper aspects of a candidate's capabilities such as reasoning ability, problem-solving, communication skills, and potential for growth. As a result, highly qualified candidates may be overlooked simply because their resumes do not contain exact keyword matches — a limitation that contributes to biased or incomplete talent evaluation. [3]

For example, in Saudi Arabia, large organizations often handle thousands of applications during major hiring campaigns. Without efficient and holistic recruitment systems, HR teams may spend weeks or even months screening and evaluating candidates, leading to delayed hiring decisions and increased operational costs.

On the other hand, job seekers face challenges in optimizing their resumes for ATS-compatible formats, finding suitable opportunities, and preparing effectively for interviews, which reduces their chances of securing positions that match their qualifications and aspirations. [4]

In our project, we specifically focus on the early and middle stages of the recruitment process, including resume screening, candidate evaluation, and initial interview preparation — stages that

are not only time-consuming and prone to human bias, but also heavily influenced by ATS-based filtering.

This inefficiency affects not only companies and individuals but also the labor market, contributing to underemployment and reduced productivity. Addressing these challenges is essential to improving recruitment quality and aligns with the goals of Saudi Vision 2030 to empower the workforce, enhance labor market efficiency, and improve quality of life [1].

1.2 The Solution

This section presents the proposed solution, **Jadeer**, and explains how it tackles the challenges in the recruitment process. It highlights the platform's key features and the ways it benefits both companies and job seekers.

Jadeer is an AI-powered dual-sided recruitment platform. **Jadeer** is designed to automate and enhance the hiring process for companies while also supporting individuals in their job-seeking journey. The platform provides **companies** with efficient tools for managing job postings, conducting AI-assisted interviews, and receiving insightful candidate performance reports. Since the platform supports company registration, an **admin** is included to verify each company by checking the submitted documents and confirming their authenticity before granting access, ensuring that no one can use a company's name without authorization. On the other hand, it empowers **job seekers** to explore job opportunities, enhance their CVs, and prepare for interviews through AI-driven practice sessions. By addressing these perspectives, **Jadeer** bridges the gap between companies and candidates, aiming to make recruitment more efficient, fair, and transparent.

- **Company Side:**
  1. **Job Posting:** Companies can either create job postings manually or use **Jadeer's** intelligent job-posting generator to automatically craft job descriptions. This ensures consistency and saves time, while still allowing customization. **Jadeer** provides a centralized space for companies to reach a broad pool of job seekers, maximizing visibility and accessibility.
  2. **AI-powered Interviews:** **Jadeer** allows companies to conduct preliminary AI-driven interviews with applicants. The interview is conducted as an interactive voice-and-

video meeting led by the AI, where candidates are presented with both technical and psychometric questions to assess the applicant's skillset and personality.

3. **Evaluation of candidates:** The system evaluates candidates based on the accuracy of their responses to both technical and psychometric questions, the clarity of their communication, their provided CV, and voice-tone analysis. Each of these evaluation criteria is assigned a specific weight according to its importance, and the weighted scores are combined to calculate an overall score out of 100. This approach ensures consistent, transparent, and unbiased evaluations.
4. **Candidate Performance Report and Ranking:** After interviews, **Jadeer** generates a detailed report for each candidate, summarizing their strengths, weaknesses, and overall suitability for the role. Candidates are ranked from highest to lowest fit, allowing companies to make fair and data-driven hiring decisions.

- **Job seeker Side:**
  1. **Browsing Job Opportunities:** job seekers can browse job postings published by companies on **Jadeer**. The system highlights opportunities that match their skills and qualifications by aligning keywords from CVs with job contents. To help candidates discover the most relevant job opportunities.
  2. **AI-powered CV Enhancement:** job seekers can improve their CVs with AI-driven suggestions tailored to their specialization. The platform can enhance the CV either generally or in a job-specific manner, allowing it to highlight the candidate's strengths that align with a particular role. It refines language for clarity, emphasizes the most relevant skills, and optimizes the overall structure and formatting and ensures the CV is optimized to pass through ATS filters smoothly, increasing its chances of being noticed by recruiters.
  3. **Mock AI Interviews:** job seekers can practice interviews by selecting their specialization area. The AI conducts general interview simulations, evaluating the accuracy and clarity of responses as well as voice tone analysis. Afterward, **Jadeer** provides a comprehensive report that highlights strengths, areas for improvement, and practical tips to perform better in real interviews.

Through its dual-sided design, **Jadeer** delivers an integrated solution that supports both companies and job seekers. By automating core recruitment tasks, offering fair and unbiased evaluations, and providing valuable tools for preparation, **Jadeer** enhances efficiency and transparency in the hiring process. This solution ultimately helps companies find the right talent faster while empowering individuals to present themselves more effectively in the job market.

1.3 Product

1.3.1 Product Vision

This section defines the vision of **Jadeer** by highlighting its purpose, target audience, and unique value. It provides a clear direction for development and explains how the product stands out compared to existing solutions.

For companies and job seekers **Who** struggle with time-consuming, inefficient, and biased recruitment processes. **The Jadeer is an** AI-powered intelligent recruitment platform **That** streamlines the hiring journey by managing resume screening, candidate evaluation, interview preparation, and CV optimization **Unlike** HireVue [5], which focuses mainly on conducting and analyzing AI-driven video interviews, **Our product** provides a unified, end-to-end solution that covers the entire recruitment process from CV optimization and job matching to AI-powered interviews and comprehensive candidate evaluations.

1.3.2 Product Roadmap

The following roadmap presents the planned development of **Jadeer** across six sprints, organized into two major releases aligned with the project timeline.

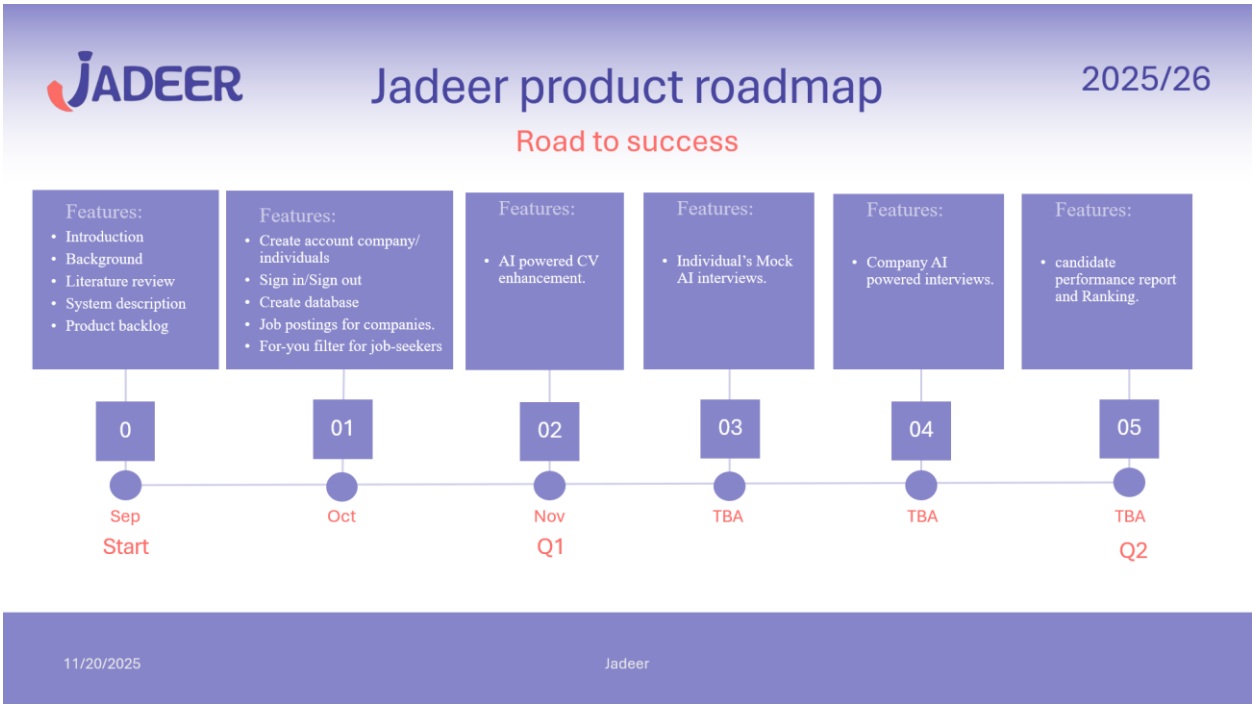

Figure 1: 1-1 Product Rodemap

1.3.3 Objectives

In this section we will define the product, project and learning objectives

- **Product (customer focus-value)**:

  These objectives are about the product, and how we will solve different problems and provide good benefits for users:

  1. **Unified Job Platform:** deliver a unified platform that centralizes all job-related processes for both companies and job seekers.
  2. **Automated HR Support:** support HR departments by automating key recruitment tasks (screening, matching, initial interviews, evaluation).
  3. **Efficient Job Posting:** enables companies to post job vacancies and manage applications efficiently.
  4. **AI-Powered Virtual Interviews: c**onduct realistic, AI-powered virtual interviews that simulate professional scenarios.

5. **Candidate Skill Analysis**: analyze candidate skills based on their CV and interview performance and generate a detailed report including a suitability score for each applicant.
6. **Job Matching:** match suitable job opportunities to job seeker based on their skills and experiences from their CV.
7. **Mock Interviews for Practice:** provide AI-driven interview simulations to help job seeker improve their performance.
8. **Personalized Feedback Reports:** generate personalized feedback reports highlighting strengths and weaknesses after mock interviews.
9. **CV Enhancement:** enhance CVs using AI to meet professional standards and pass automated company filters smoothly.

- **Project (solution focus-plan):**

These objectives outline the development stages of **Jadeer** platform and the outcomes to be achieved by the end of the project. They include:

1. **User Needs Identification:** identify user needs (job seekers & HR managers).
2. **Database Schema Design:** build core database schema.
3. **UI/UX Development:** design and develop user interfaces, ensuring intuitive navigation and accessibility.
4. **Interview Question Generation:** use existing AI capabilities (e.g., GPT) to generate and evaluate domain-specific interview questions (e.g., IT, finance, marketing), relying on prompt engineering and curated examples.
5. **Model Integration:** use existing pre-trained models for speech-to-text (Whisper) and text-to-speech (Google TTS) interview functionalities.
6. **Custom Model Development:** Build and fine-tune our own Speech Emotion Recognition (SER) model to recognize and evaluate candidate performance.
7. **AI-Generated Candidate Report:** AI-generated report combining interview transcript, answer evaluation, voice analysis, CV-job fit and candidate ranking.
8. **Usability Testing & Iteration:** conduct usability testing and iterate based on feedback from target users.

- **Learning (student focus):**

These objectives are about the team and the outcomes for the team while doing this project:

1. **Flutter Development:** learn how to use Flutter framework for building cross-platform mobile applications.
2. **Model Fine-Tuning:** learn how to fine-tune pre-trained AI models for domain-specific tasks.
3. **AI Model Integration:** learn how to integrate multiple AI models (e.g. Whisper, OpenAI GPT, Google TTS) into one system.
4. **AI-Driven UX Design:** learn how to design and implement AI-driven user experiences (e.g. interview simulation, CV enhancement).
5. **System Testing & Validation:** learn how to test and validate AI-powered systems with real users.

1.3.4 Scope

In this section we will define our boundaries and what is outside the scope of our platform.

The **Jadeer** platform is designed to enhance the recruitment process for both companies and job seekers. It provides companies with tools to generate job postings and conduct AI-powered interviews that evaluate candidates both technically and psychometrically, moving beyond the limitations of traditional Applicant Tracking Systems (ATS) keyword filtering [3] For job seekers, **Jadeer** offers CV refinement and realistic mock interview simulations, helping them prepare more effectively and receive meaningful feedback.

The application will be developed as a mobile application, accessible through mobile devices. The initial version will support English only, ensuring accessibility for a wide audience. The scope is limited to recruitment-related functions and does not extend to other HR modules such as payroll or attendance management.

The development of **Jadeer** will take place over two semesters, during which the core features will be implemented and tested to deliver a reliable and practical solution.

1.3.5 Hardware/Software Tools and Cost

This section outlines the hardware and software tools required to build **Jadeer**, along with their associated costs.

Hardware Tools	
Name and Description	Cost
Development Tools (personal laptops and computers)	Free (already owned)
Software Tools	
Name and Description	Cost
Flutter (SDK) an open-source framework for building natively compiled multi-platform applications from a single codebase. [6]	Free
Visual studio code (IDE) open-source code editor by Microsoft supports different languages, debugging, Git, and extensions.	Free
Android studio code (IDE, Emulator) the official Integrated Development Environment (IDE) for Android app development. [7]	Free
GitHub A platform for collaborating and code version control.	Free

Python Libraries (PyTorch, TensorFlow, Scikit-learn) Collections pre-written modules to simplify programming tasks.	Free
OpenAI API a service for developers to access OpenAI's AI tools and models.	input: $3.00 per 1M tokens output: $12.00 per 1M tokens [8]
Whisper OpenAI API an automatic speech recognition (ASR) system. [9]	Estimated as $0.006 per minute of audio, official pricing is not available.
Google TTS API Converts text into natural-sounding speech using an API powered by the best of Google's AI technologies. [10]	$4 per 1 million characters [11]
Firebase (cloud storage and database) A comprehensive backend-as-a-service (BaaS) platform by Google that provides tools for authentication, real-time databases, cloud storage, and hosting. It enables seamless integration with mobile and web applications, supporting rapid development and scalability.	Cloud storage: No-cost up to 5 GB Then $0.026/GB Realtime database: No-cost up to 1 GB Then $5/GB [12].

Table 1: 1-1 Hardware/Software Tools and Cost

1.4 Scrum Team

1.4.1 Skill Set Requirements

To successfully develop this product, the team requires a diverse set of technical skills across frontend, backend, databases, AI/ML, and deployment. The table below highlights the required skills, the team's current level, and plans to bridge any skill gaps:

Technical Skill Required	The current level of the team
Flutter (mobile & web development)	Current Level: Intermediate Gap Bridging Plan: Enhance skills through building app prototypes and official documentation
Backend Development (Django/Node.js)	Current Level: Beginner–Intermediate Gap Bridging Plan: Take online courses (Udemy, Coursera) and follow tutorials to strengthen backend APIs and authentication
Database Management (Firebase)	Current Level: Intermediate Gap Bridging Plan: Practice advanced queries and database optimization through project implementation.
Machine Learning with Python (PyTorch/TensorFlow)	Current Level: Intermediate Gap Bridging Plan: Assign team members to complete ML crash courses and implement small-scale models before integration.
NLP (OpenAI)	Current Level: Beginner Gap Bridging Plan: Explore pre-trained models and gradually fine-tune them for CV and interview tasks
Speech-to-Text (Whisper/Google STT)	Current Level: Beginner

	Gap Bridging Plan: Learn API integration and test accuracy with pilot interviews
Frontend UI/UX Development (React/Angular/Vue)	Current Level: Intermediate Gap Bridging Plan: Build interactive and responsive interfaces with real-time feedback for users.
Security & Privacy (JWT, OAuth2)	Current Level: Intermediate Gap Bridging Plan: Learn API authentication methods and implement secure data storage for sensitive user information.

Table 2: 1-2 Skill Set Requirements

Learning

To achieve the necessary learning outcomes, the team has undertaken several steps:

1. **Tutorials and Online Courses:** Team members have enrolled in specialized online courses to strengthen their technical skills. This includes:
   a. *Flutter Development* courses on Satr [13] and Udemy [14] to enhance mobile and web application development.
   b. *Backend Development* with Django and Node.js from Coursera [15], [16] to build secure and scalable APIs.
   c. Database Management training using Firebase through official documentation and YouTube tutorials. [17]
   d. *Machine Learning & NLP* specialization from Coursera (Andrew Ng) [18] and Hugging Face tutorials [19] to apply text analysis and AI-driven resume screening.
   e. *Computer Vision* workshops on OpenCV [20] and MediaPipe [21] for future implementation of gesture and facial analysis.
2. **Peer Learning:** The team conducts collaborative coding sessions, code reviews, and knowledge-sharing meetings to ensure that every member develops both theoretical understanding and practical problem-solving skills.

3. **Practical Implementation:** Learning is directly integrated into the project by building prototypes and small-scale experiments (e.g., testing CV filtering with NLP models, designing database schemas, and creating Flutter app mockups).
4. **Feedback and Iteration:** Regular supervisor feedback and self-assessment sessions are conducted to evaluate the team's learning progress and address gaps through additional resources.

Current Stage of Learning:

The team is currently in the active learning phase, with ongoing tutorials, prototype development, and practical exercises. Initial progress has been made in strengthening Flutter and backend skills. Meanwhile, the team is working toward intermediate proficiency in AI and NLP to ensure the successful integration of resume screening, candidate evaluation, and interview analysis features.

1.4.2 Roles and Responsibilities

Scrum Team	
Product Owner:	Dr. Mashael AlSaleh
Developers:	1. Walaa Saif Aleslam (Team Leader) 2. Noor Algumlas 3. Rawan Alshammari 4. Jana Almohsen 5. Walaa Alhajri
Scrum Master (SM):	Dr. Mashael AlSaleh
Stakeholders:	• Project team • Job seekers • Employers and companies • Recruitment agencies • HR departments within companies • Ministry of Human Resources and Social Development • University and IT department • AI service providers • Cloud service providers • Sponsors and investors • Market competitors

Table 3: 1-3 Roles and Responsibilities

2 Background

In this section, we provide the necessary theoretical and domain background for **Jadeer**. We begin by outlining the current state of recruitment technology, focusing on the use of Applicant Tracking Systems (ATS) and related e-recruitment practices. Following this, we introduce additional technologies and methodologies that **Jadeer** relies on to enhance recruitment processes, including Natural Language Processing (NLP), Large Language Models (LLMs), Speech-to-Text (STT), Text-to-Speech (TTS), and Speech Emotion Recognition (SER) and Psychometric Evaluations. Finally, we discuss the role of APIs such as Firebase, Whisper, Google Cloud TTS, and OpenAI in enabling the system's intelligent functionality. Together, these concepts form the foundation upon which **Jadeer** is designed and developed.

2.1 Overview of Modern Recruitment Practices

The integration of technology into recruitment has transformed how organizations attract, assess, and hire talent. Traditional paper-based processes have largely been replaced by e-recruitment systems, which automate job postings, streamline CV submissions, and enable faster candidate screening [22]. Video recruitment tools now allow candidates to record or join interviews remotely, saving time and eliminating geographical barriers. While these systems increase efficiency, they also introduce challenges such as reduced personal connection and data security concerns [22].

Building on this landscape, **Jadeer** aims to move beyond administrative automation toward deeper candidate evaluation, combining CV checks with AI-driven simulations to address the limitations of current tools.

2.2 Applicant Tracking Systems (ATS)

As organizations face increasingly high volumes of applications for each job opening, managing candidate information efficiently has become a critical challenge. To address this, recruitment technology has evolved beyond manual review and email-based submissions toward specialized software designed to streamline the process.

An Applicant Tracking System (ATS) is recruitment software designed to help employers manage the large number of applications they receive for job openings. These systems automate core tasks such as storing applicant information (resumes, cover letters, and contact details), tracking candidates throughout the hiring process, and scanning resumes to identify relevant qualifications [23]. By automating these functions, ATS platforms enable HR professionals to reduce manual effort, accelerate hiring cycles, and maintain an organized pool of candidates. Today, nearly all large organizations, including the majority of Fortune 500 companies, rely on ATS as part of their recruitment infrastructure [23].

2.2.1 Constraints

Despite their widespread adoption, ATS systems face several notable limitations:

- **Keyword Dependence**: Most ATS platforms rely on keyword-based filtering, where recruiters configure the system to search for specific terms related to skills, education, certifications, or experience. As a result, qualified candidates may be overlooked simply because their resumes use different phrasing than the job description. This creates a bias toward applicants who tailor their resumes to match ATS requirements.
- **Limited Contextual Understanding**: Keyword matching ignores semantic meaning and relationships between terms. For instance, an applicant with experience in "software engineering" may not be flagged for a role seeking "programming," even though the skills overlap. Research shows that such keyword-focused methods produce low precision and miss latent semantic connections [24].
- **Incomplete Knowledge Resources**: Even more advanced ATS that integrate semantic ontologies, or occupational classifications remain constrained by limited domain coverage. When a skill or concept is missing from the knowledge base, the system may fail to recognize it, leading to false negatives [24].
- **Lack of Feedback:** While ATS platforms help manage applications on a scale, they rarely provide recruiters with actionable insights into why a candidate is not a good fit. Studies highlight that "common issues such as resume rejection, lack of feedback, and technical problems" remain prevalent in ATS implementations [25].

These constraints highlight that ATS platforms, while useful for reducing the administrative workload of CV handling, focus almost entirely on document level screening. This automation saves time, but it does not reflect the real-world decision-making process of recruiters, which depends heavily on how candidates perform during interviews. Automating CV filtering may help shortlist applicants, but automating candidate evaluation provides far greater value; it captures communication skills and the ability to articulate expertise qualities that cannot be inferred from a resume alone.

Jadeer takes this approach by shifting automation from simple keyword-based screening to more meaningful evaluation. Through features such as AI enhanced CV refinement and interview simulations, the system enables recruiters to assess both the qualifications and the performance of candidates. This not only aligns more closely with actual recruitment practices but also ensures a fairer, more informative process for both recruiters and job seekers.

2.3 Natural Language Processing (NLP)

Natural Language Processing (NLP) is a branch of artificial intelligence concerned with enabling computers to analyze, interpret, and generate human language. At its foundation, NLP involves transforming raw text into a structured form that machines can process. Basic preprocessing techniques include tokenization, which breaks text into words or subword units, and the removal of stop-words such as “the” or “and” More advanced approaches use Byte-Pair Encoding (BPE) to represent subword units, allowing systems to handle out-of-vocabulary words effectively [26]. Additional methods such as stemming, lemmatization, and similarity metrics like minimum edit distance are commonly applied to normalize text and measure the closeness of two-word sequences.

A closely related area is Information Retrieval (IR), which focuses on finding relevant documents in response to a user’s information need. IR techniques are designed to handle unstructured text, by indexing terms and ranking documents according to their similarity to a query Manning [27].

While these methods provided foundational capabilities for text processing, they suffer from critical limitations: keyword-based matching cannot capture semantic relationships (e.g.,

"software engineering" vs. "programming expertise"), bag-of-words models ignore context and word order, and rule-based systems require extensive manual engineering for each edge case.

The emergence of Large Language Models (LLMs) addresses the fundamental limitations of traditional NLP approaches [28]. Rather than relying on rigid keyword matching and handcrafted rules, LLMs learn rich contextual representations from vast text corpora, enabling them to understand semantic similarity, generate contextual content, adapt without retraining by responding to diverse prompts and tasks through prompt engineering [29], eliminating the need for task-specific models, and handling ambiguity by interpreting nuanced language and context that rule-based systems cannot process.

2.3.1 Use in Jadeer

In **Jadeer**, natural language processing is used in a lightweight and practical way to support features such as extracting keywords from job postings and from the CVs that users upload to their profiles. These keywords are then compared to recommend relevant job postings on the job seeker's "For You" page. This process relies on simple text preprocessing and list-based matching rather than advanced NLP models. More complex language understanding and text generation tasks such as creating job descriptions, enhancing CVs, and generating interview questions are handled separately through Large Language Models (LLMs). This distinction allows **Jadeer** to remain efficient while still benefiting from the richer capabilities of modern generative AI.

2.4 Large Language Models (LLMs)

Language models are systems that assign probabilities to sequences of words, allowing them to predict the likelihood of a word or phrase appearing in context. One of the earliest approaches, the n-gram model, estimated the probability of a word based on a fixed window of preceding words in a training corpus [26]. While n-gram models were effective for tasks such as spelling correction and speech recognition, they suffered from data sparsity and were limited by their short context windows. To address these issues, researchers introduced evaluation metrics such as perplexity and smoothing techniques to improve performance on unseen data.

In contrast to n-gram models, modern LLMs differ fundamentally in both their underlying architecture and their linguistic capabilities. Traditional n-gram models rely on fixed-size context windows and discrete probability counts, which limits their ability to capture long-range dependencies and makes them susceptible to data sparsity issues when encountering unseen word combinations [26]. LLMs, however, are built on transformer architectures that use self-attention mechanisms to model relationships across an entire sequence, regardless of distance [28]. This enables them to learn rich semantic representations and contextual meanings that extend far beyond the shallow, frequency-based statistics of n-grams. Additionally, unlike n-gram models that must be manually engineered for specific tasks, LLMs are trained on large-scale datasets and can generalize across multiple tasks such as reasoning, summarization, question answering, and long-form text generation with significantly higher fluency and coherence [26]. These differences mark a major shift from probabilistic language modeling toward deep contextual understanding.

2.4.1 Use in Jadeer

In **Jadeer**, Large Language Models (LLMs) are directly embedded into the platform through the OpenAI API, enabling several core features within the application. Companies can use LLMs to automatically generate clear and professional job-posting descriptions, while job seekers benefit from CV enhancement features where the LLM restructures their text, improves the clarity and organization of the content, identifies missing or unclear sections, and produces personalized improvement feedback that is stored and displayed in the application. **Jadeer** also employs LLMs to generate interview questions for both real interviews and mock interviews; mock interview questions are tailored according to the specialty selected by the job seeker, whereas real interview questions are generated based on the specific content of each job posting. These LLM-driven functionalities are fully integrated into **Jadeer's** workflows, allowing the system to interpret user inputs, understand job contexts, and produce high-quality outputs in real time. By leveraging the natural-language comprehension capabilities of LLMs, **Jadeer** automates processes that would otherwise require manual review, enabling the platform to scale efficiently while maintaining consistent and context-aware recruitment assistance.

2.5 Speech-to-Text (STT)

Speech recognition, also known as Automatic Speech Recognition (ASR), is the technology that enables computers to convert spoken words and phrases into machine-readable text. Unlike traditional input methods such as keyboards or touchscreens, ASR allows users to interact with devices naturally through voice commands [30].

An ASR system operates by capturing audio signals, splitting them into sound waves, extracting acoustic features (such as pitch, intensity, and duration), and applying algorithms that map these features to the most likely words in a language. This process involves multiple models, including acoustic models, language models, and natural language processing (NLP) techniques [30].

Modern speech recognition is widely applied in domains such as banking, healthcare, marketing, and education. Consumer systems such as Siri, Google Assistant, Alexa, Cortana, and Bixby highlight the everyday role of ASR in enhancing accessibility and convenience [30].

2.5.1 Use in Jadeer

In **Jadeer**, a speech to text (STT) API is used to transcribe candidate interview audio responses. This transcription is then analyzed by the system to provide feedback, enabling a realistic interview experience.

2.6 Text-to-Speech (TTS)

Text-to-Speech (TTS) systems are computer-based applications designed to automatically convert written text into spoken audio. Unlike simple voice response systems that concatenate pre-recorded words for limited domains (e.g., train announcements), a TTS synthesizer is capable of producing novel sentences through processes such as grapheme-to-phoneme transcription. This makes TTS a more flexible technology, enabling the generation of natural sounding speech for any input text [31].

A TTS system does not replicate the exact biological processes of human speech production, which involve complex interactions of airflow, vocal tract dynamics, and cortical control. Instead, most systems adopt simplified engineering architecture composed of two main modules. The Natural Language Processing (NLP) module analyzes input text, producing a phonetic transcription along with prosodic features such as rhythm and intonation. The Digital Signal Processing (DSP) module then transforms this symbolic representation into a speech

waveform. This architecture balances linguistic accuracy with computational efficiency, enabling real-time synthesis with manageable resource requirements [31].

2.6.1 Use in Jadeer

In **Jadeer**, Text-to-Speech (TTS) technology is employed through Google text-to-speech (TTS) API to enhance the realism of both mock and actual interview features. By converting written interview questions into natural sounding spoken output, the system simulates the experience of a live interviewer. This functionality contributes to a more engaging and authentic interview environment.

2.7 Speech Emotion Recognition (SER)

Speech Emotion Recognition (SER) is a field of artificial intelligence that focuses on identifying human emotions from audio signals. Unlike traditional speech-processing systems that extract only linguistic information, SER analyzes both acoustic and prosodic features such as pitch, intensity, tone, rhythm, and speaking rate, which are strong indicators of emotional expression [32]. Modern SER systems are widely used in virtual assistants, customer service analysis, and human–computer interaction due to their ability to interpret affective states and provide context-aware responses.

2.7.1 Data Preprocessing Pipeline

Before training or fine-tuning SER models, several preprocessing steps must be applied to ensure that audio samples from different datasets follow a consistent structure. The following steps represent the standardized pipeline adopted across RAVDESS [33] and CREMA-D [34]:

- **Format Standardization:** All audio is converted to WAV, 16kHz, mono-channel, 16-bit precision.
- **Silence Removal:** Voice Activity Detection (VAD) removes long silent segments.
- **Noise Reduction:** Filters such as spectral subtraction or Wiener filtering reduce background noise.
- **Normalization:** Peak or RMS normalization makes audio amplitudes consistent.
- **Segmentation:** Clips are segmented into 3–5 second windows with 50% overlap to increase training samples.

• **Data Augmentation:** Applied during training only (time stretching, pitch shifting ±2 semitones, and noise injection) to reduce overfitting and improve generalization.

These preprocessing steps prepare the audio for all three model-training approaches [35].

2.7.2 Model Training Approaches for SER

To build an accurate SER model for **Jadeer**, we reviewed recent research and identified three well-established training approaches. These approaches differ in computation cost, accuracy, and adaptability.

2.7.2.1 Approach 1: End-to-End Fine-Tuning of Pretrained Models

This approach involves fine-tuning self-supervised speech models such as wav2vec 2.0 [36]and HuBERT [37]directly on emotion-labeled audio [38] [39].

Steps include:

1. Load a pretrained model.
2. Freeze 70–80% of lower layers to preserve general speech features.
3. Add a dense emotion classification head.
4. Train on RAVDESS [33] + CREMA-D [34] emotion labels.

Technical Specs:

- Embedding size: 768–1024
- Optimizer: AdamW
- Learning rate: 1e-6 – 1e-4
- Dropout: 0.1–0.5
- Training epochs: 10–50

Advantages:

- Highest accuracy due to full task-specific adaptation [40].
- End-to-end learning captures subtle emotional cues.
- State-of-the-art results across benchmark datasets.

Disadvantages:

- High GPU requirements (16GB+).
- Long training time.
- Large model size and higher risk of overfitting with small datasets.

2.7.2.2 Approach 2: Feature Extraction + Classical Machine Learning

Here, pretrained models such as wav2vec 2.0 [36] or HuBERT [37] are used only to extract embeddings, while the embeddings are passed to classical ML algorithms [41] [42].

1. Pretrained model generates fixed-length embeddings.
2. Embeddings undergo mean pooling.
3. Classifiers such as SVM, Random Forest, or XGBoost are trained on these embeddings.

Advantages:

- Very fast training (minutes).
- Works well on small datasets.
- Low computational cost (runs on CPU).
- Reproducible and easy to tune.

Disadvantages:

- Slightly lower performance than fine-tuning.
- Emotion features are not adapted to the task.
- Requires experimenting with pooling strategies.

2.7.2.3 Approach 3: Feature Extraction + Deep Learning Classifier

Similar to Approach 2 for feature extraction, but uses deep learning classifiers to capture temporal features in emotion sequences [42] [43].

Common architectures:

- **BiLSTM:** Models temporal patterns and bi-directional context.
- **CNN:** Extracts local acoustic patterns.

- **Attention mechanisms:** Focus on emotionally salient frames.
- **Hybrid CNN + LSTM:** Combines local feature extraction with sequential modeling [44].

Advantages:

- Captures sequential emotional patterns.
- Higher accuracy than classical ML approaches.
- More computationally efficient than full fine-tuning.

Disadvantages:

- Requires GPU.
- More hyperparameters and risk of overfitting.
- Larger model size compared to classical ML.

2.7.3 Use of SER in Jadeer

In **Jadeer**, the SER model supports the interview evaluation process by analyzing vocal tone and prosodic patterns associated with the six core emotion classes (neutral, happy, sad, angry, fearful, and disgust). This allows the system to identify emotional shifts during candidate responses, contributing to a richer understanding of speaking style and communication performance. To achieve this, **Jadeer** adopts the "feature extraction with a deep learning classifier" approach. This approach provides strong performance while remaining computationally efficient for our system.

Jadeer does not rely solely on emotion recognition to judge performance; instead, SER is one component of a holistic evaluation integrating LLM-based answer quality assessment and job-role requirements.

2.7.4 Evaluation

To evaluate the SER component in **Jadeer**, the model will be tested using standard performance metrics, including accuracy, precision, recall, and F1-score for the six emotion classes. A confusion matrix will also be used to identify common misclassifications. After standalone testing, the model will be integrated into **Jadeer's** interview simulation to ensure

correct prediction flow, stable inference, and proper interaction with the LLM-based scoring pipeline.

2.8 Psychometric Evaluations

Psychometric evaluations are standardized assessments designed to measure a candidate's cognitive abilities, personality traits, and behavioral tendencies in a structured and objective way. Recruiters often use these evaluations to gain deeper insights into whether a candidate's skills, motivations, and interpersonal style align with the requirements of a role and the culture of the organization. Common examples include aptitude tests (e.g., numerical, verbal, or logical reasoning), personality inventories, and situational judgment tests. These tools complement CV screening and interviews by providing quantifiable data on attributes that are not easily observable in traditional recruitment stages. As a result, psychometric evaluations have become a common component of modern recruitment processes, helping organizations make more informed and fair hiring decisions [45].

2.8.1 Use in Jadeer

In **Jadeer**, psychometric-style assessments are incorporated into the interview simulation through a set of structured behavioral and personality-related questions using the Five-Factor Model. These questions are designed to reveal traits such as communication style, adaptability, teamwork, and problem-solving behavior [46]. The system evaluates the candidate's spoken answers using integrated LLMs, **Jadeer** uses this approach to give job seekers practical insight into how they present themselves and to support recruiters with an additional layer of qualitative information during interviews.

2.9 APIs used in **Jadeer**:

2.9.1 Firebase API

Firebase is a cloud-based platform by Google that provides a comprehensive suite of backend services and tools for mobile and web applications. It offers Flutter plugins that allow seamless integration between applications and Firebase's infrastructure, enabling developers to accelerate time-to-market and improve app quality with minimal effort. Firebase services cover core areas such as authentication, real-time databases, analytics, and cloud storage [47].

2.9.1.1 Use in Jadeer

In **Jadeer**, Firebase is primarily used to manage user authentication and data storage. By relying on Firebase's secure and scalable infrastructure, the system ensures that candidate and recruiter data remain accessible, synchronized, and protected.

2.9.1.2 Evaluation

A study [48] shows that Firebase performs well for unstructured data and real-time sync. For **Jadeer**, this means resumes, job postings, and user data can be stored and updated seamlessly, reducing latency and improving user experience while avoiding the overhead of building a custom backend.

2.9.2 OpenAI API

The OpenAI API is a cloud-based service that provides access to advanced artificial intelligence models through a general-purpose "text-in, text-out" interface [49] . By submitting natural language prompts, developers can leverage models for tasks such as summarization, text generation, classification, and reasoning without the need to build or host the models locally. In addition to these capabilities, the API also supports fine-tuning, where developers can train base models on domain-specific datasets to improve performance for specialized tasks [49].

The API offers several model families optimized for different use cases, ranging from lightweight models designed for fast responses to larger models capable of handling complex reasoning and extended conversations [49].

2.9.2.1 Use in Jadeer

In **Jadeer**, the OpenAI API is used to generate tailored job posting description, interview questions, provide CV improvement features, and generate interviews feedback.

2.9.2.2 Evaluation

The GPT-4 Technical Report [50] shows state-of-the-art results on benchmarks like MMLU and HumanEval, while independent studies confirm the high coherence and fluency of GPT outputs [51] [52]. In **Jadeer**, quality is further enhanced by prompt engineering, which

allows the API to generate specific recruitment outputs such as tailored interview questions, job postings and CV improvements.

2.9.3 Whisper API (Speech-to-Text)

Whisper is an automatic speech recognition (ASR) system developed by OpenAI and trained on 680,000 hours of multilingual and multitask supervised data collected from the web. This large and diverse training dataset makes Whisper highly robust against variations in accents, background noise, and technical vocabulary. The system supports both transcription (converting speech into text across multiple languages) and translation (rendering non-English speech into English text), offering broad applicability in multilingual contexts [9].

2.9.3.1 Use in Jadeer

For **Jadeer**, the Whisper API provides the backbone for speech-to-text processing in interview simulations. ensuring that the spoken content is accurately captured for further analysis. By leveraging Whisper, **Jadeer** ensures reliable, accessible transcription capabilities that enhance the realism of the simulated interview process.

2.9.3.2 Evaluation

OpenAI's Whisper has demonstrated state-of-the-art performance across multiple public datasets, showing robustness to noisy environments, diverse accents, and domain-specific terminology. Its ability to generalize to previously unseen conditions reduces transcription errors compared to traditional ASR models [53] .

2.9.4 Google Cloud Text-to-Speech (TTS) API

Google Cloud Text-to-Speech (TTS) is an API that converts written text or Speech Synthesis Markup Language (SSML) into natural-sounding, synthetic human speech. The service supports multiple audio formats, such as MP3 and LINEAR16 (WAV), making it adaptable for integration into applications and media systems. TTS enables developers to provide audible feedback to users, generate voice responses, or augment content with human-like narration [54].

2.9.4.1 Use in Jadeer

In **Jadeer**, the TTS API is used to generate realistic interviewer voices during simulated interviews, enhancing the realism of the candidate experience. By converting generated questions into spoken audio, the system offers candidates a more immersive environment that mirrors real-world interview conditions.

2.9.4.2 Evaluation

Studies have shown that Google Cloud TTS achieves high MOS ratings, often approaching the quality of human speech. Tests on US English WaveNet voices, for example, achieved an average MOS of 4.1 out of 5, more than 20% better than standard voices, thereby reducing the gap with human speech by over 70% [55].

2.10 Integration of Technologies in Jadeer

In **Jadeer**, all technologies mentioned in the background section work together to create a recruitment system that goes beyond the limitations of traditional ATS. Instead of focusing solely on keyword filtering of resumes, **Jadeer** emphasizes a more holistic evaluation of candidates. Large Language Models (LLMs) are used to refine CVs, generate tailored interview questions, and help in creating job postings, ensuring candidates are assessed on both their background and their responses. Speech-to-Text (STT) is employed to transcribe candidates' spoken answers, allowing the system to analyze responses accurately and consistently. Text-to-Speech (TTS) adds realism to the process by simulating an interactive interviewer, enhancing the authenticity of interview simulations. Furthermore, the Speech Emotion Recognition (SER) model analyzes vocal tone and prosodic patterns to provide additional insight into emotional expression during responses, enriching the overall evaluation. Meanwhile, APIs such as OpenAI, Whisper, Firebase, and Google Cloud TTS provide the backbone for scalable, secure, and seamless integration. Together, these technologies enable **Jadeer** to automate candidate assessment in a way that mirrors real-world recruitment more closely than simple CV screening, offering recruiters richer insights and candidates more meaningful feedback.

3 Literature Review

For **Jadeer**, the literature review plays a key role in shaping the system's direction by clarifying what is required and why certain approaches are most suitable. This section looks at existing recruitment platforms and highlights how they function, where they succeed, and where they fall short. Understanding these existing efforts provides context, but the greater value lies in examining the difficulties experienced by recruiters and job seekers, difficulties that many current tools only partially resolve.

The review therefore focuses on competitor analysis, outlining the main capabilities of each platform and the limitations that restrict their effectiveness. By comparing these systems, **Jadeer** can draw meaningful lessons and identify opportunities to design features that directly address persistent gaps, such as lack of candidate feedback, limited fairness, and weak personalization. In this way, the literature review provides a well-grounded basis for **Jadeer's** development, ensuring that the platform grows out of both user needs and an informed view of the competitive landscape.

3.1 Competitive Product Analysis

To better understand the current landscape, the following analysis examines leading recruitment platforms, beginning with HireVue, a widely adopted AI-powered interviewing tool.

HireVue

HireVue is a widely used AI-powered hiring platform that enables organizations to conduct video interviews, assessments, and skill-based evaluations to streamline the recruitment process [56].

Features:

1. **Video Interviewing**: Offers both asynchronous (on-demand) and live video interviews with structured evaluations.
2. **AI-Driven Assessments**: Provides game-based, technical, and language assessments to measure candidate skills and potential.

3. **Find My Fit™ Application**: Matches candidates to roles based on skills, interests, and future potential, supporting diversity and inclusivity.
4. **Human Potential Intelligence**: Uses data science and industrial/organizational psychology to focus on aptitude and attitude, rather than traditional CV-based hiring.

Limitations:

1. **Transparency Concerns**: Candidates often feel uncertain about how AI models evaluate their responses, raising issues of trust.
2. **Accessibility Challenges**: Non-native accents, speech impairments, or poor internet connections can reduce fairness in AI-driven assessments.

Harver

Pymetrics (by Harver) is a talent assessment solution originally founded as a neuroscience-based platform using game-like exercises to measure cognitive, emotional, and social traits. After being acquired by Harver in 2022, it became part of Harver's broader portfolio for high-volume, science-driven hiring, combining large-scale automation with innovative neuroscience assessments [57].

Features:

1. **Neuroscience Games**: Provides short, engaging games that measure traits such as memory, attention, decision-making, and risk tolerance, delivering objective behavioral data.
2. **AI-Driven Matching**: Uses machine learning models to compare candidates' profiles with success benchmarks for specific roles, emphasizing aptitude and potential over traditional CVs.
3. **Bias Mitigation**: Includes regular audits, validation studies, and scientifically supported models to reduce adverse impact and promote fairness in hiring.
4. **Integration at Scale**: Through Harver, Pymetrics is embedded into large-scale hiring workflows, enabling companies to process thousands of applicants efficiently while maintaining depth in assessment.

Limitations:

1. **Transparency Concerns**: Some candidates may find it difficult to understand how their gameplay data translates into hiring decisions, which can affect trust.
2. **Cultural and Contextual Differences**: Game-based assessments may not fully account for global cultural diversity, which can influence fairness and consistency across applicant pools.

Kanz

Kanz is an AI recruiting copilot and job marketplace, especially for Saudi Arabia, designed to help employers source, assess, and interview candidates faster and more efficiently via automation and broad profile reach [58].

Features:

1. **Widespread Sourcing:** Pulls from a large database (100M+ profiles) to find potential candidates.
2. **Multi-Platform Job Posting:** Post jobs to various platforms through Kanz, increasing visibility.
3. **Automated Assessment & Interview Scheduling:** Uses AI to evaluate candidates and automates scheduling of interviews, aiming to reduce turnaround time ("days, not weeks").
4. **Regional/Local Market Focus:** Tailored to the Saudi market, which could mean localization (language, regulations, culture), which few global platforms can match.

Limitations:

1. **Lack of Deep Candidate Support:** It's not clear whether they provide mock interviews, feedback on responses, or tools to help candidates improve (CV optimization, interview practice).
2. **Transparency & Fairness:** The information available does not clearly show how their AI assessments work (how decisions are made, fairness audits, bias mitigation).
3. **Language / Accent / Context Sensitivity:** Even though regional, AI assessments often struggle with dialects or speech variation; unless explicitly stated, it's unclear how well their system handles those.

4. **Feature Depth vs Breadth Trade-Offs:** Because they emphasize automation and speed, they may sacrifice depth in candidate evaluation (e.g. less personalized feedback, less emotional or tone evaluation) in favor of efficiency.

Kabi

Kabi is an AI-powered recruitment platform that combines ATS functionality, psychometric video assessments, and HR consulting, with a strong focus on Saudi Arabia and the wider regional market [59].

Features:

1. **AI-driven ATS (HYRDD):** Streamlines the recruitment pipeline, from posting to shortlisting and interview scheduling.
2. **Psychometric Video Assessments (INVIEWS):** Provides deeper behavioral insights into candidates beyond traditional CVs.
3. **HR Consulting Services:** Offers human capital consulting alongside technological tools.
4. **Regional and Local Focus:** Headquartered in Saudi Arabia, with regional expansion and acquisition of BLOOVO to strengthen local market presence.
5. **Efficiency and Analytics:** Emphasizes reducing time-to-hire and costs while offering analytics to support better decision-making.

Limitations:

1. **Limited Candidate Support:** Lacks clear tools for CV enhancement, mock interviews, or detailed candidate feedback.
2. **Transparency Concerns:** Public information does not clarify how video and psychometric evaluations are scored, nor how bias is mitigated.
3. **Over-reliance on Assessments:** Heavy focus on video/psychometric evaluations may overshadow technical skills, experience, or multilingual ability.
4. **Language and Accent Sensitivity:** Video-based AI assessments can struggle with dialects, accents, or technical issues unless explicitly designed to handle them.
5. **Personalization Depth:** Employers may need richer, customized reports, while candidates may want clearer explanations of acceptance/rejection — areas where **Kabi** seems limited.

Tamayaz

Tamayaz is a Saudi Arabia-based AI-powered talent pool and assessment platform that connects job seekers and employers via verified candidate assessments, video and chat simulations, and auto-scoring [60].

Features:

1. **AI Auto-Scoring across Formats:** Supports scoring for video, chat simulation, and standard assessments, allowing employers to get consistent candidate evaluations.
2. **Verified Talent Pool:** Maintains a pool of pre-assessed and verified candidates, helping reduce risk and filtering effort for employers.
3. **Multi-Industry Streams:** Offers streams by industry (IT, Hospitality, Healthcare, etc.) so assessments and matching are more relevant per field.
4. **Anti-Cheating Measures:** Includes measures to maintain assessment integrity.
5. **Employer Customization:** Employers can invite candidates to take company-specific assessments/tests and use the platform's search / shortlisting tools.

Limitations:

1. **Candidate Feedback Depth:** It's not clear how detailed the feedback is for rejected candidates — whether they receive insights into their performance (strengths/weaknesses) or just scores.
2. **Mock Interview / Practice Tools:** There is no obvious mention of mock interviews or preparatory practice simulations beyond assessments.
3. **Transparency of Scoring / Fairness:** The auto-scoring system may not show how decisions are made, how fairness or bias is ensured (e.g., how chat/video is evaluated, whether cultural or accent bias is handled).
4. **Language / Dialect Support:** While localized, the platform doesn't explicitly state support for multiple dialects or non-standard speech, which may affect fairness in video/chat assessments.

Competitors / Features	HireVue	Pymetrics	Kanz	Kabi	Tamayaz	Jadeer
CV Management (Upload & AI Enhancement)	Limited – Upload for context, no AI CV editing	No	Yes	Yes	Yes	Yes
Job Search & Application	No	No	Yes	Yes	Yes	Yes
AI-Powered Interviewing	Yes	No	No	Limited, Some automated assessments.	Limited	Yes
Mock Interviews & Training	Yes	No	No	No	No	Yes
Job Posting Management	No	No	Yes	Yes	No	Yes
Application Management	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: 3-1 Competitive Product Analysis

In reviewing existing recruitment platforms, it is clear that each competitor brings valuable innovations yet also reveals notable gaps. **HireVue** focuses on AI-driven video interviews but offers limited transparency and minimal support for candidate preparation. **Pymetrics** emphasizes fairness and behavioral assessments but does not cover core recruitment needs such as CV management or interview simulations. **Kanz** provides regional focus and automation for job postings and scheduling but lacks detailed candidate feedback or training features. **Kabi** combines ATS functions with video assessments and consulting, yet its approach

remains centered on employers with little direct support for job seekers. **Tamayaz** highlights verified talent pools and AI auto-scoring but falls short in providing mock interview practice or in-depth feedback.

Taken together, these platforms demonstrate strong progress in digitizing recruitment but leave critical user challenges unresolved. **Jadeer** addresses these gaps through its dual-sided design, enhancing job seekers' employability with AI-driven CV improvements and mock interviews, while simultaneously supporting employers with AI-powered candidate reports, automatic ranking, and verified company management. This positions **Jadeer** as a more comprehensive and balanced platform, ensuring value for both companies and applicants.

By closing the gaps left by existing solutions, **Jadeer** establishes itself as a platform that not only leverages AI to streamline hiring but also empowers candidates to prepare effectively. The following section provides a detailed description of **Jadeer's** system, including its users, requirements, and architecture.

4 System Requirements

This section provides an overview of the **Jadeer** system, including its users, requirements elicitation process, architecture, and use case diagram, highlighting how the platform supports both companies and job seekers in the recruitment process.

4.1 Users

This section describes the main types and characteristics of users of the **Jadeer** platform. **Jadeer** serves two primary groups: **companies** looking to hire qualified candidates, and **individuals/job seekers** aiming to find job opportunities and improve their chances in the recruitment process in addition to the admin responsible for managing company accounts.

1) **Company users**:

   Companies using **Jadeer** vary in size, industry, and recruitment needs. Key characteristics include:

   - Users are HR professionals, recruiters, or hiring managers responsible for recruiting talent.
   - Users must be able to navigate digital platforms and understand recruitment processes.
   - Users can be from any industry or sector.
   - Users expect an efficient, unbiased, and data-driven hiring process.
   - Users require tools for job posting candidate evaluation, AI-assisted interviews, and performance reporting.

2) **Job seekers users:**

   Job seekers on **Jadeer** include individuals at different career stages who want to find suitable job opportunities and prepare effectively for interviews. Key characteristics include:

   - Users are adults, typically 18 years or older.
   - Users may be fresh graduates, early-career professionals, or experienced job seekers.
   - Users can be of any gender and nationality.
   - Users should have basic digital literacy to use AI features for CV enhancement, interview practice, and job browsing.

- Users may have prior experience with job platforms or may be new to online recruitment systems.
- Users are motivated to improve their employability and seek fair, transparent recruitment processes.
- Users may have varying levels of preparation: some plan and polish their applications carefully, while others seek guidance on improving their CVs and interview skills.

3) Admin Users:

Admins in **Jadeer** are responsible for overseeing the registration and verification of company accounts. Their duties ensure that only authorized representatives can create and manage company profiles. Key characteristics include:

- Admins are platform supervisors tasked with reviewing company sign-up requests and validating the authenticity of the documents and email credentials submitted.
- Admins must be able to evaluate verification materials, such as proof of employment, official business emails, or authorization letters provided during registration.
- Admins ensure that each company account is legitimate, verifying that the user registering is officially permitted to act on behalf of the organization.
- Admins must be detail-oriented and compliant-driven, as their decisions prevent fraudulent companies from entering the system.
- Admins have the authority to approve or reject company accounts, marking them as *Verified* or *Rejected* within the platform after completing their review.

General Expectations Across Users:

- All users – except for the admin - should have a willingness to engage with AI-driven tools to optimize recruitment or job-seeking outcomes.
- Users value efficiency, accuracy, and fairness in the recruitment process.
- Users are expected to benefit from personalized recommendations, whether for job opportunities, candidate evaluations, or interview preparation.

4.2 Requirements Elicitation and Analysis

In this section, we will describe our approach to eliciting requirements for our project. Initially, we documented and elicited requirements using techniques such as user interviews and questionnaires. We relied primarily on these techniques to effectively gather requirements. These methods allowed us to gather valuable insights into the factors influencing the recruitment process for both companies represented by the human resources department and individuals seeking jobs, the challenges they face, and the features that could enhance their experience.

Regarding the interviews (see Appendix A: Interviews), we interviewed five stakeholders as a valuable source of information, three of them were human resources consultants and experts, and the other two were job seekers.

For HR consultants we formulated nine targeted questions focusing on HR professionals' experience with recruitment platforms, their typical hiring process, and the most time-consuming tasks they face. The questions also explored their current methods of resume screening, common reasons for applicant rejection, and the key details they look for in CVs. Additionally, we investigated how they structure interviews, the importance they place on detailed candidate assessment reports, and the features that would make a recruitment app valuable for regular use.

And for job seekers we formulated seven targeted questions focusing on how job seekers choose which jobs to apply for, the challenges they face during the application process, and the ways they usually prepare their CVs. The questions also explored their methods of preparing for interviews, their expectations from mock interview tools, the type of feedback they find most useful, and the features that would make a recruitment app valuable for regular use.

In addition, we used questionnaires (see Appendix B: Questionnaires) as another method for eliciting requirements. We distributed two separate forms one for companies and the other for individuals. The companies form composed of a set of ten carefully designed questions, combining both closed and open-ended formats, to gather valuable insights from HR professionals about their recruitment practices. We collected a total of 10 responses, which allowed us to analyze common trends and challenges in the hiring process. The questionnaire covered topics such as prior experience with recruitment platforms, the typical hiring process, time-consuming tasks, resume screening methods, common reasons for rejection, and the importance of detailed candidate reports.

As for the job seeker's form, composed of a set of 16 questions combining both closed and open-ended formats, these questions capture the perspectives of job seekers regarding their application journey. We collected a total of 30 responses, enabling us to identify common patterns, challenges, and preferences among participants. The questionnaire focused on how they select job opportunities, the biggest obstacles they face in the application process, their methods of preparing CVs and interviews, their expectations from mock interview tools, and the type of feedback they find most useful.

Overall, the combination of interviews and questionnaires enabled us to gather valuable insights from both job seekers and HR professionals, uncovering their needs, challenges, and expectations in the recruitment process. By analyzing this data and presenting it visually, we developed a comprehensive understanding of both perspectives, which guided us in shaping **Jadeer** into a smarter, more effective, and user-centered recruitment platform.

4.2.1 Interviews

Through the interviews, we gained valuable insights and results about job seekers' and HR professionals' experiences and preferences when using recruitment platforms in Saudi Arabia. We found that HR professionals have varying degrees of experience with recruitment software: some rely on well-known platforms such as LinkedIn, Jadara, and Job.com and value their efficiency in saving time and finding suitable candidates (from interview 2), while others still rely on manual filtering of CVs, especially in private companies, and consider the process time-consuming (from interview 1). In terms of the hiring process, HR professionals emphasized that it is often long, complex, and labor-intensive, with multiple stages including job posting, candidate screening, interviews, and final evaluation (from interviews 1 and 3). The most time-consuming tasks identified were recruiting candidates and filtering CVs, highlighting a strong need for automation and AI assistance (from interviews 1, 2, and 3).

Regarding candidate evaluation, HR professionals highlighted that personality, experience, qualifications, and compatibility with company culture are crucial factors in rejecting or selecting applicants (from interviews 1, 2, and 3). They also value detailed and organized assessment reports, especially those that measure personality, confidence, and achievements, which support objective decision-making (from interviews 2 and 3). Features that make a recruitment platform valuable include AI-driven personality analysis, efficient candidate selection, and strong performance in recommending suitable applicants (from interviews 1 and 3).

From the job seekers' perspective, participants commonly use specialized websites, personal connections, and social platforms to find job opportunities, with some relying heavily on AI tools like ChatGPT to prepare their CVs and practice interviews (from interviews 4 and 5). The main challenges they face include lack of feedback from companies, difficulty in CV preparation, and insufficient guidance for interviews (from interviews 4 and 5). Job seekers expressed interest in features that provide realistic mock interview simulations, actionable feedback on performance, and opportunities to improve CVs (from interviews 4 and 5).

Suggestions for improving recruitment platforms include providing clear and honest feedback, enhancing AI support for CV optimization and interview preparation, verifying the authenticity of job postings, and integrating all opportunities into a single accessible platform (from interviews 4 and 5). Overall, the interviews highlighted a gap between current recruitment tools and user needs, emphasizing automation, personalized recommendations, and comprehensive feedback as key factors for a successful recruitment experience.

Here is information about our participations:

Participants	Name	Location	Gender	Age	Nationality	Occupation	Educational Level
1	Participant 1	Riyadh	Male	45	Saudi Arabia	HR	PhD
2	Participant 2	Riyadh	Male	48	Saudi Arabia	HR	Master
3	Participant 3	Jeddah	Male	51	Saudi Arabia	HR	Master
4	Participant 4	Riyadh	Female	24	Saudi Arabia	Computer science	Bachelor
5	Participant 5	Riyadh	Female	25	Syria	Software engineering	Bachelor

Table 5: 4-1 Summarizing the participants' information

4.2.2 Questionnaires

1- Companies Survey:

We conducted a survey with **10 organizations** from different sectors (70% government, 20% private sector, 10% regulatory bodies). The findings can be summarized as follows:

- **Volume of Applications:** 40% of organizations receive more than 500 applications per job posting, 30% receive 201–500, another 30% receive 50–200, while 10% receive fewer than 50.
- **Most Time-Consuming Stage:** 60% identified *initial CV screening* as the most time-consuming stage, 30% said *candidate evaluation/reporting*, and 10% mentioned *conducting first interviews*.
- **Use of Digital Tools:** 30% currently use recruitment platforms, another 30% are planning to, 20% are unsure, and 20% do not use any tools. Reported tools included LinkedIn, HireVue, SAP SuccessFactors, and traditional recruitment systems.
- **Trust in AI Systems:** Opinions were divided: 20% expressed low trust, 30% moderate trust, 30% high trust, and 20% very high trust in delegating interviews to AI systems.
- **Concerns about AI-Generated Questions:** Main concerns were *professional tone* (50% marked as major concern), *difficulty level* (30%), *relevance to the role* (20%), and *risk of repetition* (20%).
- **Analytical Reports:** All participants (100%) found analytical reports after AI-assisted interviews useful, with 50% rating them "very useful" and 50% "somewhat useful."
- **Most Desired Insights:** 80% wanted *strengths and weaknesses*, 70% *comparison with other applicants*, 50% *overall suitability ranking*, and 50% *communication and confidence analysis*.
- **Report Usage:** 50% would use the report as *assistant support*, 40% as *final decision support*, and 10% were unsure.
- **Suggestions for Improvement:** Included *integration with government platforms*, *benchmarking against market data*, and *general feedback requests*.

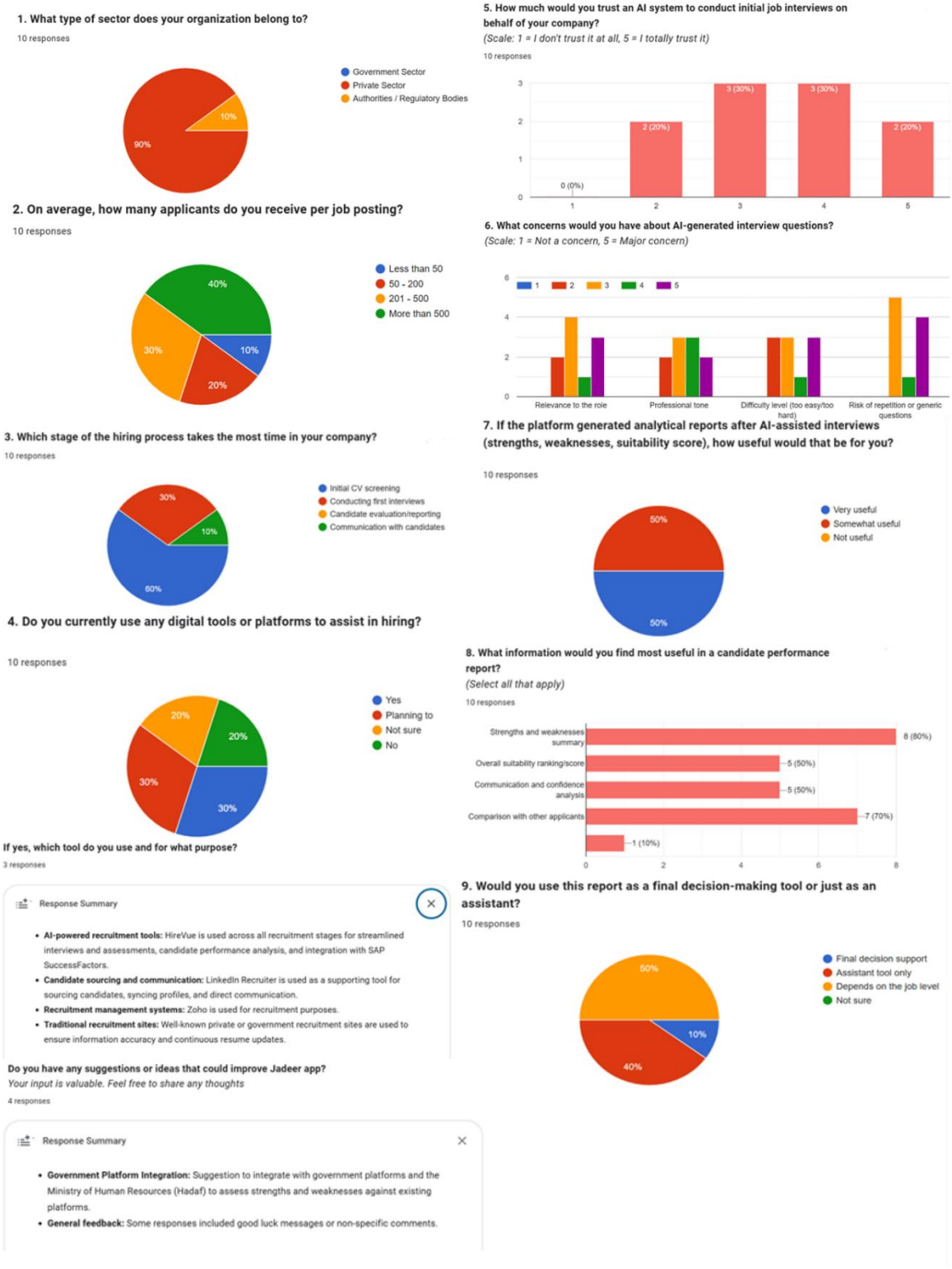

Figure 2: 4-1 Companies Survey Results

2- Individuals Survey:

A survey of **30 individuals** was conducted to understand their job-seeking experiences and expectations from AI-powered recruitment tools. The results were as follows:

- **Demographics:** 70% of respondents were *under 25*, 20% aged *25–34*, 7% aged *35–44*, and 3% aged *45–54*. Females represented 90% of participants, while males made up 10%.
- **Employment Status:** 50% were *students*, 26.7% *unemployed*, 13.3% *interns/freelancers*, and 10% *employed*.
- **Job Search Habits:** 36.7% always apply for jobs online, 26.7% often, 26.7% sometimes, and 10% rarely. None reported "never."
- **Platforms Used:** LinkedIn (76.7%), WhatsApp/Telegram groups (70%), local job boards such as Saudi Aramco/others (60%), and company career portals (36.7%). Very few used Facebook (3.3%) or Sabbar/Naukri (3.3%).
- **Challenges Faced:** The biggest obstacles were *writing/improving CVs (60%)*, *finding suitable opportunities (60%)*, *high competition (60%)*, and *preparing for interviews (46.7%)*.
- **CV Customization & Feedback:** 50% reported they do not customize their CVs for each application, 36.7% do, and 13.3% sometimes do. Regarding AI-generated CV feedback, 83.3% considered it *very important*, 10% *important*, 3.3% *moderately important*, and only 3.4% considered it unimportant. The most valued CV enhancement was *skills relevance (73.3%)*, followed by *keyword match (16.7%)* and *layout (10%)*.
- **Interview Preparation:** 63.3% practice alone, 46.7% prepare with AI tools, 43.3% watch online videos, 23.3% practice with family/friends, and 16.7% attend workshops/training sessions. Only 6.7% reported not preparing much.
- **AI Mock Interviews:** 56.7% found them "very useful," 40% "somewhat useful," and only 3.3% "not useful." Preferences for using them included *before a final/important interview (36.7%)*, *before applying to any job (33.3%)*, *regularly to improve performance (26.7%)*, and *only when underprepared (3.3%)*.
- **Comfort with AI Evaluation:** 36.7% felt very comfortable, 36.7% somewhat comfortable, 23.3% neutral, 3.3% slightly comfortable, and none reported discomfort.

- **Concerns about AI Evaluation:** Participants expressed concerns about *accuracy (53.3%)*, *data privacy/security (53.3%)*, *lack of human empathy (40%)*, and *bias/unfair judgment (23.3%)*. Only 16.7% reported no concerns.
- **Preferred Feedback After Interviews:** 46.7% valued *strengths and weaknesses*, 23.3% *confidence/tone of voice*, 23.3% *answer relevance*, and 6.7% preferred "all feedback types."
- **Suggestions for Improvement:** Key suggestions included *language support (Arabic & English)*, *guidance and advice from experienced job seekers*, *continuous reminders/notifications*, and *positive encouragement*.

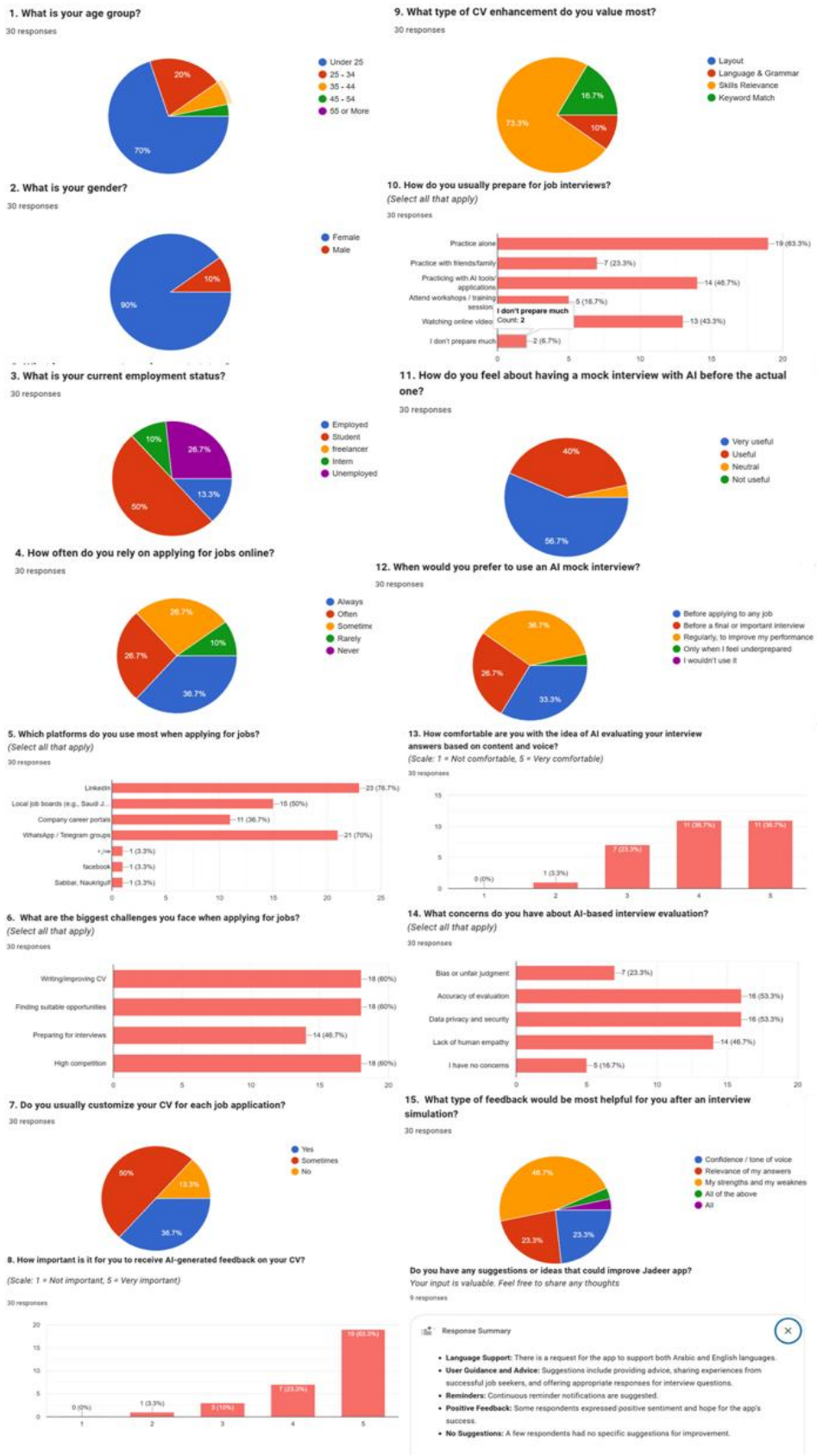

Figure 3: 4-2 individuals Survey Results

4.2.3 Reflections and Adjustments on Jadeer

After conducting interviews with three experts in the field of human resources, we also consulted an HR specialist at **SDAIA** and presented the project idea, which provided us with valuable insights. Based on the feedback received, we made several adjustments to the **Jadeer** application. One major enhancement was the integration of personality assessment questions during the interview process, with the results included in the final report alongside the evaluation of the candidate's CV and technical skills. This adjustment was driven by the strong emphasis from HR professionals on understanding candidates' personalities. Additionally, we introduced a feature to assist companies in drafting job descriptions once the job title is defined—an idea proposed by one of the experts we interviewed. On the candidates' side, we implemented an application status tracking feature (pending, shortlisted, or rejected) in response to the common frustration individuals expressed about not receiving feedback after interviews.

4.3 User Interactions

In this section, we provide the use case diagram for the **Jadeer** system. This diagram illustrates how different actors, such as the Job Seeker, Company, and Admin, interact with the system's various functionalities (use cases) like creating an account, browsing for jobs, and managing job postings.

We have two types of relationships in the diagram:

- **<include>:** This relationship is used when a use case contains the processes of another use case as a mandatory part of its normal flow of actions. For example, the "Apply for job" use case includes "Participate in AI interview" which means a user must verify their email during the account creation process.
- **<extend>:** This relationship is used for an optional behavior that can be added to a use case. For instance, the "Browse jobs" use case is extended by "Filter/Search jobs," meaning that while browsing jobs, a user has the option to filter the results.

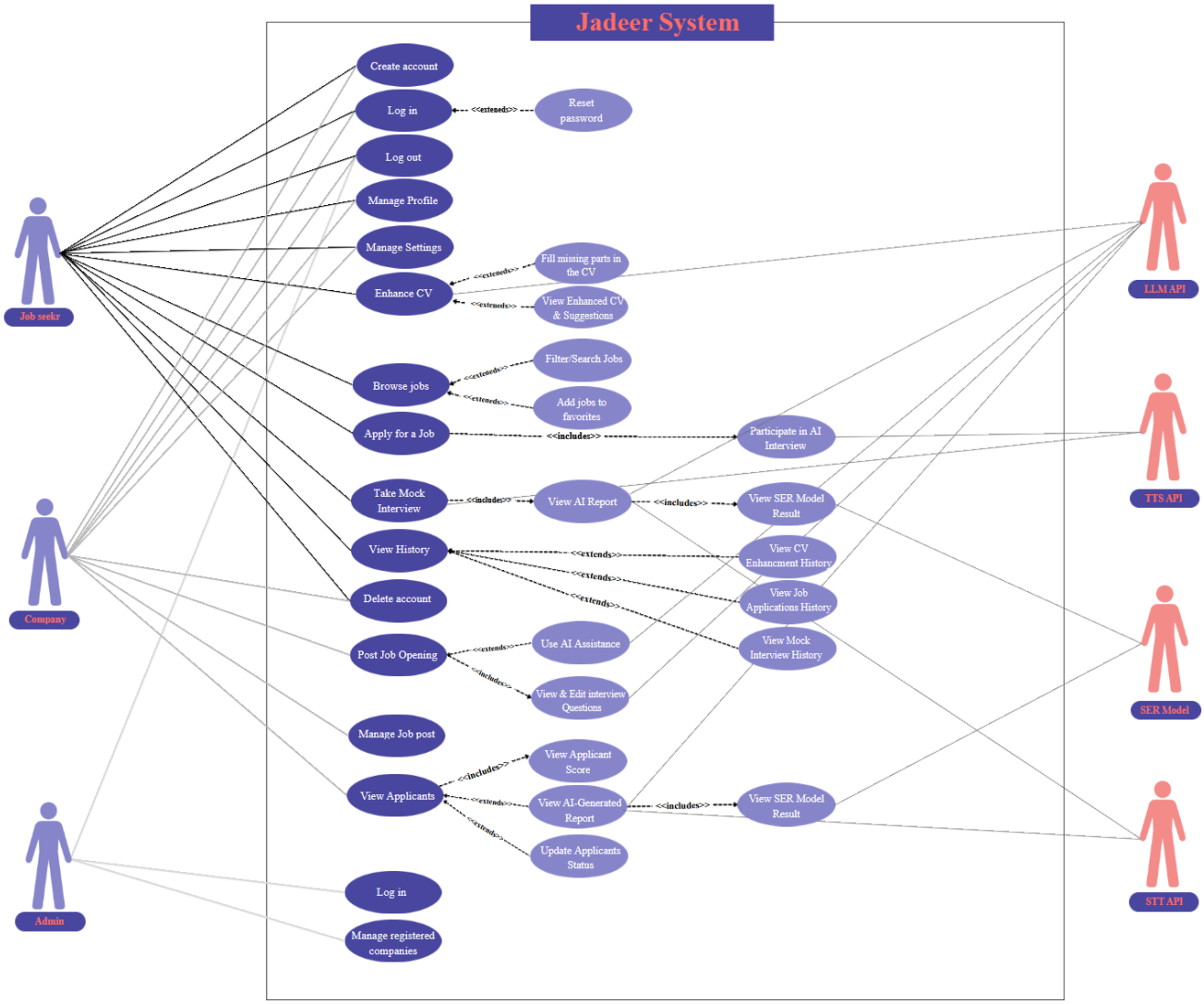

Figure 4: 4-3 Jadeer's Use Case Diagram

4.4 Product Backlog Table

This section presents the product backlog for **Jadeer**. It includes all functional user stories for job seekers, companies, and admins, as well as supporting items such as defects and technical tasks. Each story is assigned a size, type, and acceptance criteria written in an *if…then* format to ensure clarity and testability.

#	**PBI** (user story)	**Size** (Story points)	**Type** (Feature, defect, technical work, knowledge acquisition)	**Status** (To do, in progress, or Done)	**Acceptance Criteria** (The conditions of satisfaction that must be met for that item to be accepted)
1	As a job seeker, I want to create an account by entering my full name, email, and password so that I can use **Jadeer**.	5	Feature	Done	• As a job seeker, if any required field (full name, email, or password) is missing, then I should see an error message indicating which field is required. • As a job seeker, if the full name contains numbers, special characters, or non-English letters, then I should see an error message: "Name must be in English letters only, without numbers or special characters". • As a job seeker, if the email format is invalid (e.g., missing "@"), then I should see an error message "Enter a valid email address". • As a job seeker, if the email is already registered, then I should

					see an error message “Email already in use”. • As a job seeker, if the password is shorter than 8 characters, or does not include at least one letter, or does not include at least one number, then I should see an error message explaining the password policy. • As a job seeker, if all fields are valid, then I should receive a one-time password (OTP) to verify my email. • As a job seeker, if I enter a valid OTP within 2 minutes, then my account should be activated. • As a job seeker, if the OTP expires, then I should be required to request a new one. • As a job seeker, if I request a new OTP while the current one is still valid, then **Jadeer** should show: “Please wait until the current OTP expires”.
2	As a company, I want to create an account by providing email, password, and company name so that I can use **Jadeer**.	5	Feature	Done	• As a company, if any required field (email, password, company name) is missing, then I should see an error message identifying the missing field.

					• As a company, if the email format is invalid or already registered, then an error message should appear. • As a company, if the company name contains invalid characters (numbers or special symbols), then I should see an error message stating: “Company name must contain only English letters and spaces”. • As a company, if all fields are valid, then I should receive an OTP at the provided email. • As a company, if I enter a valid OTP within 2 minutes, then **Jadeer** should create a registration record with status = Pending. • As a company, if the OTP expires, then I should be required to request a new one. • As a company, if the registration record is created, then I should receive an email requesting the upload of an official company document for verification. • As a company, if the admin approves the document, then the account status changes to

					Verified, and a confirmation email is sent. • As a company, if the admin rejects it, then the account status changes to Rejected, and a rejection email is sent.
3	As a job seeker, I want to log in using my email and password so that I can access my account.	2	Feature	Done	• As a job seeker, if I enter a valid email and password, then I should be logged into my account successfully. • As a job seeker, if I enter an invalid email or password, then I should see an error message "Invalid credentials. Please try again". • As a job seeker, if I enter invalid password 5 times in one day then I should be required to reset my password before attempting to log in again.
4	As a company, I want to log in using my email and password so that I can access my account.	2	Feature	Done	• As a company, if I enter a valid email and password and the account status is Verified, then I should be logged into my account successfully. • As a company, if the account status is Pending or Rejected, then the login attempt should be blocked with a message that clearly explains the reason.

					• As a company, if I enter an invalid email or password, then I should see the error message: "Invalid credentials. Please try again." • As a company, if I enter an invalid password 5 times within one day, then I should be required to reset my password before attempting to log in again.
5	As a user (job seeker or company), I want to reset my password through the "Forgot Password" option using my registered email so that I can regain access to my account.	2	Feature	Done	• As a user, if I click "Forgot Password" on the login screen, then I should be prompted to enter my registered email. • As a user, if I enter a registered email, then I should receive an OTP in my email. • As a user, if I enter an unregistered email, then I should see an error message: "Email not found". • As a user, if I enter the OTP correctly, then I should be redirected to a secure page to create a new password. • As a user, if I enter a new password that meets the password policy (minimum 8 characters, at least one uppercase, one lowercase, one number, and one

					special character), then the password should be updated, and I should see a confirmation message.
6	As an admin, I want to log in using my email and password so that I can access the admin dashboard.	5	Feature	Done	• As an admin, if I enter a valid email and password, then I should be prompted to complete OTP verification. • As an admin, if I enter an invalid email or password, then I should see an error message "Invalid credentials. Please try again". • As an admin, if I enter invalid password 5 times in one day then I should be required to contact system administrator to reset my password before attempting to log in again. • As an admin, if I enter a valid OTP within 2 minutes, then I should be logged in successfully and redirected to the admin dashboard. • As an admin, if I enter an incorrect OTP, then I should see the error message: "Invalid code. Please try again". • As an admin, if the OTP expires after 2 minutes, then I should be able to request a new OTP.

					• As an admin, if the current OTP has not expired, then I should not be able to request a new one. • As an admin, If I am logged in successfully, then my session should remain active for 1 hour. • As an admin, if 1-hour passes, then my session should expire, and I should be redirected to the login screen to repeat login and OTP verification.
7	As an admin, I want to manage company accounts (Pending, Verified, Rejected) so that I can approve or reject companies and ensure only verified companies can access **Jadeer**.	3	Feature	Done	• As an admin, if I open the admin dashboard, then I should see a list of all registered companies with their current status (Pending, Verified, Rejected). • As an admin, if no companies exist in **Jadeer**, then I should see the message: "No companies found." • As an admin, if I view a company's details, then I should see the company name, email, date of registration, and status. • As an admin, if I approve a pending company, then its status should change to Verified and **Jadeer** should automatically send an activation email.

					• As an admin, if I reject a pending company, then its status should change to Rejected and **Jadeer** should automatically send a rejection email including the reason. • As an admin, if I filter by "Pending", then only companies marked as Pending should be displayed. • As an admin, if I filter by "Verified", then only companies marked as Verified should be displayed. • As an admin, if I filter by "Rejected", then only companies marked as Rejected should be displayed. • As an admin, if no companies match the selected filter, then I should see the message: "No companies found for this status." • As an admin, if I clear the filter, then all companies should be displayed.
8	As a user (admin, company, or job seeker), I want to log out so that I can securely exit my	2	Feature	Done	• As a user, if I click "Logout", then my session should end immediately, and I should be redirected to the login screen.

	account and protect my session.				• As a user, if I click “Logout”, then I should be redirected to the login screen. • As a user, If I attempt to access any part of **Jadeer** after logging out, then I should be required to log in again using my email and password.
9	As a job seeker, I want to permanently delete my account so that my personal data and activity history are removed from **Jadeer**.	2	Feature	Done	• As a job seeker, if I click “Delete Account”, then I should be asked to confirm the deletion. • As a job seeker, if I confirm deletion, then my account, CVs, reports, and interview data should be permanently deleted from **Jadeer**. • As a job seeker, if I cancel the deletion request, then no changes should occur. • As a job seeker, if the deletion completes successfully, then I should be logged out automatically and redirected to start page with a message: “Your account has been deleted successfully”.
10	As a company, I want to permanently delete our account so that our organization’s data and	2	Feature	Done	• As a company, if I click “Delete Company Account”, then I should be prompted to confirm the deletion.

	job postings are removed from **Jadeer**.				• As a company, if I confirm deletion, then all job postings, applicant data, and reports linked to the company should be permanently deleted from **Jadeer**. • As a company, if deletion completes successfully, then the account should be permanently removed, and a confirmation email should be sent to the registered email address. • As a company, if I cancel the deletion request, then no changes should occur.
11	As a job seeker, I want to use the Settings page so that I can customize my experience and manage my account preferences in **Jadeer**.	3	Feature	Done	• As a job seeker, if I open the Settings page, then I should see options for Appearance, Notifications, Change Password, My Account Details, About, Log Out, and Delete Account. • As a job seeker, if I toggle the Appearance setting, then the theme should switch between Light Mode and Dark Mode. • As a job seeker, if I toggle the Notifications setting, then alerts and reminders should be enabled or disabled according to my selection.

					• As a job seeker, if I update my password, then I must provide my current password and create a new one that meets the password policy (minimum 8 characters, at least one uppercase letter, one lowercase letter, one number, and one special character). • As a job seeker, if I open About, then I should see the current app information and version. • As a job seeker, if I open the My Account Details page from Settings, then my full name, email, and password section should be displayed, and I should be able to edit my full name and password only, while the email is shown as read-only. • As a job seeker, if I leave any required fields empty or enter invalid input, then an error message should be shown, and the update should be blocked. • As a job seeker, if my updates are valid, then I should see a success message confirming the changes. • As a job seeker, if I tap Log Out, then I should be signed out and redirected to the login screen.

					• As a job seeker, if I tap Delete Company Account, then I should be asked to confirm, and if I confirm, the company account and related data should be permanently deleted.
12	As a company, I want to use the Settings page so that I can customize our experience and manage our account preferences in **Jadeer**.	3	Feature	Done	• As a company, if I open the Settings page, then I should see options for Appearance, Notifications, Change Password, My Account Details, About, Log Out, and Delete Company Account. • As a company, if I toggle the Appearance setting, then the theme should switch between Light Mode and Dark Mode. • As a company, if I toggle the Notifications setting, then alerts and reminders should be enabled or disabled according to my selection. • As a company, if I tap Change Password, then I should be taken to a secure password update screen. • As a company, if I update the password, then I must provide the current password and create a new one that meets the password

					policy (minimum 8 characters, at least one uppercase letter, one lowercase letter, and one number). • As a company, if I tap My Account Details, then I should be able to view our company name and email, with the email displayed as read-only, and update our company name and password. • As a company, if required fields are left empty or invalid input is entered, then the update should be blocked, and an inline error should be shown. • As a company, if my updates are valid, then I should see a success message confirming that the account information has been updated. • As a company, if I tap About, then I should see the current app version and information. • As a company, if I tap Log Out, then I should be signed out and redirected to the login screen. • As a company, if I tap Delete Company Account, then I should be asked to confirm, and if I confirm, the company account

					and related data should be permanently deleted.
13	As a job seeker, I want to edit my profile information (CV, personal photo, date of birth, nationality, phone number, and contact email) so that companies can better understand my background and reach me easily.	2	Feature	Done	• As a job seeker, if I upload my personal photo, then it should be in JPG/PNG format with a maximum size of 5MB; if the file is corrupted, too large, or in the wrong format, then the upload should be blocked, and I should see an inline error message. • As a job seeker, if I select my date of birth, then I should use a calendar picker that disables future dates and dates that make me younger than 18. • As a job seeker, if I enter my nationality, then I should choose it from a standardized list of countries. • As a job seeker, if I enter my phone number, then I should first select a country dialing code from an international list of countries and then enter only the remaining digits for that number. If the format is invalid for the selected country, then I should see a validation message.

					• As a job seeker, if I enter my contact email, then it must follow valid email formatting. • As a job seeker, if my profile includes a CV, a personal photo, a valid 18+ date of birth, nationality, and at least one valid contact method (phone number OR contact email), then my profile should be marked as complete. • As a job seeker, if I already have applications in **Jadeer**, then I must keep my required profile fields complete and cannot make my profile incomplete.
14	As a company, I want to edit my profile information (logo, description, location, contact email/phone and website) so that job seekers see accurate information.	2	Feature	Done	• As a company, if I upload a company logo, then it should be in JPG/PNG format with a maximum size of 5MB; if the file is corrupted, too large, or unsupported, then the upload should be blocked, and I should see an error message. • As a company, if I update the company description, then it should be saved only if it is at least 150 characters and does not exceed 900 characters; otherwise, I should see a warning message.

					• As a company, if I enter the company location, then it should be validated to ensure it contains only valid text characters and meets required length constraints. • As a company, if I enter a contact email, then it should be validated as a proper email format; if invalid, then saving should be blocked with a validation message. • As a company, if I enter contact phone number, then I should first select a country dialing code from an international list of countries and then enter only the remaining digits for that number. If the format is invalid for the selected country, then I should see a validation message. • As a company, if I enter a company website URL, then it should be validated for proper web format; if invalid, then saving should be blocked with an inline validation message. • As a company, if the company profile includes a valid logo, description, location, and at least one valid contact method (phone number OR contact email), then

					the profile should be marked as complete. • As a company, if an unexpected error occurs during saving or upload, then an inline error message should appear indicating the failure. • As a company, if I already have posted jobs, then I must keep all required company profile fields complete and cannot make my company profile incomplete.
15	As a company, I want to post job openings (title, position, description, specialty, and requirements) so that job seekers can view all necessary details and apply.	3	Feature	Done	• As a company, if I attempt to create a job posting, then **Jadeer** should first check that my company profile is complete (logo, description, location, and at least one valid contact method: email or phone). • As a company, if the profile is incomplete, then the job posting should be blocked, and I should see a message prompting me to complete missing profile fields. • As a company, if the profile is complete, then I should be allowed to proceed to the job posting form. • As a company, if I submit the job posting form and required fields

					(job title, description, specialty, and at least one requirement) are missing or invalid, then the submission should fail with inline validation errors, and I should not move to the questions step. • As a company, if all required job fields are valid, then **Jadeer** should save the job data and navigate me to the Interview Questions screen. At this stage, the job should not yet be visible to job seekers.
16	As a company, I want AI assistance to generate a job description draft for my job posting so that creating postings is faster and more accurate.	3	Feature	Done	• As a company, if I open the Create Job Posting page, then I should see an option to "Generate with AI" and a label showing my remaining AI job posting credits (per day). • As a company, if I enter the job title, specialty and position, and I have AI credits remaining, then when I tap "Generate with AI", **Jadeer** should call the AI service using that information. • As a company, if the AI service returns a successful response, then the Job Description field should be auto filled with the generated text, and I should be

					able to edit this description freely before continuing. • As a company, if I have no AI credits remaining for job postings, then the "Generate with AI" button should be disabled (or show a warning), and I should still be able to write the job description manually. • As a company, if the AI cannot generate the job description (for example, server/network error, invalid response), then I should see a clear error message, and I should still be able to complete or edit the job description manually.
17	As a company, I want to view and edit the AI-generated interview questions after creating a job posting so that I can customize them for my hiring needs.	3	Feature	Done	• As a company, if I successfully submit a valid job posting form (title, description, specialty, and requirements), then I should be redirected to an Interview Questions screen for that job instead of immediately publishing the job. • As a company, when I arrive at the Interview Questions screen, then **Jadeer** should automatically generate a set of interview questions based on the job details,

					with each question labeled as either Technical or Psychometric. • As a company, if I edit the text of an auto-generated question, then **Jadeer** should validate the new text (non-empty, within maximum and minimum length); if the edit is invalid, an inline error should appear, and the change should not be saved. • As a company, if I add a new custom question, then I should be able to choose its type (Technical or Psychometric). • As a company, I should be allowed to add up to 3 custom questions per job; if I try to add more than 3, then **Jadeer** should block the action. • As a company, I should be able to delete only the custom questions that I added myself. • As a company, if I click Done, then **Jadeer** should: o Save the final list of questions (with their types) attached to the job. o Trigger the creation of the job posting with Status = Active, making it visible to

					job seekers and shown in the company dashboard. • As a company, if an unexpected error occurs while generating, saving, or finalizing the interview questions, then I should see a red error message and the job posting should not be published until the issue is resolved.
18	As a company, I want to manage job posts so that I can update, close, or delete them when needed.	3	Feature	Done	• As a company, if I open a job post, then I should see options to Edit, Close, Reopen, or Delete the post. • As a company, if I click Edit, then I should be able to modify some job details (start date, and end date). • As a company, if I save changes after editing, then the post should update immediately and reflect the new information for job seekers. • As a company, if I click Close, then the job post status should change to Closed, and no new applications should be accepted. • As a company, if a job is closed early, then it should remain visible in the company dashboard with status = Closed, and all

					existing applicants should be preserved. • As a company, if a job is currently Closed and I click Reopen, then I should be required to select a new application start date and end date before the job is reopened. • As a company, if I successfully reopen a job, then its status should change to Open, and it should become visible again to job seekers. • As a company, if I click Delete, then I should be asked to confirm deletion. • As a company, if I confirm deletion, then the job post and all related applications, reports, and interviews should be permanently removed from **Jadeer**. • As a job seeker, if I had applied to a deleted post, then it should no longer appear in my "Applied Jobs" list. • As a company, if I cancel the delete action, then no changes should be made.
19	As a job seeker, I want to browse and search job postings so that I can	3	Feature	Done	• As a job seeker, if I open the jobs page, then I should see all open

	explore available opportunities.				(non-Closed) job postings by default. • As a job seeker, if no jobs are available, then I should see an empty-state message. • As a job seeker, if I enter a keyword in the search bar, then only matching job postings should be displayed. • As a job seeker, if no matches exist, then I should see an empty-state message. • As a job seeker, if I clear the search, then the full list of jobs should be displayed again. • As a job seeker, if I open a job posting, then I should see: o Company details: company name, logo, location, description, contact email/phone and website. o Job details: job title, job description, and position. o Job requirements • As a job seeker, if I open a job posting, then I should see the application start date and application end date clearly displayed.

					• As a job seeker, if I open a job posting, then I should see available actions:
					  ○ "Apply" (goes to CV upload/application step).
					  ○ "Add to Favorites" (stores job for later).
					• As a job seeker, if I click "Apply" from the job details page, then I should be directed to the application flow.
					• As a job seeker, if the job is Closed, then the job card and Apply button should visually indicate that the job is closed (grey styling and disabled Apply).

20	As a job seeker, I want to add jobs to a Favorites so that I can apply later.	2	Feature	Done	• As a job seeker, if I click "Add to Favorites" on a job posting, then it should be saved to my Favorites. • As a job seeker, if I click "Remove" on a job in my Favorites, then it should be deleted from the list. • As a job seeker, if I open the Favorites page, then I should see all jobs I have added.

					• As a job seeker, if my Favorites is empty, then an empty-state message should be displayed.
21	As a job seeker, I want to filter job postings by specialty, posting date (newest or oldest), job status (open or closed), or personalized recommendations (For You), so that only the relevant matching jobs are displayed to me.	3	Feature	Done	• As a job seeker, if I filter by specialty, date (Newest, Oldest), closed, or enable “For You”, then only jobs in that category should be displayed. • As a job seeker, if I reset filters, then the full job list should be displayed again. • As a job seeker, if I have uploaded a CV to my profile, then personalized “For You” recommendations should be generated based on my skills and experience. • As a job seeker, if my profile is incomplete and I enable "For You", then I should see a reminder to complete my profile. • As a job seeker, if I update my CV, then the recommendations should be refreshed accordingly. • As a job seeker, if no sorting option is applied, then the default view should be “Newest First” and only open jobs should be shown.

					• As a job seeker, if I enable "For You", then all other filters (specialty, sort, search text) should reset to default (specialty = All, sort = Newest First, search bar = empty, Show closed jobs = off), and only personalized job recommendations should be shown. • As a job seeker, if "Show closed jobs" is OFF, then closed jobs should be hidden in all views. • As a job seeker, if "Show closed jobs" is ON, then closed jobs should be included in the results. • As a job seeker, if I apply any filters, then I should see the total matching job count, and if the result is empty, then I should see the message: "No jobs match your filters."
22	As a job seeker, I want to view a history page with tabs for my activities (CV Enhancements, Mock Interviews, and Job Applications) so that I can track my progress and past actions.	3	Feature	Done	• As a job seeker, if I open the History Page, then I should see three tabs: CV Enhancements, Mock Interviews, and Job Applications. • As a job seeker, if no records exist in a tab, then an empty state message should be displayed.

23	As a job seeker, I want AI to enhance my CV in general or based on a specific job so that it becomes more professional and well-structured.	5	Feature	Done	• As a job seeker, if I upload a CV in PDF or DOCX format and size of max 10Mbite, then it should be stored successfully, and a confirmation message should be shown. • As a job seeker, if the uploaded file is corrupted or in an unsupported format, then the upload should fail, and an error message should be displayed. • As a job seeker, if I request a general CV enhancement, then **Jadeer** should generate an improved version without requiring a specific job title or description. • As a job seeker, if I provide a job title and description or choose a job from **Jadeer**, then **Jadeer** should enhance my CV to emphasize skills and experiences aligned with that title.
24	As a job seeker, I want **Jadeer** to identify missing sections in my CV and allow me to fill them in easily, so that my CV becomes complete before enhancement.	5	Feature	Done	• As a job seeker, if missing sections are shown, then I should have the option to fill in any of these sections through simple input fields. • As a job seeker, if I choose not to fill a missing section, then I

					should be able to skip it and continue without being blocked. • As a job seeker, if I choose to skip all missing sections, then **Jadeer** should still allow me to proceed with CV enhancement. • As a job seeker, if I fill in one or more missing sections, then **Jadeer** should save this information and update my CV accordingly. • As a job seeker, if **Jadeer** fails to detect missing sections due to processing error, then an appropriate error message should be displayed.
25	As a job seeker, I want to view the enhanced version of my CV as a PDF, along with AI-generated improvement suggestions, so that I can review them and use the improved CV for job applications.	2	Feature	Done	• As a job seeker, if my CV has been enhanced, I should have the option to download the improved version as a PDF and view the AI-generated suggestions explaining the enhancements. • As a job seeker, when I choose to download the enhanced CV, the file should open or save in a standard PDF format and should include all applied improvements. • As a job seeker, if the PDF download fails due to a **Jadeer** error, an error message should be

					displayed informing me of the failure. • As a job seeker, if the AI suggestions cannot be loaded, a message should inform me that the suggestions are unavailable, while still allowing me to download the enhanced CV.
26	As a job seeker, I want to view my CV enhancement history so that I can track improvements and review past feedback.	3	Feature		• As a job seeker, if I open the CV Enhancements tab in the History Page, then I should see a list of all CV enhancements I performed. • As a job seeker, if a CV enhancement record is displayed, then it should include: o The date of enhancement. o The enhanced CV version (downloadable as PDF). o The feedback provided, including comments on writing style and missing details. • As a job seeker, if no CV enhancements exist, then I should see an empty-state message: "No CV enhancements found".
27	As a job seeker, I want to start and complete a mock	2	Feature	To Do	• As a job seeker, if I select a specialty and start a mock

	interview by specialty so that I can practice effectively in my field.				interview, then the interview session should begin. • As a job seeker, if the interview begins, then I should be able to answer each question one by one. • As a job seeker, if a question is displayed, then I should be able to hear it or read it on the screen. • As a job seeker, if I answer a question, then I should be able to proceed to the next one until completion. • As a job seeker, if I reach the final question, then I should be able to finish the mock interview. • As a job seeker, if I finish the interview successfully, then a practice report should be generated. • As a job seeker, if I exit the interview before completing it, then the mock interview should be canceled, and no report should be generated. • As a job seeker, if I exit the interview before completing it or lose connection, then the mock interview should be canceled, and no report should be generated.

28	As a job seeker, I want AI to analyze my voice tone during the mock interview so that I can better understand and improve my confidence and communication style.	5	Feature	To Do	• As a job seeker, if I complete a mock interview, then AI voice tone analysis should be performed on my responses (e.g., confidence, hesitation, stress, articulation). • As a job seeker, if the analysis is completed, then I should see the results in my mock interview practice report along with other feedback metrics. • As a job seeker, if voice tone analysis fails or is unavailable, then the report should still be generated with a note such as "Voice tone analysis unavailable for this session."

29	As a job seeker, I want a mock interview report to be generated so that I can receive feedback about my performance.	5	Feature	To Do	• As a job seeker, if a mock interview is completed, then a report should be generated.
					• As a job seeker, if the report is generated, then it should include:
					  ○ Strengths — areas performed well.
					  ○ Weak Points — areas needing improvement.
					  ○ Advice — personalized recommendations for enhancement.

					○ Voice Tone Analysis — insights on confidence, clarity, and communication tone.
30	As a job seeker, I want my mock interview history to be saved so that I can review past practice sessions.	3	Feature	To Do	• As a job seeker, if I complete a mock interview, then the report and the interview date should be saved in the Mock Interviews tab of the History page. • As a job seeker, if I open the Mock Interviews tab, then I should see all my past mock interview reports listed. • As a job seeker, if I click on a past mock interview, then I should be able to view its full report.
31	As a job seeker, I want to apply for jobs easily so that I can submit my applications successfully.	2	Feature	To Do	• As a job seeker, if I click "Apply", then **Jadeer** should first check that my profile is complete (CV, personal photo, DOB, nationality, and contact info). • As a job seeker, if my profile is incomplete, then **Jadeer** should block the application and prompt me to complete the missing fields. • As a job seeker, if my profile is complete, then I should be prompted to upload my CV in PDF or DOCX format.

					• As a job seeker, if my CV is valid and successfully uploaded, then it should be stored, and the application should proceed to the next step. • As a job seeker, if the CV upload fails (corrupted or unsupported), then I should see an error message and not be allowed to continue. • As a job seeker, if I do not upload a CV, then I should not be able to proceed with the application.
32	As a job seeker, I want to complete the AI interview so that I can successfully finish the job application process.	2	Feature	To Do	• As a job seeker, if I begin the AI interview, then I should first confirm my readiness before starting. • As a job seeker, if the interview begins, then I should progress through the questions one by one. • As a job seeker, if a question is displayed, then I should be able to hear it or read it on the screen. • As a job seeker, if I answer a question, then I should be able to move to the next until I reach the final question. • As a job seeker, if I finish answering the final question, then the interview session should end successfully.

					• As a job seeker, if the interview is interrupted or disconnected, then the session should end, and the application should be marked as canceled. • As a job seeker, if the interview is canceled due to interruption, then I should not be able to re-apply for the same job.
33	As a company, I want AI to analyze the voice tone of job seekers during the interview so that I can better assess their confidence and communication style.	5	Feature	To Do	• As a company, if a job seeker completes an interview, then **Jadeer** should analyze their voice tone (e.g., confidence, hesitation, stress) after the session. • As a company, if the analysis is completed, then the results should be included in the final interview report along with other evaluation metrics. • As a company, if the voice tone analysis fails, then the report should still be generated with a note that "Voice tone analysis unavailable for this session".
34	As a company, I want an AI-generated report for each applicant so that I can make better hiring decisions.	3	Feature	To Do	• As a company, if a candidate applies and completes the AI interview, then an AI report should be automatically generated.

					• As a company, if the AI report is ready, then it should be attached to the candidate's application in my dashboard. • As a company, if no interview is completed, then no AI report should exist. • As a company, if I open a candidate's AI report, then it should contain: o The CV the candidate attached with the application. o Checklist of job requirements met / not met. o Psychometric analysis (confidence, communication, personality traits). o Voice tone analysis (stress, confidence, hesitation, clarity). o Technical evaluation (domain-specific knowledge). o Full list of interview questions and the candidate's answers.
35	As a company, I want to view applications for a job posting so that I can evaluate candidates.	3	Feature	To Do	• As a company, if I open a job posting, then I should see a list of all applicants.

					• As a company, if applicants exist, then I should see their CV and AI-generated report. • As a company, if I review applications, then I should only see one valid submission per candidate. • As a company, if no applicants exist, then I should see a clear message: "No candidates applied". • As a company, if I open a candidate's application, then I should see a Download Report action. • As a company, if I click Download Report, then the report should be downloaded as PDF. • As a company, if the report is not yet generated, then the Download Report action should be disabled with a tooltip/message: "Report not available yet." • As a company, if a download error occurs, then I should see a clear error message and be able to retry. • As a company, if I open a candidate's application, then I

					should be able to view their profile information including: ○ Full name, nationality, date of birth, and contact details (phone/email). ○ Personal photo. ○ Uploaded CV (view and download).
36	As a company, I want **Jadeer** to automatically generate a weighted AI evaluation score for each applicant so that I can objectively compare and rank candidates.	5	Feature	To Do	• As a company, if a candidate completes the AI interview, then **Jadeer** should calculate a final score out of 100 using weighted scoring, where each category (CV analysis, Job requirements match, Psychometric analysis, Voice tone analysis, Technical evaluation) is scored from 0 to 100 and combined using the following weights: 30% CV analysis, 20% Job requirements match, 20% Psychometric analysis, 10% Voice tone analysis, and 20% Technical evaluation. The final score should be rounded to the nearest whole number. • As a company, if multiple candidates apply for a job, then they should be displayed in

					descending order, from the highest score to the lowest. • As a company, if two or more candidates have the same final score, then they should be ranked equally. • As a company, if I open a candidate's score breakdown, then I should see each category's partial score clearly listed alongside its contribution to the final score.
37	As a company, I want to change a candidate's application status so that I can reflect on the current decision.	3	Feature	To Do	• As a company, if I open a candidate's application, then I should be able to change the status to Shortlisted or Rejected. • As a company, if I view the list of applicants for a job, then I should be able to select multiple candidates at once. • As a company, if I change the status for one or multiple selected candidates, then the new status should be saved and reflected immediately. • As a company, if I confirm a bulk status change, then all selected candidates should update accordingly.

					• As a company, if any status update fails for specific candidates, then I should receive feedback identifying which candidates failed with the option to retry only those. • As a company, if the status changes, then the affected candidates should receive both an in-app notification and an email notification.
38	As a job seeker, I want my job application status to be tracked in the Job Applications tab in the history page so that I can stay informed about the progress and status of my application.	3	Feature	To Do	• As a job seeker, if I open the Job Applications tab in the History Page, then I should see all jobs I have applied for. • As a job seeker, if the report is sent to the company, then the job application status should set to "Pending". • As a job seeker, if the company responds (Shortlisted/Rejected), then the status should update accordingly. • As a job seeker, if I apply to multiple jobs, then all applications for should appear in my Reports section, showing: o The job title and company name.

					○ The current application state (Pending, Shortlisted, Rejected). ○ The application/interview date. • As a job seeker, if no applications exist, then an empty-state message should appear: "No job applications found".

Table 6: 4-2 Jadeer's Product Backlog

4.5 Non-functional Requirements

This section lists the non-functional requirements of **Jadeer**. These requirements describe critical operational qualities such as performance, reliability, security, and scalability. Each is expressed as a user story with measurable acceptance criteria to ensure **Jadeer** meets quality standards.

#	**PBI** (user story)	**Size** (Story points)	**Type** (Feature, defect, technical work, knowledge acquisition)	**Acceptance Criteria** The conditions of satisfaction that must be met for that item to be accepted.
1	As a user, I want the **Jadeer** to respond within 5 seconds so that I can complete my tasks quickly.	3	Feature	• As a job seeker, if I navigate between home, jobs, profile, or reports, then each page should load in ≤ 5 seconds under normal load.
2	As a user, I want **Jadeer** to be available 99% of the time so that I can use the app.	3	Feature	• As a recruiter, if **Jadeer** availability is monitored at 1-minute intervals over a

				month, then uptime should be ≥ 99%. • As a recruiter, if an outage occurs, then it should be restored within ≤ 30 minutes.
3	As a user, I want login attempts to be limited to 5 failed tries in one day so that my account remains secure.	2	Feature	• As a user, if login fails ≥ 5 times in one day, then login should be temporarily blocked. • As a user, if account lock occurs, then I should be required to reset my password before attempting to log in again.
4	As a job seeker, I want my interview recordings stored for no more than 3 days so that my privacy is protected.	2	Feature	• As a job seeker, if an interview recording is saved, then it should be encrypted and automatically deleted after 3 days.
5	As a user, I want at least 90% of tasks to be completed successfully on the first attempt by test users so that **Jadeer** is user-friendly.	3	Feature	• As a user, if 10 test users attempt core tasks (upload CV, apply for job, view job details), then ≥ 9 users should complete them successfully on the first attempt without assistance.

Table 7: 4-3 Non-functional requirements

5 System Design

5.1 Architectural Diagram

This section details the **Jadeer** system's architecture, which follows a client-server model. The system is split into two primary components: the client and the server. The client operates on a user's mobile device, handling the user interface and data transmission. The server is responsible for business logic, data storage, and intelligent processing. The server receives requests from the client and interacts with a database and various **APIs** to process them and enhance the system's functionality.

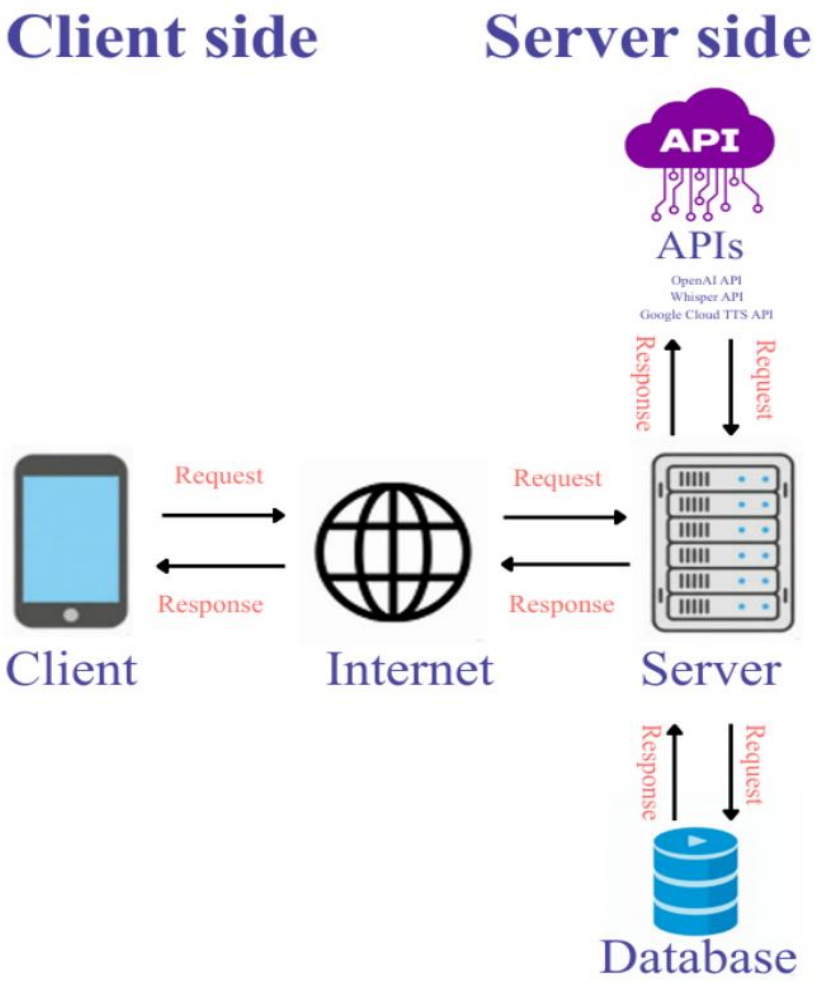

Figure 5: 5-1 Jadeer-Client-Server-Architecture

The architecture of **Jadeer** follows the client–server model, where the system is divided into two main components: the client and the server. The client runs on the user's mobile device and manages the user interface, input mechanisms, and lightweight logic for rendering and transmitting data. It is also responsible for initiating communication with the server over the Internet and displaying the responses it receives.

On the server side, the system handles business logic, data storage, and intelligent processing. The server receives requests from the client and processes them by interacting with the database, which securely stores structured information such as user profiles, system logs, and application data, ensuring efficient retrieval. It also interacts with the API systems, which processes data using advanced models to generate predictions, analyses, or classifications that enhance the system's functionality and intelligence.

When a request is received from the client, the server coordinates between the database and the API systems as needed, processes the request, and sends the appropriate response back to the user's device. This response may include data, confirmation of an action, or feedback from the system.

The client–server model was chosen for **Jadeer** due to its scalability, flexibility in handling multiple concurrent requests, and centralized nature, which makes updates and maintenance easier. Moreover, integrating APIs capabilities on the server side provides advanced analytical functions that improve user experience and support decision-making within the application.

5.2 Class Diagram

The class diagram shows a high-level structure of **Jadeer** 's application, illustrating the interactions between key roles and main components. It presents an overview of the main attributes and methods associated with each class, highlighting their relationships. The diagram serves as a visual representation of the system's architecture and aids in understanding the overall design and functionality of **Jadeer**.

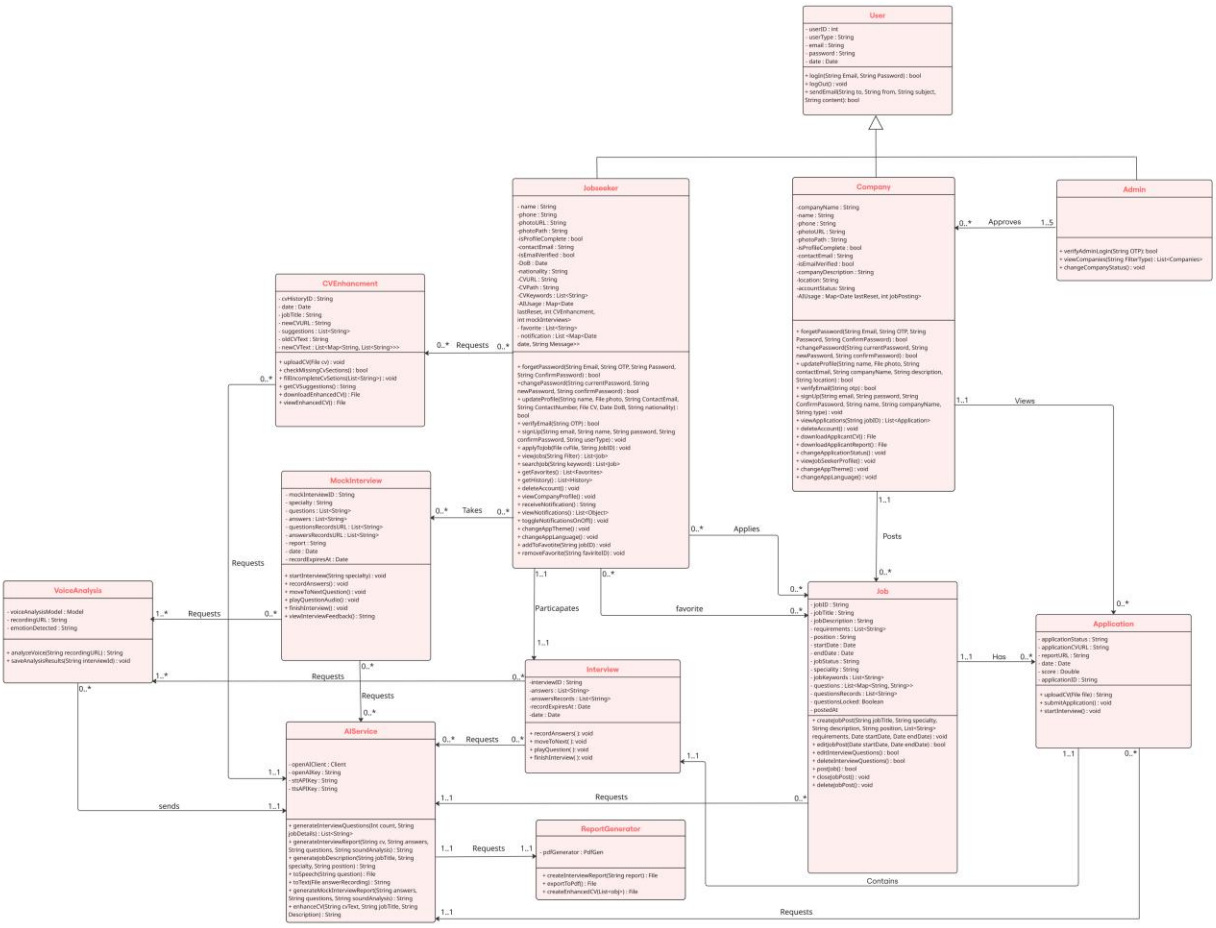

Figure 6: 5-2 Class Diagram

5.3 Component Level Design

5.3.1 Pseudocode

1) Pseudocode For CV-Driven "For You" Jobs

Step 1 – Check CV Completeness

Start Personalized Jobs Flow

Check if User.CV is uploaded and readable

IF CV is missing OR cannot be analyzed THEN

  Display message: "Upload your CV to see personalized matches"

  Stop personalized matching

ELSE

  Continue to matching logic

END IF

Step 2 – Extract Skills From CV

When CV is uploaded or updated:

Call backend Cloud Function

Extract keywords (skills, tools, technologies)

Save extracted list to User.CVKeywords

IF extraction fails OR User.CVKeywords is empty THEN

  Display message: "We couldn't analyze your CV. Try uploading a clearer version."

  Stop personalized matching

ELSE

  Continue

END IF

Step 3 – Enable “For You” Mode (Reset Filters)

IF User toggles ForYou = ON THEN

  Set Filter.Specialty = "All"

  Set Sort = "Newest first"

  Set ShowClosed = OFF

Clear SearchQuery

Load jobs list

END IF

Step 4 – Match User to Jobs

Fetch active jobs where Job.Status != "Closed"

For each Job:

Combine Job.Specialty + Job.Keywords

Compare with User.CVKeywords

Count matches → MatchCount

IF MatchCount ≥ 2 THEN

Mark Job as Recommended

END IF

END FOR

After finishing all jobs:

IF RecommendedJobs is empty THEN

Display: "No strong matches found yet – check All Jobs for more opportunities."

ELSE

Sort RecommendedJobs by StartDate descending

Display RecommendedJobs

END IF

Step 5 – Using Filters While “For You” Mode is ON

IF User changes any filter (Specialty, Search, ShowClosed, Sort) THEN

Apply filters only to RecommendedJobs

Refresh displayed job list

END IF

2) Pseudocode For Job Posting Feature

Step 1 – Check Company Profile

Start Job Posting Process

Check company profile completeness

IF profile is incomplete THEN

  Display message: "Please complete your company profile before posting a job"

  Stop process

ELSE

  Display job posting form

END IF

Step 2 – Fill Job Information

Display job posting form

Company provides:

- JobTitle
- (required)
- Description (required)
- Specialty (required)
- Requirements (at least one required)
- Position (optional unless using AI Generator)
- StartDate (required)
- EndDate
- (required)

Optional: AI Job Description Generator

IF company selects AI Generator THEN

  Request:

    JobTitle (required)

    Specialty (required)

Position (required)
Generate AI draft based on provided fields

IF AI draft generation fails THEN
Display message: "AI draft failed. Please create manually."
ELSE
Insert AI draft into Description field for review/editing
END IF
END IF

Validate fields
IF any required field is missing THEN
Display inline validation errors
ELSE
Navigate to Questions Page and pass JobData
END IF

Step 3 – Interview Questions Generation

On Questions Page:
Receive JobData

Automatically initiate AI question generation using:

- JobTitle
- Specialty
- Position (if provided)
- Requirements
- Description

Prepare request body:

- JobID
- Title

- Position
- Specialty
- Requirements
- Description
- Mix object (technical vs psychometric ratio)
- Difficulty object (easy/medium/hard ratio)

Send request to backend AI generation service
Display loading state: "Generating interview questions…"

Validate request:
IF JobID is missing OR Title is missing THEN
  Return error: "Missing required fields (JobID/Title)."
END IF

Check AI configuration:
IF AI_KEY is missing or invalid THEN
  Return error: "Invalid or missing AI key."
END IF

Map Specialty to knowledge profile:

- Technical categories
- Psychometric/behavioral dimensions

Build AI prompt using:

- Title
- Position
- Specialty
- Requirements
- Description
- Technical categories

- Behavioral dimensions

Target result:
TotalQuestions = 10

- 5 Technical
- 5 Psychometric

Call AI model

IF AI request fails OR returns invalid data THEN
  Mark AI generation as failed
ELSE
  Extract QuestionsList

  IF QuestionsList is empty OR invalid THEN
    Mark AI generation as failed
  ELSE
    Sanitize QuestionsList:
      - Remove duplicates
      - Remove empty strings
      - Ensure QuestionType in ["technical", "psychometric"]
      - Ensure Difficulty in ["easy", "medium", "hard"]
      - For psychometric: assign trait from Big Five or null
      - Ensure list contains exactly 10 questions

    Return QuestionsList to frontend
  END IF
END IF

IF backend returns valid QuestionsList THEN
  Display QuestionsList
  Allow company to:

- Edit any question
- Add up to 3 custom questions
- Delete only custom questions

ELSE

Display message: "AI generation failed. Please try again or add questions manually."

Stop AI step, allow manual question entry

END IF

When company selects Done:

Display confirmation: "After publishing, questions will be locked."

IF confirmed THEN

Create JobPost with:

JobID

Title

Description

Specialty

Requirements

Position

StartDate

EndDate

Status = "Open"

QuestionsList

QuestionsLocked = true

Display message: "Job created successfully."

Add JobPost to company dashboard

END IF

Step 4 – Manage Job Posts

In Company Dashboard show options:

- Edit Date

- Close Job
- Delete Job

Edit Date

IF company selects Edit Date THEN
  Allow editing StartDate & EndDate only
  Save changes
END IF

Close Job

IF company selects Close THEN
  Set Status = "Closed"
  Display message to job seekers: "This job is no longer accepting applications."
END IF

Delete Job

IF company selects Delete THEN
  Display confirmation
  IF confirmed THEN
    Delete JobPost and all related:
      - applications
      - interviews
      - reports
    Remove JobPost from job seekers' AppliedJobs lists
  END IF
END IF

5.3.2 Flowchart

Flowchart For CV Enhancement

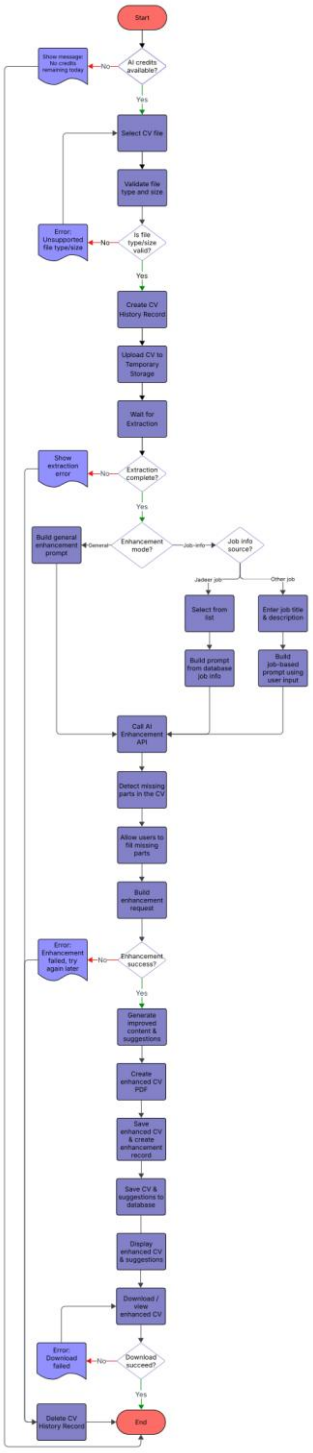

Figure 7: 5-3 CV enhancement flowchart

5.4 Data Design

5.4.1 Data Models

- ER Diagram

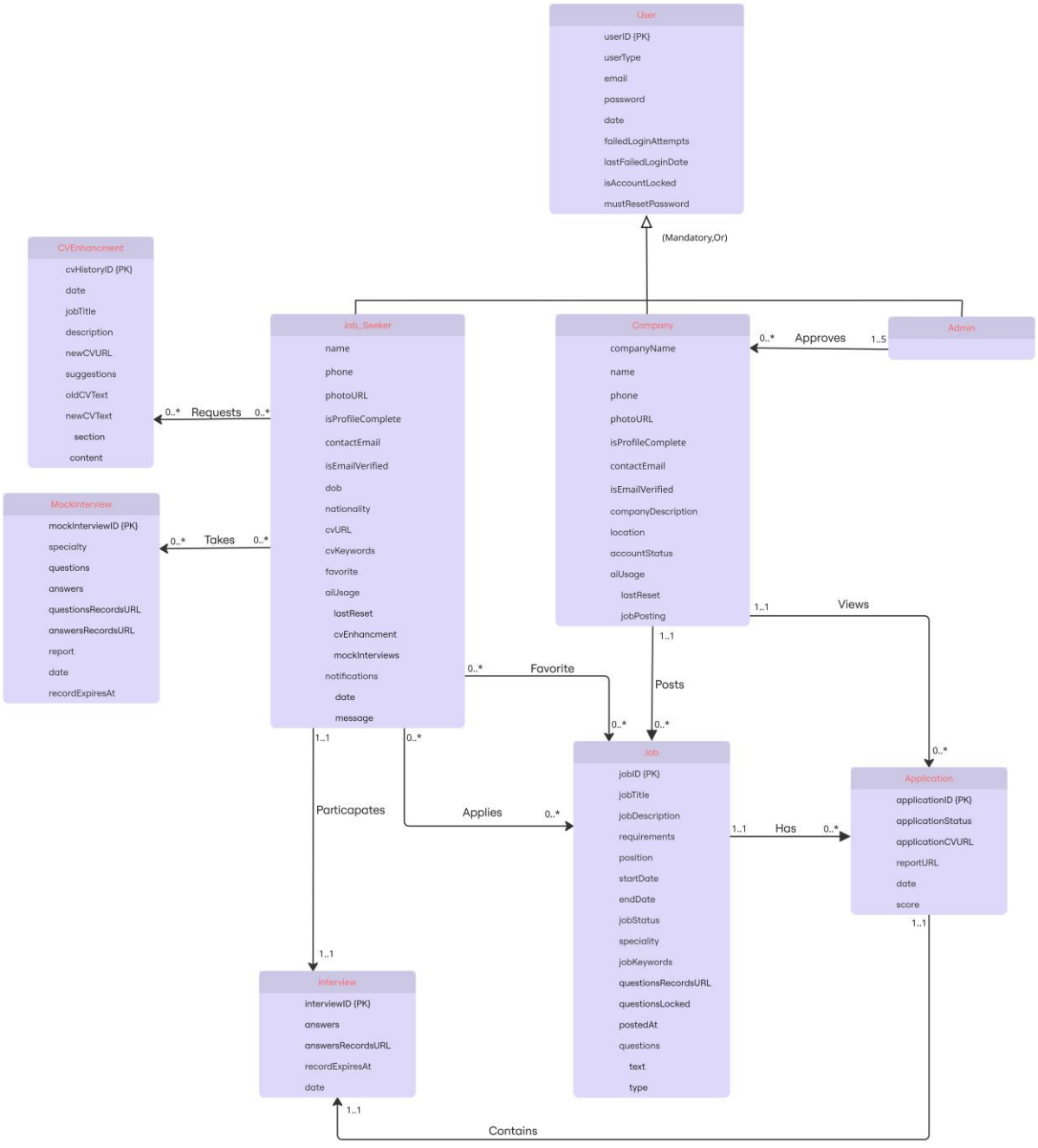

Figure 8: 5-5 ER Diagram

The Entity–Relationship (ER) diagram above provides a comprehensive visualization of the core entities within **Jadeer** application and the interactions that govern its functionality. The diagram follows UML conventions by representing each entity using singular, capitalized names, while attributes are written in lowercase. This consistent naming ensures clarity and supports industry-standard modeling practices.

The ERD illustrates how different system actors— **companies, job seekers, and admins**—interact with platform elements such as job postings, applications, interviews, enhancements, and AI-generated reports. Relationships are depicted through connecting lines with clearly marked multiplicities, indicating the logical cardinality between entities. In alignment with UML notation, foreign keys are intentionally excluded from the entity boxes and are implied through relationship connectors.

The model also highlights optional and mandatory associations. For example, a *Job Seeker* may submit multiple applications, while each application must be linked to exactly one job. Similarly, companies can manage several postings, whereas a job post belongs to a single company. These multiplicities provide precision when translating the conceptual model into a relational database schema.

To interpret this diagram, consider the following scenarios:

1. **Job Posting Lifecycle:**
   A company can publish multiple *Job Posts*, each containing attributes such as requirements, responsibilities, and skills. A job post may receive zero or many *Applications*, but each application must be tied to a single job.
2. **Job Seeker Interactions:**
   A *Job Seeker* can apply to multiple jobs and may save several job posts as favorites. Additionally, job seekers can participate in interviews scheduled based on their applications. Each interview belongs to exactly one job seeker and one job post.
3. **AI-Generated CV Enhancement:**
   Job seekers may request *CV Enhancements* or *Mock Interviews* powered by AI. These interactions form optional relationships, meaning a job seeker may use none, some, or all of these services.

- Non-Relational Model Tree

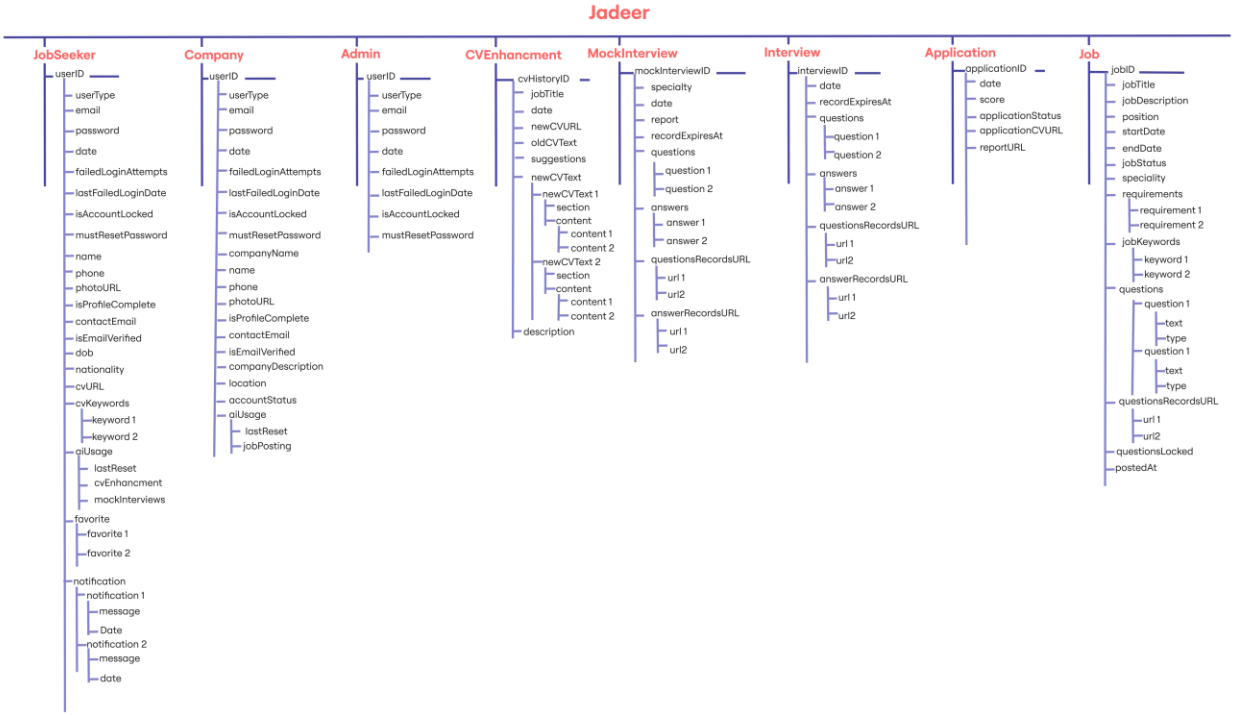

Figure 9: 5-6 Non-Relational Model Tree

- Non-Relational Model Relation Approach

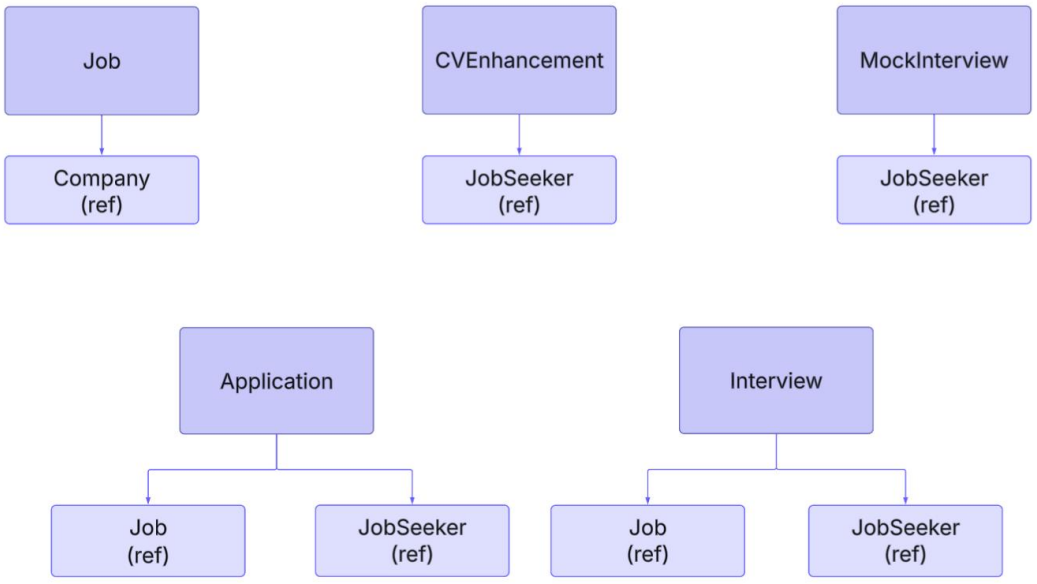

Figure 10: 5-7 Non-Relational Model Relation Approach

In the context of database design, modeling the database structure is essential for understanding its organization and the relationships between collections. Figure 10 illustrates the hierarchical tree structure of collections, documents, and their attributes, where indentation reflects different levels within the non-relational model.
Additionally, Figure 11 demonstrates how these collections interact through references.

The following points describe the reference-based relationships in our Firestore non-relational data model:

- The **"userID"** attribute in the **"Job"** collection is a reference to the **"Company"** collection, indicating which company created the job posting.
- The **" userID "** attribute in the **"CVEnhancement"** collection is a reference from the **"JobSeeker"** collection, indicating the user who submitted a CV for enhancement.
- The **" userID"** attribute in the **"MockInterview"** collection is a reference from the **"JobSeeker"** collection, indicating the user who requested a mock interview simulation.
- The **"jobID"** attribute in the **"Application"** collection is a reference from the **"Job"** collection, identifying the job the user applied for.
- The **"userID"** attribute in the **"Application"** collection is a reference from the **"JobSeeker"** collection, identifying the applicant submitting the application.
- The **"jobID"** attribute in the **"Interview"** collection is a reference from the **"Job"** collection, indicating the job associated with its corresponding interview.
- The **"userID"** attribute in the **"Interview"** collection is a reference from the **"JobSeeker"** collection, identifying the candidate being interviewed.

5.4.2 Data Collection and Preparation

In this section, we outline the external datasets that **Jadeer** relies on to develop the Speech Emotion Recognition (SER) feature used in the AI-powered interview simulation. Since SER requires large amounts of labeled emotional-speech data, we plan to utilize well-established public datasets that provide professionally recorded speech samples annotated with emotion labels. These external datasets will serve as the foundation for building and fine-tuning the SER model, enabling the system to analyze users' emotional responses during simulated interviews.

Data Collection

The emotional-speech datasets will be obtained from their official research repositories. We plan to use two well established datasets: the Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS) [33] .and the Crowd Sourced Emotional Multimodal Actors Dataset (CREMA-D) [34].

Since the two datasets do not share identical emotion categories, we will retain only the six overlapping emotions neutral, happy, sad, angry, fearful, and disgust to maintain label consistency across the combined dataset. Emotion classes unique to RAVDESS [33] (such as calm and surprise) will be excluded from the training process.

Data Organization

After downloading, we will reorganize the audio files into a unified directory structure grouped by the selected six emotion categories. The dataset's metadata (e.g., speaker ID, emotion label, file name) will be preserved and mapped to a standard format to support loading, preprocessing, and training the model.

Data Preprocessing

Before training the model, several preprocessing steps will be applied:

- Audio standardization: Converting all recordings to a consistent format (16 kHz, mono channel).
- Noise reduction: Applying audio-filtering techniques to improve signal clarity.

- Label encoding: Mapping each emotion category to a numerical class.
- Dataset splitting: Dividing the combined dataset into training, validation, and testing sets.

For feature extraction and model training, we intend to use a pre-trained speech representation model such as Wav2Vec2 [36]. Instead of manually extracting features like MFCCs, Wav2Vec2 automatically learns useful audio representations directly from raw waveforms. These learned features capture acoustic and prosodic patterns such as pitch, tone, intensity, rhythm, and speaking style which are essential for distinguishing emotional states in speech. These embeddings will then be used as input to a lightweight deep learning classifier (e.g., BiLSTM or CNN), rather than applying full end-to-end fine-tuning, to ensure strong performance while remaining computationally efficient for our system.

Software and Algorithms

All preprocessing and training will be implemented in Python. We plan to use audio-processing libraries such as Librosa and numerical libraries such as NumPy. For model development, we will use PyTorch or TensorFlow, along with pre-trained speech models available through the HuggingFace Transformers library. We will use these pretrained models to extract speech embeddings, which will then be used to train a deep learning classifier for emotion recognition. This approach allows **Jadeer** to benefit from powerful pretrained representations while maintaining computational efficiency.

5.5 Interface Design

The interface of **Jadeer** was designed following established principles of Human–Computer Interaction (HCI) to ensure that the application provides an intuitive, accessible, and efficient user experience for both job seekers and companies. In designing the user interface, we adopted Shneiderman's Eight Golden Rules [61] as the primary UX framework to guide layout decisions, interaction patterns, and component behavior.

This section presents the application's sitemap and outlines the UX principles applied during the design phase.

- **Sitemap**

  The following diagram shows the navigation structure of **Jadeer**. It highlights the main screens and flows for all three roles in the system — Job Seekers, Companies, and Admins. The sitemap covers the core processes such as creating accounts, browsing and applying for jobs, posting and managing job listings, and enhancing CVs.

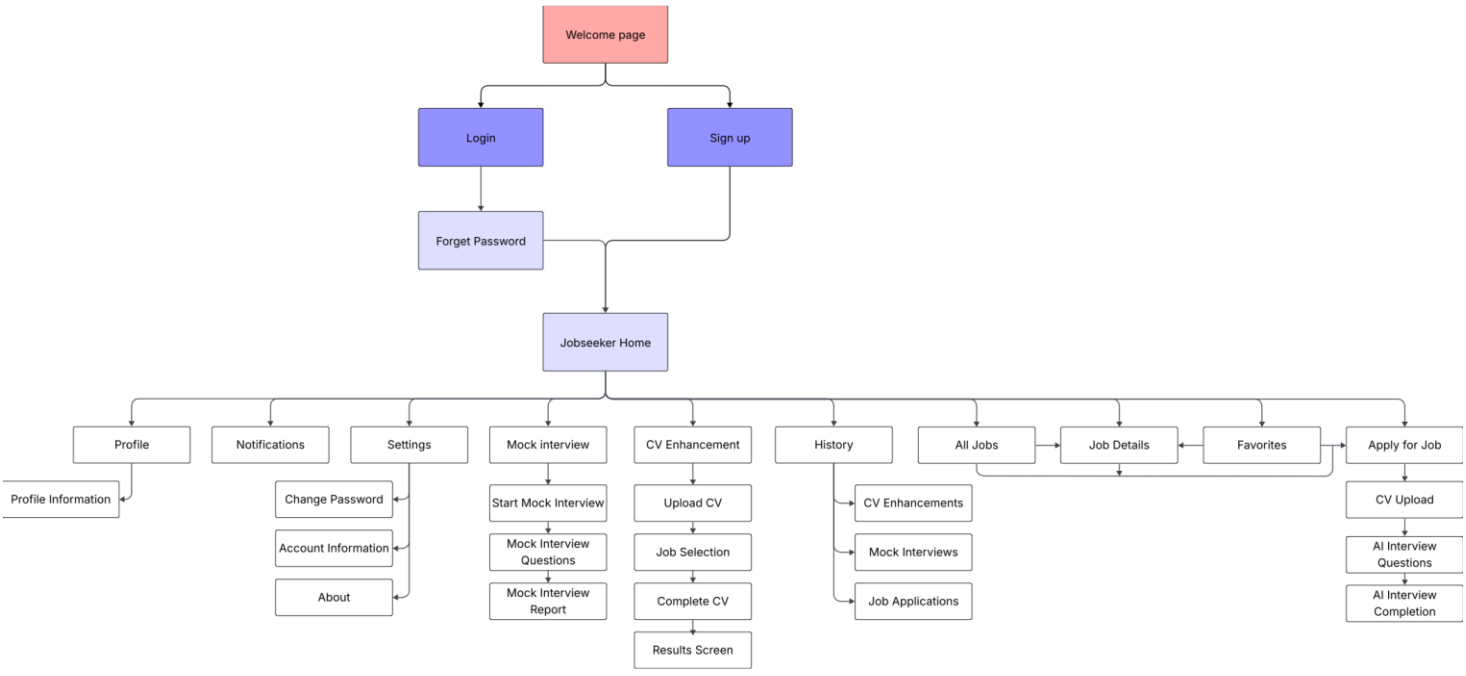

Figure 11: 5-8 Job Seeker Sitemap

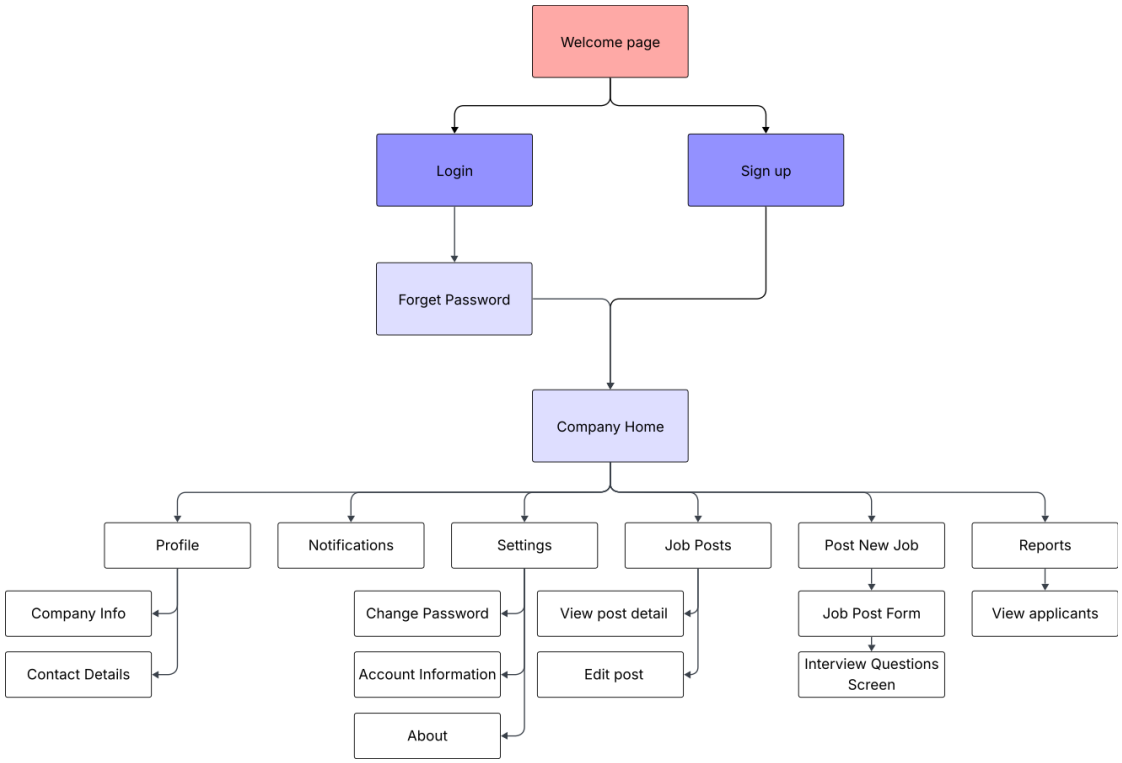

Figure 12: 5-9 Company Sitemap

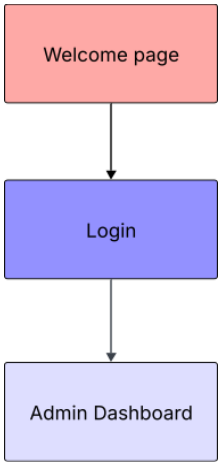

Figure 13: 5-10 Admin Sitemap

- **UX Guidelines**

During the design of **Jadeer**, we incorporated Shneiderman's Eight Golden Rules [61] to ensure clarity, reduce user effort, and enhance task efficiency. The following guidelines summarize how each rule was applied within the application:

1. **Strive for Consistency**

Consistency across colors, icons, typography, and layouts was maintained throughout all screens. This ensures predictable interaction patterns and reduces users' learning time. In **Jadeer**, consistent visual elements are used in navigation bars, job cards, input forms, and buttons for both job seekers and companies.

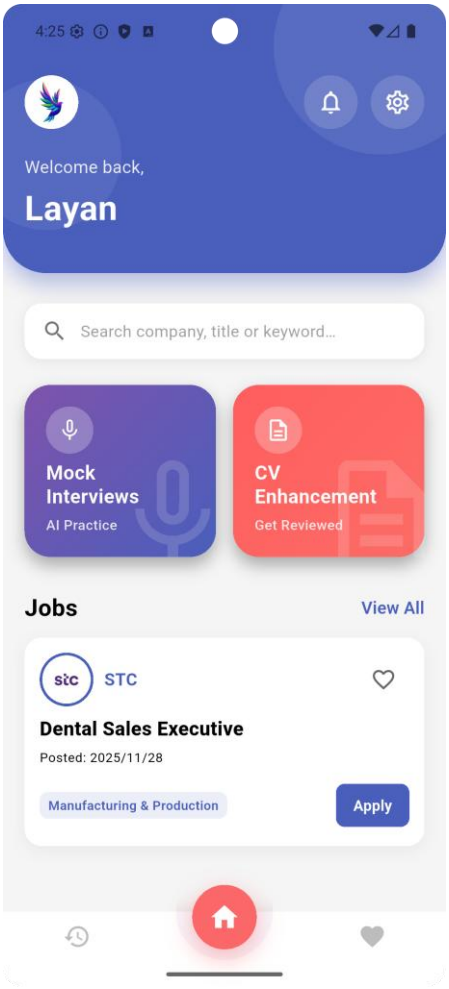

Figure 14: 5-11 Job Seeker Home Page in Jadeer

2. **Cater to Universal Usability**

The interface was designed to accommodate users with varying levels of digital experience. Clear wording, simple layouts, and step-by-step flows (such as job posting and CV enhancement) ensure accessibility for different user groups, including fresh graduates and HR professionals.

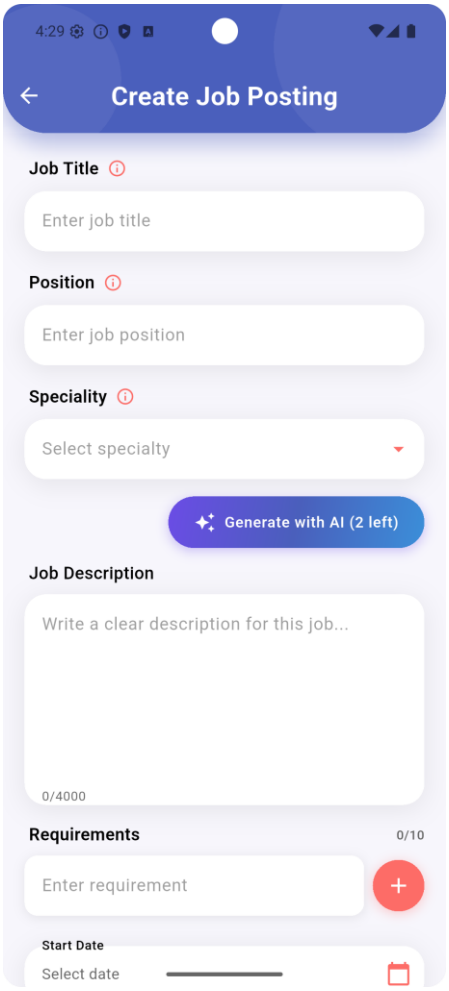

Figure 15: 5-12 Create Job Posting Page in Jadeer

3. **Design Dialogs to Yield Closure**

Each major action ends with a clear sense of completion. For instance, once a job is successfully posted, users receive a confirmation message. After the AI processes a CV or generates interview questions, the results are displayed clearly, signaling the end of the process.

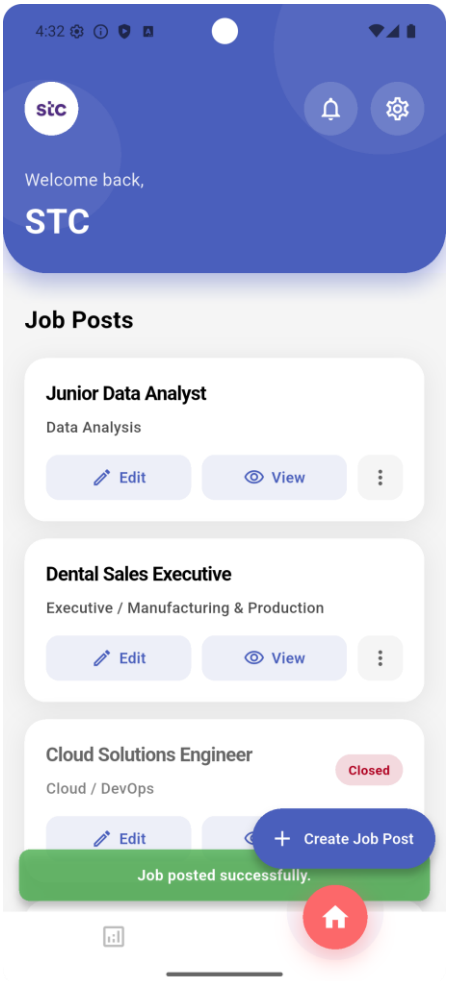

Figure 16: 5-13 Confirmation Message After Posting a Job

4. **Prevent Errors and Offer Simple Error Handling**

Validation checks are applied across all input fields to reduce user mistakes. Invalid entries such as incorrect email formats, missing job details, or weak passwords trigger descriptive error messages. Additionally, users are prevented from submitting incomplete forms, reducing the likelihood of downstream errors.

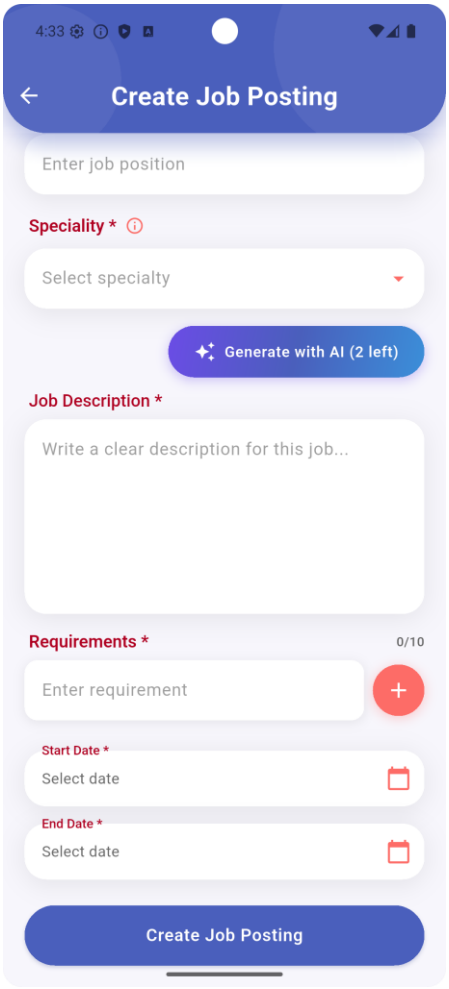

Figure 17: 5-14 Error Prevention Through Required Fields

5. **Permit Easy Reversal of Actions**

The system supports safe exploration by providing options to cancel or reverse certain actions. Examples include confirmation prompts before deleting job postings or AI-generated question sets, as well as the ability to edit posted job information.

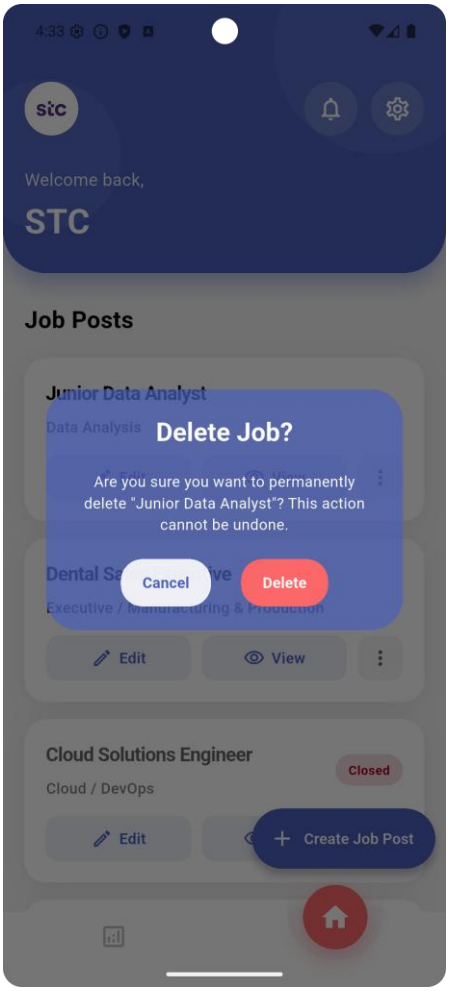

Figure 18: 5-15 Delete Confirmation Dialog

6. **Support Internal Locus of Control**

The interface ensures that users feel in control of their actions. Navigation is straightforward, buttons are clearly labeled, and system behavior aligns with user expectations. This is particularly important in multi-step processes such as job posting and profile completion.

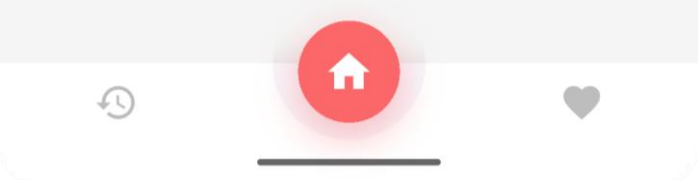

Figure 19: 5-16 User-Controlled Bottom Navigation

7. **Reduce Short-Term Memory Load**

The design minimizes cognitive effort by presenting all necessary information directly on the screen. Clear labels, placeholders, and categorized question groups help users understand requirements without needing to recall information. Job seekers can easily compare job details, and companies can manage postings without navigating through multiple screens.

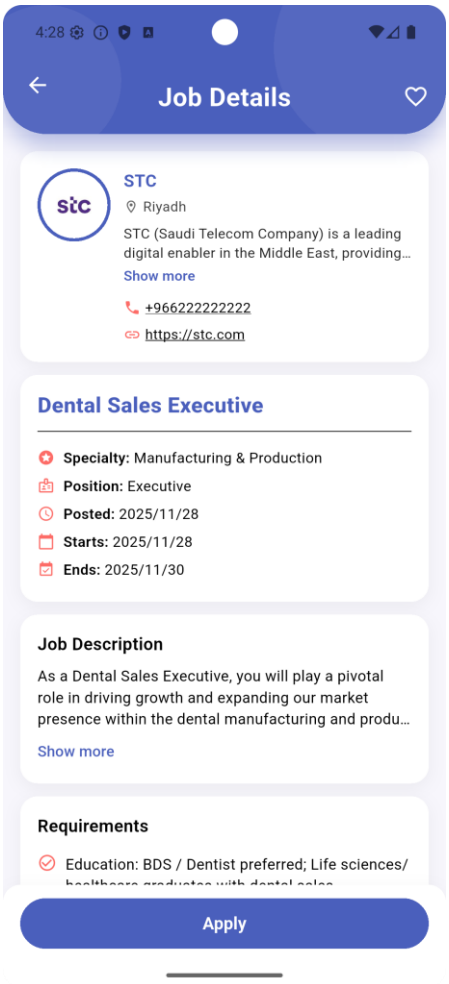

Figure 20: 5-17 Single-Page Job Details Layout

6 System Implementation

This section describes the implementation of the Jadeer system, covering the hardware and software components used, integration with third-party services, and custom features developed. We explain the technical architecture, API connections, and key implementation decisions. Additionally, we discuss the challenges encountered during development and the consultations that guided the process. Finally, we provide a link to the project repository.

6.1 Hardware and Software Components

The **Jadeer** application was developed using Visual Studio Code as the primary IDE with Flutter and Dart extensions. Android Studio was used for Android device emulation and testing. The development team used personal laptops with specifications including AMD Ryzen 7 6800HS processors (3.20 GHz), 16GB RAM, and 952GB storage. Git and GitHub were used for version control and team collaboration.

The frontend was built using Flutter framework (SDK version >=3.5.3 <4.0.0) with Dart programming language for cross-platform mobile development. Firebase was chosen as the backend platform, providing Authentication for user management, Cloud Firestore as a NoSQL database, Cloud Storage for file management, and Cloud Functions for serverless backend processing. Firebase was integrated by creating a Firebase project in the Firebase Console, downloading the configuration files, and placing them in the Flutter project directory.

6.2 Out-of-the-Box Components

The following third-party packages and services were integrated into the application:

6.2.1 Flutter Packages:

- **firebase_core, firebase_auth, cloud_firestore, firebase_storage, cloud_functions:** Firebase SDK packages for backend services integration
- **provider:** State management solution for managing application state across widgets
- **file_picker:** File selection functionality for CV uploads
- **image_picker:** Image selection for profile photos and company logos
- **http:** HTTP client for API communication with backend services
- **url_launcher:** Opening external URLs, email clients, and phone dialer
- **shared_preferences:** Local data storage for user preferences

- **intl:** Internationalization and localization support
- **iconsax_flutter, dotted_border, awesome_dialog, dropdown_button2, share_plus:** UI component libraries for enhanced user interface

6.2.2 Cloud Functions Packages:

- **openai (v6.3.0):** Official OpenAI Node.js SDK for GPT-4 API integration
- **pdf-parse, textract:** Libraries for extracting text from PDF and DOCX files
- **pdfkit:** PDF generation library for creating enhanced CV documents
- **nodemailer:** Email service for sending OTP codes and notifications
- **mammoth:** DOCX file processing

6.2.3 Pre-trained AI Model:

- **OpenAI GPT-4o:** Large language model used for CV enhancement and content generation

6.3 API Connections and Third-Party Integration

6.3.1 Firebase Backend Services:

The application connects to Firebase services for all backend operations:

- **Firebase Authentication:** Handles user registration and login using email/password authentication. Integrated using firebase_auth package with built-in security features including password hashing and account management
- **Cloud Firestore:** NoSQL database storing user profiles, job postings, applications, favorites, and CV history. Main collections include: Users, Jobs, Applications, Favourite, CVHistory. Provides real-time data synchronization across devices
- **Firebase Storage:** Stores user-uploaded files including CVs (PDF/DOCX), profile photos, and company logos. Files organized in folders by user ID and document type (cv/, NewCV/, temp_cv_extraction/)
- **Cloud Functions:** Serverless backend functions for CV text extraction, keyword extraction, and OpenAI API integration

6.3.2 OpenAI API Integration:

The CV enhancement feature integrates OpenAI's GPT-4o model through Firebase Cloud Functions (Generation 2). The implementation works as follows:

6.3.3 Integration Architecture:

- **API Access:** OpenAI Node.js SDK (v6.3.0) used in Cloud Functions with API key stored securely in environment variables
- **Model:** gpt-4o (latest GPT-4 optimized model)
- **Endpoint:** openai.chat.completions.create() method from OpenAI SDK
- **Response Format:** Structured JSON object with CV sections (PersonalInformation, Summary, Experience, Education, Skills, Certifications, Languages) and improvement suggestions
- **Configuration:** Temperature: 0.7, Max tokens: 4000, Response format: JSON mode

6.3.4 Implementation Flow:

- User uploads CV file (PDF/DOCX) through Flutter app using file_picker package
- File uploaded to Firebase Storage with metadata (cvHistoryId, userId)
- Cloud Function (extractCVKeywords) automatically triggered by storage upload, extracts text using pdf-parse or textract libraries
- Extracted text saved to Firestore CVHistory collection, keywords saved to Users collection
- Flutter app listens to Firestore updates in real-time and detects when extraction is complete
- User optionally selects target job (from **Jadeer** jobs or enters custom job details)
- Flutter app calls detectMissingSections Cloud Function with cvHistoryId
- Cloud Function uses OpenAI GPT-4o-mini to analyze OldCVText and identify completely missing or empty sections (PersonalInformation, Summary, Experience, Education, Skills, Certifications, Languages)
- If job information is provided, Cloud Function also generates suggested skills relevant to the target position
- If missing sections are detected, the user navigates to CVNextStepsScreen where they can fill in missing information section by section with guided forms
- Filled information stored in additionalSections object in Flutter app state
- If no missing sections or after user completes filling, Flutter app calls enhanceCV Cloud Function with cvHistoryId, job information, and additionalSections (if any)
- Cloud Function constructs detailed prompt merging original CV text with user-filled additional sections, sends to OpenAI GPT-4o API
- GPT-4o returns structured JSON with enhanced CV sections and improvement suggestions

- Cloud Function automatically generates professional PDF using PDFKit library
- PDF uploaded to Firebase Storage and URL saved to Firestore
- User navigates to CVReadyScreen (PublishScreen) to view enhanced CV and suggestions, can download PDF

6.4 Customizations Applied

1. CV-Job Keyword Matching Algorithm

A custom keyword-based matching algorithm was developed to filter and personalize job recommendations based on CV content. The algorithm implementation includes:

Keyword Extraction (Cloud Function):

When a CV is uploaded, a Cloud Function automatically extracts keywords using a custom algorithm that:

- Tokenizes CV text using regex pattern to extract words (minimum 3 characters)
- Filters out common English stopwords using a curated stopwords set (articles, prepositions, common verbs, pronouns)
- Includes technology-specific terms allowlist (programming languages, frameworks, tools) to preserve important short keywords like 'C++', 'API', 'ML', 'UI/UX'
- Calculates keyword frequency and selects top 20 most relevant keywords
- Stores extracted keywords in Firestore Users collection (CVKeywords field)

Job Matching (Flutter App):

When user activates 'For You' filter in job browsing:

- Retrieves user's CV keywords from Firestore
- For each job posting, extracts keywords from job's specialty and keywords fields
- Tokenizes job keywords using regex pattern (splits on special characters, converts to lowercase)
- Compares user's CV keywords with job's tokenized keywords
- Counts matching keywords and returns true if at least 2 keywords match
- Displays only matching jobs when 'For You' filter is active

2. Multi-Criteria Job Filtering System

Custom filtering system allowing users to combine multiple filters:

- Text search across job title, position, specialty, company name, and keywords
- Specialty filtering from 30+ predefined categories (Technology, Engineering, Business, Healthcare, etc.)
- Sort order toggle (newest first or oldest first based on StartDate)
- Show/hide closed jobs filter
- 'For You' personalized filter using CV keyword matching

3. Favorites System

Users can save jobs for later viewing. Implementation includes composite document IDs (UserID_JobID format) in Firestore Favourite collection, synchronization using Firestore snapshots, and optimistic UI updates with error handling.

4. CV Enhancement Workflow with Job Targeting

Multi-step CV enhancement process with three job selection options: select from **Jadeer** job postings (with wishlist/all jobs toggle), enter custom job details for external applications, or enhance CV for general use without job targeting. System provides tailored suggestions based on selected option.

5. Profile Completeness Tracking

System monitors profile completion status and displays contextual reminder messages when users attempt to use features requiring complete profiles (like 'For You' recommendations without uploaded CV), with direct navigation to profile completion screen.

6.5 Implementation Challenges

The development team encountered several technical challenges during implementation. One significant difficulty was working with the OpenAI API to ensure consistent and properly formatted responses for CV enhancement. This required iterative refinement of prompts and implementing structured response formatting to achieve reliable results.

Another challenge involved managing API usage costs and limitations. As a cloud-based service with usage-based pricing, the team needed to implement strategies to optimize API calls and control expenses while maintaining functionality for multiple users.

Additionally, the team faced issues with text extraction from various document formats during the CV upload process. These challenges were addressed by updating to stable library versions and implementing proper error handling to ensure reliable document processing across different file types.

6.6 Consultations Received

The team received regular guidance from the project Supervisor throughout the development process. Her guidance included feedback on system architecture decisions, AI integration approaches, best practices for mobile development, and ensuring alignment with academic project requirements. Specific feedback received included a software specialist Professor recommendation to separate the machine learning model into its own class in the class diagram, as the team would be responsible for training the model, ensuring proper architectural separation of concerns.

The team conducted consultations with HR professionals from a well-known companies like **SDAIA** to validate feature requirements and gather insights on recruitment challenges. Key feedback received:

- Project success depends on quality of outcomes and accurate candidate evaluation
- Medium and small companies would benefit more from the system than larger enterprises
- Suggested integration of psychometric tests (DISC, 16 Personalities) as personality assessment is crucial for company-candidate fit
- HR professionals prioritize personality tests and soft skills evaluation over voice tone analysis
- Many companies use personality test links during hiring process to filter candidates based on results
- Recommended conducting field studies and interviewing companies across different sizes and sectors to better understand their specific needs
- Overall positive feedback on project concept and potential market impact

6.7 Project Repository

Repository link: https://github.com/WS888-CODER/gp_2025_11

7 System Testing

7.1 User Acceptance Testing

To evaluate user acceptance of the application, we assembled a team of seven participants: two of them were HR consultants representing companies, and the remaining five were individuals actively seeking jobs from within our network. We had them test the application and then complete a survey to measure their level of satisfaction.

The following are the results of the test.

7.1.1 Demographics of Participants

The participants in the application testing were asked about their age, gender, education level, and experience with mobile applications. The following figures displays their answers.

As for the companies, these were their responses:

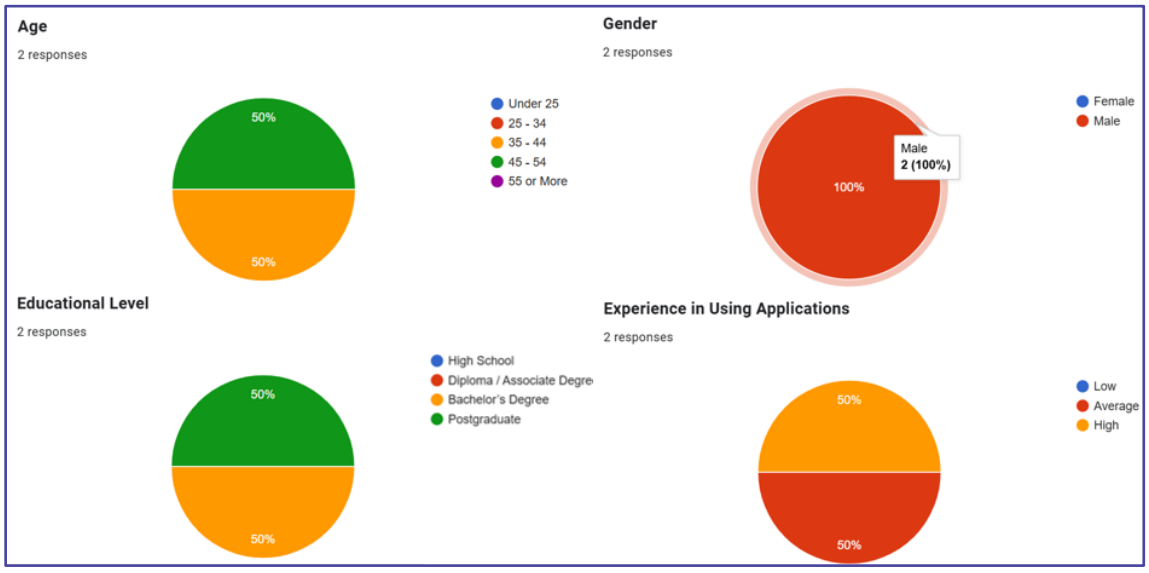

Figure 21: 7-1 Companies Demographics

For the job seekers, these were their responses:

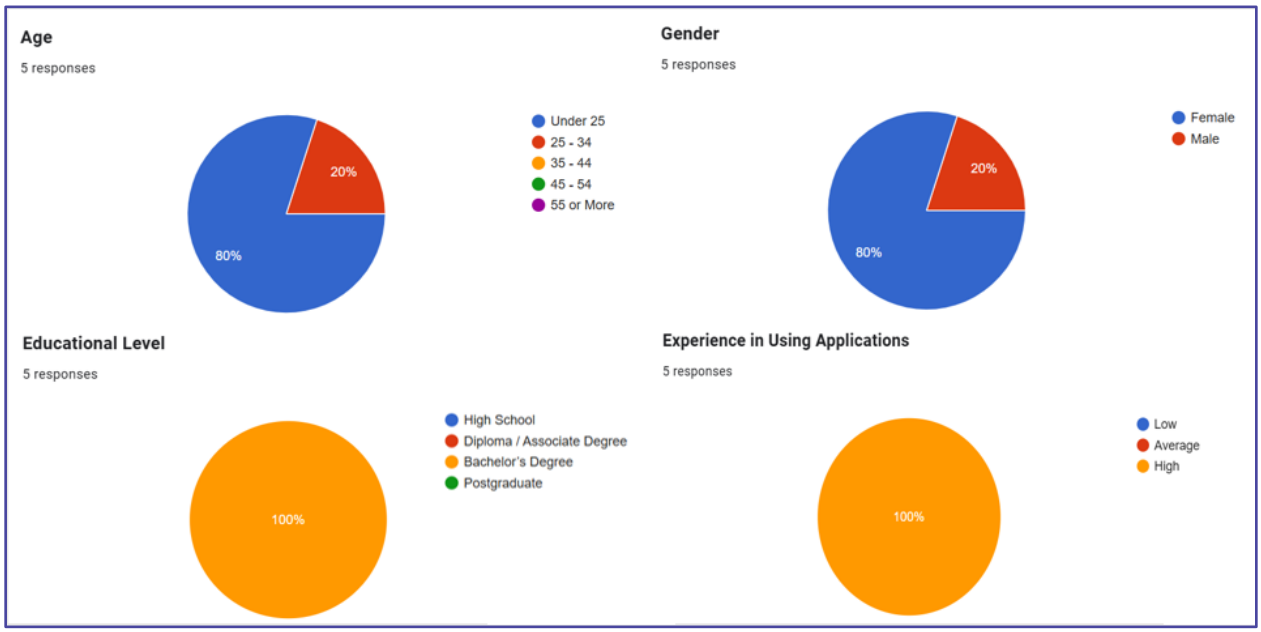

Figure 22: 7-2 Job Seeker Demographics

7.1.2 Questionnaire/Interview Results

Since our application targets two user groups — **companies** and **job seekers** — we conducted user acceptance testing on both segments using questionnaires.

A total of **7 participants** were involved: **2 companies** and **5 job-seeker**.

The survey results are summarized in the following two tables (for more details see Appendix D).

Companies' acceptance testing survey results:

Question	Number of respondents (Percentage of responses)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I needed previous experience to use the app.			1 (50%)	1 (50%)	

2. I found the application easy to use.				1 (50%)	1 (50%)
3. I found the navigation between pages smooth and clear.				2 (100%)	
4. I found the color palette and visual design comfortable.			1 (50%)		1 (50%)
5. I found the interface design clear and intuitive.				2 (100%)	
6. Some icons or labels were unclear to me.	1 (50%)		1 (50%)		
7. The app responded quickly and did not lag.			1 (50%)	1 (50%)	
8. Pages and features loaded without noticeable delays.				2 (100%)	
9. I was able to create a job post correctly, easily, and clearly.					2 (100%)
10. I found the AI-generated job descriptions useful and relevant.				1 (50%)	1 (50%)

11. The AI-generated interview questions were relevant to the job post.				1 (50%)	1 (50%)
12. The difficulty level and clarity of the questions were appropriate.			1 (50%)		1 (50%)
13. I was able to view, edit, or add to the AI-generated questions easily.					2 (100%)
14. I was able to edit my profile correctly, easily, and clearly.					2 (100%)
15. I was able to reset my password without any difficulty.				1 (50%)	1 (50%)
16. The pop-up messages I got from the app were helpful and clear.			1 (50%)	1 (50%)	
17. I think I will use this application frequently.				1 (50%)	1 (50%)

18. I will recommend this application to others.					2 (100%)

Table 8: 7-1 Companies UAT Results

Job seekers acceptance testing survey results:

Question	Number of respondents (Percentage of responses)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I needed previous experience to use the app.	1 (20%)	3 (60%)	1 (20%)		
2. I found the application easy to use.					5 (100%)
3. I found the navigation between pages smooth and clear.				3 (60%)	2 (40%)
4. I found the color palette and visual design comfortable.					5 (100%)
5. I found the interface design clear and intuitive.				1 (20%)	4 (80%)
6. Some icons or labels were unclear to me.	3 (60%)			2 (40%)	

7. The app responded quickly and did not lag.			3 (60%)		2 (40%)
8. Pages and features loaded without noticeable delays.				2 (40%)	3 (60%)
9. I was able to upload my CV to my profile correctly, easily, and clearly.				1 (20%)	4 (80%)
10. I found the AI CV enhancement helpful and easy to understand.				1 (20%)	4 (80%)
11. The AI suggestions I received after enhancing my CV were clear, relevant, and helpful.				1 (20%)	4 (80%)
12. The system correctly identified missing or incomplete information in my CV and helped me understand what to add.					5 (100%)
13. I liked having the option to choose jobs so the AI could tailor the					5 (100%)

CV enhancement toward those roles.					
14. The enhanced CV I received (PDF) was clear, well-formatted, and improved compared to my original one.			1 (20%)	2 (40%)	2 (40%)
15. I was able to browse and search for job posts easily and clearly.				1 (20%)	4 (80%)
16. The job recommendations I received based on my CV were relevant and useful.					5 (100%)
17. I was able to save or favorite job posts correctly and easily.					5 (100%)
18. I was able to find my previous CV enhancements on the History page easily.			1 (20%)		4 (80%)
19. I was able to edit my profile correctly, easily, and clearly.			1 (20%)		4 (80%)

20. I was able to reset my password without any difficulty.					5 (100%)
21. The pop-up messages I got from the app were helpful and clear.					5 (100%)
22. I think I will use this application frequently.					5 (100%)
23. I will recommend this application to others.					5 (100%)

Table 9: 7-2 Job Seeker UAT Results

7.2 Discussion

Based on the results of testing 7 participants in the User Acceptance Testing (UAT), comprising 2 company representatives and 5 individual job seekers, the majority of participants demonstrated highly positive experiences with the mobile applications. The questionnaire responses indicated that users found the app easy to use, with consistent ratings of 4-5 across both user groups. Participants strongly disagreed that previous experience was needed to use the app (ratings of 1-3), confirming that **Jadeer** is accessible regardless of technical background. The interface design was rated as clear and intuitive (4-5), with comfortable colors and smooth navigation between pages.

However, some areas showed room for improvement. Performance aspects received mixed feedback, with app responsiveness and loading times scoring 3-5, indicating occasional inconsistencies. Icon and label clarity was a notable concern, with ratings of 3-4 showing that some participants found certain visual elements unclear or confusing. Pop-up messages

received neutral to positive ratings (3-5), suggesting they were adequate but not particularly helpful or memorable.

The core AI-powered features received exceptional endorsement from both user groups. Job seekers rated AI CV enhancement at 4-5, strongly agreeing that suggestions were clear, relevant, and helpful. The system's ability to identify missing information scored 5 across most responses, and the option to target specific job roles was universally rated at 5. Company representatives rated AI-generated job descriptions and interview questions at 4-5, with the ability to edit AI content scoring 5 from both participants. These results validate the successful integration of OpenAI API for content generation.

The enhanced CV PDF output received generally positive feedback (3-5), with most participants rating quality at 4-5. One neutral response (3) indicates room for continued refinement to ensure consistent quality across all scenarios. Supporting features performed well, with profile management and password reset scoring 4-5, job browsing and favorites functionality rating 4-5, and the history page receiving 3-5, suggesting potential discoverability issues.

Most significantly, the application demonstrated exceptional user adoption potential. Intention to use frequently scored 4-5, and willingness to recommend received a perfect 5 across all responses, indicating unanimous strong agreement that participants would recommend **Jadeer** to others. These metrics suggest strong product-market fit and genuine value delivery.

Overall, the results obtained from the system evaluation were highly favorable, indicating that the design and implementation of **Jadeer** were effective in meeting project objectives. However, there is always room for improvement. Here are key areas to consider for enhancement:

- **Performance Consistency**: Some neutral responses (3) on loading times suggest occasional performance issues. Optimizing Firebase Firestore queries, implementing caching strategies, and adding progress indicators for longer operations can improve consistency and perceived responsiveness.

- **Icon and Label Clarity**: Ratings of 3-4 indicate confusion with some visual elements. Conducting a UI/UX audit, adding text labels or tooltips to unclear icons, and testing revised designs with users can enhance navigational clarity.
- **PDF Quality Refinement**: While generally positive, one neutral response suggests need for improvement. Ensuring consistent font rendering, optimizing layouts for ATS compatibility, and implementing automated quality checks can achieve uniform excellence across all generated documents.
- **Feature Discoverability**: Neutral responses on the history page indicate potential navigation issues. Adding visual cues, redesigning navigation structure, and implementing onboarding tutorials can improve feature adoption and accessibility.
- **Notification Enhancement**: Neutral ratings on pop-up messages suggest they need refinement. Making messages more contextual and actionable, with clear visual hierarchy and specific guidance, can increase their perceived value.
- **Localization Support**: Incorporating Arabic language support and adapting content to reflect local Saudi market conditions would significantly broaden appeal and accessibility for the target demographic.

In summary, while the system evaluation yielded strongly positive results with unanimous recommendation scores (5/5) and high satisfaction ratings, addressing performance consistency, interface clarity, and feature discoverability through iterative refinement will enhance the platform further. The strong foundation demonstrated in testing positions **Jadeer** as a viable solution for the AI-powered recruitment space with potential for real-world deployment beyond the academic context of this graduation project.

8 Conclusions and Future Work

This section reflects on the journey of developing **Jadeer**, starting from identifying the recruitment challenges in Saudi Arabia to designing and implementing an AI-powered solution that addresses these gaps. The report began by introducing the problem of inefficient and biased hiring processes, followed by an in-depth background study on recruitment technologies and their limitations. We explored existing platforms through a literature review, identifying gaps such as lack of candidate feedback, limited fairness, and weak personalization. These insights guided the design of **Jadeer** as a dual-sided platform serving both companies and job seekers.

Moving forward, we defined system requirements through interviews and surveys, ensuring that **Jadeer** meets real user needs. The design phase translated these requirements into a structured architecture, incorporating advanced technologies such as Natural Language Processing, Large Language Models, and Speech-to-Text systems. Implementation focused on delivering core features: AI-powered CV enhancement, AI-generated job posting, and mock interviews for candidates, alongside AI-driven evaluation and ranking for companies. Finally, user acceptance testing validated the usability and effectiveness of **Jadeer**, confirming its potential to streamline recruitment and improve fairness. This conclusion summarizes the project's impact, limitations, and contributions, and outlines future directions for enhancement.

- **Global and Local impact**

Jadeer significantly impacts recruitment both locally and globally. On a local level, it supports Saudi Vision 2030 by promoting workforce empowerment and labor market efficiency. Companies benefit from automated CV screening, AI-driven interviews, and structured candidate reports, reducing hiring delays and operational costs. Job seekers gain tools for CV optimization and realistic interview practice, improving their chances of securing suitable roles. On a global scale, **Jadeer** demonstrates how AI can transform recruitment processes by reducing bias and enhancing transparency, serving as a model for future HR technologies worldwide.

- **Problems and Challenges Encountered During the Software Development**

During the development of **Jadeer**, the team faced several challenges that required adaptability and problem-solving. One of the initial difficulties was reaching stakeholders to gather accurate requirements. This was resolved by leveraging the Nawafith [62]platform to schedule consultations with HR experts, ensuring that the system design aligned with real-world recruitment needs.

Another challenge involved technical issues with OTP (One-Time Password) functionality, which initially failed to work within the Kingdom. After multiple attempts and adjustments, the team identified and implemented a workaround to ensure successful verification.

Database design also posed significant challenges, particularly in determining the necessary tables and attributes to support **Jadeer**'s dual-sided functionality. This required multiple iterations and refinements throughout the early stages of the project.

Additionally, defining the methods for the class diagram was a complex task. The team sought guidance from the supervisor and external experts, including consultations with specialists, to finalize the appropriate methods and ensure accurate representation of system behavior. These challenges collectively strengthened the team's ability to adapt, acquire new knowledge, and refine the system design effectively.

- **Limitations of the system**

Despite its innovative features, **Jadeer** has certain limitations in its current release. The application is currently available only for Android devices, which restricts accessibility for users on other platforms such as iOS. Additionally, **Jadeer** supports English language exclusively, which may limit usability for non-English speakers. The system focuses primarily on recruitment-related functionalities and does not include broader HR modules such as payroll or attendance management. Furthermore, advanced

features like real-time video interviews and multi-language support are planned for future versions but are not yet implemented.

- **The main contribution of the project**

The main contribution of **Jadeer** lies in its ability to bridge the gap between employers and job seekers through a unified, AI-powered platform. Unlike traditional Applicant Tracking Systems that rely on keyword filtering, **Jadeer** offers a holistic approach by combining CV optimization, AI-generated job postings, and unbiased interview evaluations. By leveraging technologies such as NLP, LLMs, and speech analysis, **Jadeer** ensures fairer recruitment decisions and provides actionable feedback to candidates, ultimately improving hiring quality and candidate preparedness.

- **Future work**

Jadeer aims to enhance the user experience in its upcoming journey by introducing several new features. Future plans include expanding language support to incorporate multiple languages and adding Arabic localization to increase adoption within the Saudi market. The application will also focus on improving accessibility for a wide audience by ensuring compatibility with different platforms and operating systems. Additionally, **Jadeer** intends to integrate real-time video interviews for more interactive assessments and develop advanced analytics dashboards to help companies track recruitment metrics effectively. Further improvements will include refining AI models for deeper psychometric analysis and personalized job recommendations. These enhancements demonstrate a strong commitment to optimizing the platform and meeting the evolving needs of both employers and job seekers.

9 References

[1] Saudi Vision 2030, "Vision 2030: Kingdom of Saudi Arabia," Saudi Vision 2030, [Online]. Available: https://www.vision2030.gov.sa. [Accessed 6 9 2025].

[2] Small and Medium Enterprises General Authority (Monsha'at), "Human Resources for SMEs: HR Thematic Report 2022," Monsha'at, Riyadh, 2022.

[3] R. Chauhan, M. R. Buckley and M. G. Harvey, "Applicant tracking systems: A review and future research agenda," *Human Resource Management Review,* p. 122–140, 2013.

[4] LinkedIn, "Global Talent Trends Report 2024," LinkedIn, [Online]. Available: https://business.linkedin.com/talent-solutions/global-talent-trends. [Accessed 6 9 2025].

[5] HireVue, "AI-powered hiring solutions," HireVue, [Online]. Available: https://www.hirevue.com. [Accessed 6 9 2025].

[6] Google, "Flutter: Build apps for any screen," 2025. [Online]. Available: https://flutter.dev/.

[7] A. Developers, "Meet Android Studio," Android Developers, [Online]. Available: https://developer.android.com/studio/intro.

[8] OpenAI, "Pricing," OpenAI, [Online]. Available: https://openai.com/api/pricing/. [Accessed 6 September 2025].

[9] OpenAI, "Introducing Whisper," OpenAI, 21 September 2022. [Online]. Available: https://openai.com/index/whisper/.

[10] Google, "Text-to-Speech AI: Lifelike Speech Synthesis," Google Cloud, [Online]. Available: https://cloud.google.com/text-to-speech?hl=en.

[11] G. LLC, "Text-to-Speech pricing," Google Cloud, 2025. [Online]. Available: https://cloud.google.com/text-to-speech/pricing?hl=en/.

[12] googlr, "firebase pricing," [Online]. Available: https://firebase.google.com/pricing.

[13] Satr Learning, "Learn Flutter Development," Satr, 2024. [Online]. Available: https://satr.codes.

[14] Udemy, "The Complete Flutter Development Bootcamp," Udemy, 2024. [Online]. Available: https://www.udemy.com/course/flutter-bootcamp.

[15] Coursera, "Django for Everybody," University of Michigan, Coursera, 2023. [Online]. Available: https://www.coursera.org/specializations/django.

[16] Coursera, "Server-side Development with Node.js, Express, and MongoDB," Coursera, 2023. [Online]. Available: https://www.coursera.org/learn/server-side-nodejs.

[17] Google, "Firebase Documentation and Tutorials," 2024. [Online]. Available: https://firebase.google.com/docs.

[18] A. Ng, "Machine Learning Specialization," Coursera / Stanford, 2022. [Online]. Available: https://www.coursera.org/specializations/machine-learning-introduction.

[19] Hugging Face, "Hugging Face Documentation," Hugging Face, 2024. [Online]. Available: https://huggingface.co/docs.

[20] OpenCV.org, "OpenCV Documentation," OpenCV.org, 2024. [Online]. Available: https://docs.opencv.org.

[21] Google Research, "MediaPipe Solutions," Google Developers, 2024. [Online]. Available: https://developers.google.com/mediapipe.

[22] C. Sołek-Borowska and M. Wilczewska, "New Technologies in the Recruitment Process," *Economics and Culture,* 2018.

[23] R. Henderson, "What Is an Applicant Tracking System (ATS)? 8 Things You Need to Know About Applicant Tracking Systems," 2025. [Online]. Available: https://www.jobscan.co/blog/8-things-you-need-to-know-about-applicant-tracking-systems/?utm_source=chatgpt.com.

[24] H. A. H. a. M. H. H. A. Ezzat, "Analysis & Shortcomings of E-Recruitment Systems: Towards a Semantics-based Approach Addressing Knowledge Incompleteness and Limited Domain Coverage," arXiv, 2020.

[25] G. M and D. M. S. Kumar, "Effectiveness of Applicant Tracking Systems in Recruitment and Selection," *International Research Journal of Modernization in Engineering, Technology and Science (IRJMETS),* vol. 7, no. 6, 2025.

[26] D. J. a. J. H. Martin, Speech and Language Processing, 3rd ed., draft version ed., 2023.

[27] C. D. Manning, P. Raghavan and H. Schütze, Introduction to Information Retrieval, Cambridge: Cambridge University Press, 2008.

[28] A. Vaswani, "Attention Is All You Need," arXiv, June 2017. [Online]. Available: https://arxiv.org/pdf/1706.03762. [Accessed 2025].

[29] T. B. Brown, B. Mann, N. Ryder, M. Subbiah, J. D. Kaplan, P. Dhariwal, A. Neelakantan, P. Shyam, G. Sastry, A. Askell, S. Agarwal, A. Herbert-Voss, G. Krueger, T. Henighan and R. Child, " Language Models are Few-Shot Learners," July 2020. [Online]. Available: https://arxiv.org/abs/2005.14165. [Accessed 2025].

[30] R. Pahwa, H. Tanwar and S. Sharma, "Speech Recognition System: A Review," *International Journal of Future Generation Communication and Networking,* 2020.

[31] T. Dutoit, An Introduction to Text-to-Speech Synthesis, Dordrecht: Springer, 2011.

[32] Y. Cai and e. al., "Knowledge enhancement for speech emotion recognition via multi-level acoustic feature," *Connection Science,* 2024.

[33] S. R. Livingstone and F. A. Russo, "The Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS)," Zenodo, 2018. [Online]. Available: https://zenodo.org/record/1188976.

[34] H. Cao, D. G. Cooper, M. K. Keutmann, R. C. Gur, A. Nenkova and R. Verma, "CREMA-D: Crowd-Sourced Emotional Multimodal Actors Dataset," GitHub, 2014. [Online]. Available: https://github.com/CheyneyComputerScience/CREMA-D.

[35] B. McFee, C. Raffel, D. Liang, D. Ellis, M. McVicar, E. Battenberg and O. Nieto, "librosa: Audio and music signal analysis in python," in *Proceedings of the 14th Python in Science Conference*, 2015.

[36] A. Baevski, Y. Zhou, A. Mohamed and M. Auli, "wav2vec 2.0: A framework for self-supervised learning of speech representations," *Advances in Neural Information Processing Systems,* 2020.

[37] W.-N. Hsu, B. Bolte, Y.-H. H. Tsai, K. Lakhotia, R. Salakhutdinov and A. Mohamed, "HuBERT: Self-supervised speech representation learning by masked prediction of hidden units," *IEEE/ACM Transactions on Audio, Speech, and Language Processing,* 2021.

[38] P. Jafarzadeh and e. al., "Speaker Emotion Recognition: Leveraging Self-Supervised Models for Feature Extraction Using Wav2Vec2 and HuBERT," arXiv, 2024.

[39] H. Li and e. al., "Self-supervised learning for speech emotion recognition task using audio-visual features and Distil HuBERT model," *journal of Systems Science and Systems Engineering,* vol. 33, 2024.

[40] Y. Wang and e. al., "Speech emotion recognition using fine-tuned Wav2vec2.0 and neural controlled differential equations classifier," *PLOS ONE,* vol. 20, no. 2, 2025.

[41] L. Pepino, P. Riera and M. Ferrer, "Emotion Recognition from Speech Using wav2vec 2.0 Embeddings," in *Interspeech*, 2021.

[42] A. Chakhtouna and e. al., "Unveiling embedded features in Wav2vec2 and HuBERT models for Speech Emotion Recognition," *Procedia Computer Science,* vol. 220, 2024.

[43] Y. Liu and e. al., "Speech Emotion Recognition with Co-Attention based Multi-level Acoustic Information," arXiv, 2022.

[44] M. Chen and e. al., "Combining wav2vec 2.0 Fine-Tuning and ConLearnNet for Speech Emotion Recognition," *Electronics,* vol. 13, no. 6, 2024.

[45] A. Jenkins, "Companies' Use of Psychometric Testing and the Changing Demand for Skills: A Review of the Literature," Centre for Economic Performance, London School of Economics, London, 2001.

[46] P. T. C. a. R. R. McCrae, Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual, Odessa, FL: Psychological Assessment Resources, 1992.

[47] Google, "Firebase for Flutter," [Online]. Available: https://firebase.google.com/docs/flutter?utm_source=chatgpt.com.

[48] C. Khawas and P. Shah, "Application of Firebase in Android App Development — A Study".

[49] OpenAI, "OpenAI API Documentation," 2025. [Online]. Available: https://openai.com/index/openai-api/?utm_source=chatgpt.com.

[50] OpenAI, "GPT-4 Technical Report," arXiv, 2023.

[51] A. M. M. P. N. Z. O. M. T. M. Hassan Shakil, "Evaluating Text Summaries Generated by Large Language Models Using OpenAI's GPT," 2024.

[52] J. J. L. G. D. Tanya Goyal, "News Summarization and Evaluation in the Era of GPT-3," 2022.

[53] A. Radford, J. Kim, T. Xu, G. Brockman, C. McLeavey and I. Sutskever, "Robust Speech Recognition via Large-Scale Weak Supervision," arXiv, 2022.

[54] G. Cloud, "Text-to-Speech Documentation," 2025. [Online]. Available: https://cloud.google.com/text-to-speech/docs/basics.

[55] G. Cloud, "Introducing Cloud Text-to-Speech powered by DeepMind WaveNet technology," March March 2018. [Online]. Available: https://cloud.google.com/blog/products/ai-machine-learning/introducing-cloud-text-to-speech-powered-by-deepmind-wavenet-technology?utm_source=chatgpt.com.

[56] [Online]. Available: https://www.hirevue.com/about.

[57] [Online]. Available: https://harver.com/about-us.

[58] [Online]. Available: https://www.ka.nz/ar.

[59] [Online]. Available: https://kabi.ai/ar/kabi.

[60] [Online]. Available: https://tamayaz.sa/tamayaz/Ar#hero.

[61] B. Shneiderman, C. Plaisant, M. Cohen, S. Jacobs, N. Elmqvist and N. Diakopoulos, Designing the User Interface: Strategies for Effective Human-Computer Interaction, Pearson , 2018.

[62] nawafith, "nawafith platform for HR cosulting," [Online]. Available: https://nawafith.sa.

[63] Workday, "Applicant tracking systems: Simplifying hiring," Workday, [Online]. Available: https://www.workday.com. [Accessed 6 9 2025].

[64] World Economic Forum, "The Future of Jobs Report 2023," World Economic Forum, Geneva, 2023.

[65] Government of Saudi Arabia, "Vision 2030 Kingdom of Saudi Arabia," April 2016. [Online]. Available: https://www.vision2030.gov.sa.

[66] PostgreSQL Global Development Group, "PostgreSQL Documentation," PostgreSQL Global Development Group, 2024. [Online]. Available: https://www.postgresql.org/docs.

[67] MongoDB Inc., "MongoDB Manual," MongoDB Inc., 2024. [Online]. Available: https://www.mongodb.com/docs/manual.

[68] M. B. a. O. K. Akçay, "Speech emotion recognition: Emotional models, databases, features, preprocessing methods, supporting modalities, and classifiers," *Speech Communication,* vol. 116, 2020.

10 Appendix

10.1 Appendix A (Interviews):

Since our application **Jadeer** has two types of users, we conduct interviews with both types to gather requirements more accurately. Let us begin with the first type of users, which are the **companies**. We interviewed employees and consultants in the field of **Human Resources**, and after introducing them to the idea of our application **Jadeer**, we asked them the following questions:

Companies Interview Questions:

1) Do you have prior experience using recruitment software or platforms? If yes, which tools have you used, and what did you like or dislike about them?
2) Could you describe your typical hiring process?
3) What are the most time-consuming tasks in your recruitment process?
4) Can you walk me through your current process for screening resumes? What tools or methods do you rely on, and what would you consider the main strengths and weaknesses of this approach?
5) What are the most common factors or reasons that lead to the rejection of applicants during the recruitment process?
6) What details of a candidate's CV are most important for you in the first review?
7) How do you usually structure your interviews — for example, what kinds of questions do you start with, and how do you move on from there?
8) How do you evaluate the importance of receiving detailed and objective assessment reports about applicants, and what aspects of such reports matter to you the most?
9) What feature would make a recruitment app valuable enough for you to use it regularly?

Interview (1)	
Interviewee: Participant 1	**Interviewer:** Walaa Saif Aleslam
Location/Medium: Online via Nawafith app	**Appointment Date:** 15 Sep 2025 **Start Time:** 12:00 PM

	End Time: 01:00 PM
Objectives: • Understand prior experience with recruitment software and user preferences. • Explore the typical hiring process followed by HR professionals. • Identify the most time-consuming tasks in recruitment. • Assess current resume screening methods, tools, and their strengths and weaknesses. • Understand common reasons for applicant rejection. • Determine which CV details are most important during initial review. • Explore how interviews are structured and conducted. • Evaluate the perceived importance of detailed and objective candidate assessment reports. • Identify features that make the recruitment platform valuable for regular use.	**Reminders:** The interviewee constantly emphasizes the importance of quality of application output.
Agenda:	**Approximate Time:**
Introduction:	12 min
Background in project:	15 min
Overview of interview:	4 min
Topic to be covered:	2 min
Permission to record:	1 min
Question 1:	3 min
Question 2:	5 min
Question 3:	4 min
Question 4:	2 min
Question 5:	2 min
Question 6:	2 min
Question 7:	1 min
Question 8:	2 min
Question 9:	2 min

Summary of major points: Questions from interviewee: Closing:	1 min 1 min 1 min
General Observations: The interviewee showed interest and curiosity about the project and advised focusing on measuring the personal side of the candidate.	
Topic not covered: Due to the lack of time and the interviewee's limited appointments, there was not enough time for me to ask him about the names of companies he would recommend me to meet with, because he advised me to focus on medium and small companies.	
Interviewee: Khalid Al-Kwelet	**Date:** 15 Sep 2025
Questions:	**Answers and Notes:**
Q1: Do you have prior experience using recruitment software or platforms? If yes, which tools have you used, and what did you like or dislike about them?	Yes, I have experience with recruitment programs, for example, LinkedIn. What I like about it is that it gives me the ability to post jobs for free, and it allows me to search for candidates based on their city of residence. It also suggests people suitable for the job. **Observations:** To persuade businesses to embrace **Jadeer**, we need to perform better than current applications.
Q2: Could you describe your typical hiring process?	First, we post the available position and explain the job description and employee responsibilities in detail. Then, we see which candidates meet the requirements. After that, we send them to the decision-maker. Then, an interview is organized with them, whether in person or online. The interview is attended by a committee consisting of the head of the department for the available position, a human resources employee, and an employee from a neutral department. After that, each applicant is evaluated by this committee. Finally, we offer the position to the appropriate person, and the appropriate salary is determined. **Observations:**

	The recruitment process is complex, long, time-consuming and labor-intensive.
Q3: What are the most time-consuming tasks in your recruitment process?	We suffer from all the stages of the hiring cycle that I mentioned previously, and they waste our time, from announcing the job until we hire the right person. **Observations:** There is a real need to automate the process.
Q4: Can you walk me through your current process for screening resumes? What tools or methods do you rely on, and what would you consider the main strengths and weaknesses of this approach?	I work in the private sector. We do not have a specific tool that we use to filter CVs, and we rely more on the manual filtering method. **Observations:** Human resources employees suffer from the filtering process, especially since it is done manually in the private sector, which causes a delay in selecting the right person.
Q5: What are the most common factors or reasons that lead to the rejection of applicants during the recruitment process?	The main reasons we reject job applicants can be summed up in three reasons: First, the skills may be overqualified or underqualified than required. Second, the salary may be higher or lower than the company's budget. Third, the personality, if it does not suit the work environment and system, will result in his rejection. **Observations:** We should focus on these things when suggesting jobs to people and also when training them for interviews.
Q6: What details of a candidate's CV are most important for you in the first review?	The most important detail in any CV is the applicant's suitability for the job. This varies from one job to another, but the most important thing is to ensure that he is able to carry out all the job responsibilities. **Observations:** The candidate should concentrate on emphasizing his abilities in a way that aligns with the job posting.

Q7: How do you usually structure your interviews — for example, what kinds of questions do you start with, and how do you move on from there?	Each role has its own questions that show us the person's skills in the field. **Observations:** The importance of asking appropriate questions in each interview according to the field
Q8: How do you evaluate the importance of receiving detailed and objective assessment reports about applicants, and what aspects of such reports matter to you the most?	From every job description, we get an assessment sheet, which becomes like a checklist. Every interviewer fills them out, and the final report is made up of them. **Observations:** The importance of arranging the final report in the form of a checklist
Q9: What feature would make a recruitment app valuable enough for you to use it regularly?	Focus on analyzing the applicant's personality, not just his skills. Also, the efficiency of the artificial intelligence in your application and its ability to select suitable candidates are the two most important points I can advise you on. **Observations:** Performance is what distinguishes us

Table 10: 10-1 Interview's Transcription for first Interviewee

Interview (2)	
Interviewee: Participant 2	**Interviewer:** Walaa Saif Aleslam
Location/Medium: Online via Nawafith app	**Appointment Date:** 15 Sep 2025 **Start Time:** 02:30 PM **End Time:** 03:25 PM
Objectives: • Understand prior experience with recruitment software and user preferences. • Explore the typical hiring process followed by HR professionals. • Identify the most time-consuming tasks in recruitment. • Assess current resume screening methods, tools, and their strengths and weaknesses.	**Reminders:** The importance of providing solutions to individuals that qualify them to obtain a job.

• Understand common reasons for applicant rejection. • Determine which CV details are most important during initial review. • Explore how interviews are structured and conducted. • Evaluate the perceived importance of detailed and objective candidate assessment reports. • Identify features that make the recruitment platform valuable for regular use.	
Agenda:	**Approximate Time:**
Introduction:	12 min
Background in project:	15 min
Overview of interview:	4 min
Topic to be covered:	2 min
Permission to record:	1 min
Question 1:	3 min
Question 2:	5 min
Question 3:	4 min
Question 4:	2 min
Question 5:	2 min
Question 6:	2 min
Question 7:	1 min
Question 8:	2 min
Question 9:	2 min
Summary of major points:	1 min
Questions from interviewee:	1 min
Closing:	1 min
General Observations: The interviewee believes that our company side is not new and that we need to be excellent at implementing it if we want to be truly helpful and attract corporations' attention. Despite their frustration with the drawn-out and difficult hiring process, I also observed that not all HR staff members are happy with the integration of AI into their jobs. This could be due to a lack of confidence in technology or a reluctance to let AI take their place.	
Topic not covered:	

I didn't have time to question him about why he wasn't amenable to AI doing job interviews.	
Interviewee: Mohammed Al-Zahrani	**Date:** 15 Sep 2025
Questions:	**Answers and Notes:**
Q1: Do you have prior experience using recruitment software or platforms? If yes, which tools have you used, and what did you like or dislike about them?	Yes, I use more than 150 recruitment platforms, the most prominent of which are Jadara, LinkedIn, and Job.com. Their advantages are that they all facilitate the process and save energy. **Observations:** HR professionals are already accustomed to recruitment platforms.
Q2: Could you describe your typical hiring process?	There is no specific process. Each company has its own method of hiring. **Observations:** The hiring process varies between companies.
Q3: What are the most time-consuming tasks in your recruitment process?	Recruiting candidates is the most difficult part of the process. **Observations:** A broad audience of job seekers must be built.
Q4: Can you walk me through your current process for screening resumes? What tools or methods do you rely on, and what would you consider the main strengths and weaknesses of this approach?	I use Jadara and ATS system to bring me the best candidates **Observations:** The importance of researching the systems currently used
Q5: What are the most common factors or reasons that lead to the rejection of applicants during the recruitment process?	The most frequent reason I turn away job applicants is that their personalities or methods don't fit the workplace. **Observations:** Focus on character analysis
Q6: What details of a candidate's CV are most important for you in the first review?	Experience, qualifications and skills **Observations:** How to build a CV

Q7: How do you usually structure your interviews — for example, what kinds of questions do you start with, and how do you move on from there?	In order to better grasp his or her personality, I first ask them to tell me about themselves. The remainder is dependent on the work and specialty. **Observations:** Againe, focus on character analysis
Q8: How do you evaluate the importance of receiving detailed and objective assessment reports about applicants, and what aspects of such reports matter to you the most?	The most important point in the report is measuring and analyzing the applicant's personality. We will know the rest during the trial period. **Observations:** Againe, focus on character analysis
Q9: What feature would make a recruitment app valuable enough for you to use it regularly?	Although I represent companies and HR staff for your app, I am very interested in your individual side and the features you offer them. **Observations:** Focus on the features of individuals.

Table 11: 10-2 Interview's Transcription for second Interviewee

Interview (3)	
Interviewee: Participant 3	**Interviewer:** Walaa Saif Aleslam
Location/Medium: Online via Nawafith app	**Appointment Date:** 15 Sep 2025 **Start Time:** 08:00 PM **End Time:** 09:00 PM
Objectives: • Understand prior experience with recruitment software and user preferences. • Explore the typical hiring process followed by HR professionals. • Identify the most time-consuming tasks in recruitment. • Assess current resume screening methods, tools, and their strengths and weaknesses. • Understand common reasons for applicant rejection.	**Reminders:** He very much welcomes the idea of automating the recruitment process and having artificial intelligence choose the most suitable candidates, but he is strict about the quality of the results.

• Determine which CV details are most important during initial review. • Explore how interviews are structured and conducted. • Evaluate the perceived importance of detailed and objective candidate assessment reports. • Identify features that make the recruitment platform valuable for regular use.	
Agenda:	**Approximate Time:**
Introduction:	12 min
Background in project:	15 min
Overview of interview:	4 min
Topic to be covered:	2 min
Permission to record:	1 min
Question 1:	3 min
Question 2:	5 min
Question 3:	4 min
Question 4:	2 min
Question 5:	2 min
Question 6:	2 min
Question 7:	1 min
Question 8:	2 min
Question 9:	2 min
Summary of major points:	1 min
Questions from interviewee:	1 min
Closing:	1 min
General Observations: The idea is not new to human resources employees, yet they believe there is still plenty of scope for work on it and developing applications to serve employees and facilitate the recruitment process.	
Topic not covered: There was not enough time to ask him about the most important sources of data collection.	
Interviewee: AbuBaker Balbid	**Date:** 15 Sep 2025
Questions:	**Answers and Notes:**

Q1: Do you have prior experience using recruitment software or platforms? If yes, which tools have you used, and what did you like or dislike about them?	I use LinkedIn, Monster and many others. The advantage of LinkedIn is that because people are keen on it, it is always up-to-date and provides their latest data and gives an impression of the person from a personal perspective other than the qualifications mentioned in the CV. **Observations:** The importance of getting an initial impression of individuals before hiring them for companies
Q2: Could you describe your typical hiring process?	The process begins with the recruitment plan approved by the administration according to the budget. After it is translated into job vacancies, the job is announced after writing an accurate description for it. Candidates are searched for according to the required specifications, either through the published post or through acquaintances to save time. Although the matter is not completely fair, it shortens the path. **Observations:** Letting AI choose job candidates could ensure fair hiring.
Q3: What are the most time-consuming tasks in your recruitment process?	The CV screening process takes time, so we often hire people we know who are qualified. **Observations:** Providing a way to select the right employee without having to filter the entire CVs helps HR staff.
Q4: Can you walk me through your current process for screening resumes? What tools or methods do you rely on, and what would you consider the main strengths and weaknesses of this approach?	I don't rely on the ATS system very often and typically filter manually because it doesn't always filter appropriately. For example, it instantly deletes a CV that isn't written in the required format without reading its contents, even though the applicant may be qualified. **Observations:** Providing a way to evaluate CVs without filtering is important.

Q5: What are the most common factors or reasons that lead to the rejection of applicants during the recruitment process?	Good question, the first reason is that he does not have sufficient experience and qualifications, and the second reason is his compatibility with the system in terms of values and personality. **Observations:** Understanding the reasons for rejection is the first step to addressing the problem.
Q6: What details of a candidate's CV are most important for you in the first review?	Ease of reading, organization, language accuracy and experience. **Observations:** Important details to improve CVs
Q7: How do you usually structure your interviews — for example, what kinds of questions do you start with, and how do you move on from there?	The applicant must prove to me that he is ready to contribute to the place and the system in which he is coming to work and that he is familiar with the details of the company and the job. My questions will be focused on understanding and extracting these points from the applicant. **Observations:** Ask the right questions
Q8: How do you evaluate the importance of receiving detailed and objective assessment reports about applicants, and what aspects of such reports matter to you the most?	Two important things: the degree of a person's self-confidence, whether from the tone of voice or body language, and secondly, his achievements and the way he talks about them. These reports are important, but the way they are written is more important. **Observations:** Provide organized and comprehensive reports.
Q9: What feature would make a recruitment app valuable enough for you to use it regularly?	Having strong candidates in the application and evaluation process ensures that I get the right employee. **Observations:** System efficiency

Table 12: 10-3 Interview's Transcription for third Interviewee

Then, we conducted interviews with the second type of users, who are **job seekers**, and we asked them the following questions:

Individuals Interview Questions:

1) How do you usually choose the jobs you apply for (job sites, connections, LinkedIn)?
2) Can you describe your biggest challenge when applying for jobs?
3) How do you usually prepare your CV, and what kind of help would you like to receive?
4) How do you usually prepare for interviews?
5) What features would you expect from mock interviews or interview practice tools, and if you tried them what improvements would you expect from them?
6) What type of feedback would be most useful for you after an interview?
7) What feature would make a recruitment app valuable enough for you to use it regularly?

Interview (4)	
Interviewee: Participant 4	**Interviewer:** Walaa Saif Aleslam
Location/Medium: Online via Zoom	**Appointment Date:** 16 Sep 2025 **Start Time:** 08:00 PM **End Time:** 08:35 PM
Objectives: • Understand how job seekers choose which jobs to apply for. • Identify the main challenges faced during job applications. • Explore users' CV preparation process and support needs. • Assess how users prepare for interviews. • Explore expectations for mock interview tools and possible improvements. • Determine the most useful feedback after interviews. • Identify features that make the app valuable for regular use.	**Reminders:** The interviewee relies on ChatGPT to prepare for interviews and improve her CV, and she suffers from companies not providing any feedback after applying for the job or interviews.

Agenda:	**Approximate Time:**
Introduction:	3 min
Background in project:	3 min
Overview of interview:	1 min
Topic to be covered:	2 min
Permission to record:	1 min
Question 1:	2 min
Question 2:	5 min
Question 3:	3 min
Question 4:	3 min
Question 5:	5 min
Question 6:	2 min
Question 7:	2 min
Summary of major points:	1 min
Questions from interviewee:	1 min
Closing:	1 min

General Observations:

Job seekers rely heavily on artificial intelligence, specifically ChatGPT, to prepare for interviews and create resumes.

Topic not covered:

Due to time constraints, the interviewee did not give me any tips or additional features that she would like to see in the application.

Interviewee: Nourah Al-Manee	**Date:** 16 Sep 2025
Questions:	**Answers and Notes:**
Q1: How do you usually choose the jobs you apply for (job sites, connections, LinkedIn)?	I usually search for jobs on graduate development websites and from my acquaintances and friends. **Observations:** She doesn't use LinkedIn much or other popular sites.
Q2: Can you describe your biggest challenge when applying for jobs?	The most challenging and difficult thing I face is that companies do not give me any feedback after applying for jobs, and this makes me confused. **Observations:**

	The importance of providing feedback in **Jadeer** app for interviewee
Q3: How do you usually prepare your CV, and what kind of help would you like to receive?	Depending on the role I applied for, I conduct research on the most important skills that the candidate should have, then I focus on them in my CV. **Observations:** She has the intelligence to prepare the CV to catch the company's attention.
Q4: How do you usually prepare for interviews?	I use ChatGPT to conduct a mock interview for me and get a thorough understanding of the questions that could be asked during the interview. **Observations:** Convincing users to use AI in mock interviews can be easy.
Q5: What features would you expect from mock interviews or interview practice tools, and if you tried them what improvements would you expect from them?	It should be able to answer questions quickly and teach you how to present yourself in a good way. It also should focus more on the role and give you an honest report, not just praise me. **Observations:** Job seekers are already familiar with mock interviews
Q6: What type of feedback would be most useful for you after an interview?	Of course, the honest feedback that really taught me what I need to improve on. **Observations:** Accurate and clear results are the most important thing.
Q7: What feature would make a recruitment app valuable enough for you to use it regularly?	It is important that the opportunities offered are real and that I receive feedback after applying. **Observations:** Business identity verification is important.

Table 13: 10-4 Interview's Transcription for fourth Interviewee

Interview (5)	
Interviewee: Participant 5	**Interviewer:** Walaa Saif Aleslam

Location/Medium: Online via Zoom	**Appointment Date:** 16 Sep 2025 **Start Time:** 05:25 PM **End Time:** 06:00 PM
Objectives: • Understand how job seekers choose which jobs to apply for. • Identify the main challenges faced during job applications. • Explore users' CV preparation process and support needs. • Assess how users prepare for interviews. • Explore expectations for mock interview tools and possible improvements. • Determine the most useful feedback after interviews. • Identify features that make the app valuable for regular use.	**Reminders:** The interviewee uses many websites to apply and search for jobs and suffers from companies not providing any feedback after applying for the job or interviews.
Agenda:	**Approximate Time:**
Introduction:	3 min
Background in project:	3 min
Overview of interview:	1 min
Topic to be covered:	2 min
Permission to record:	1 min
Question 1:	2 min
Question 2:	5 min
Question 3:	3 min
Question 4:	3 min
Question 5:	5 min
Question 6:	2 min
Question 7:	2 min
Summary of major points:	1 min
Questions from interviewee:	1 min
Closing:	1 min
General Observations:	

Job seekers have had many unsuccessful experiences in searching for jobs and also in creating CVs and they believe that most job advertisements are misleading.	
Topic not covered: Due to time constraints, the interviewee did not give me any tips or additional features that she would like to see in the application.	
Interviewee: Lubabah Al-Zawadi	**Date:** 16 Sep 2025
Questions:	**Answers and Notes:**
Q1: How do you usually choose the jobs you apply for (job sites, connections, LinkedIn)?	I search for opportunities through a site called NAKURI, LinkedIn, and also a freelancing site. I also hear about opportunities through people by attending events related to my field. I also go to companies and ask them. **Observations:** Providing a single platform that brings together all opportunities will greatly help job seekers and save them effort.
Q2: Can you describe your biggest challenge when applying for jobs?	The most challenging and difficult thing I face is that companies do not give me any feedback after applying for jobs, and this makes me confused. **Observations:** The importance of providing feedback in **Jadeer** app for interviewee
Q3: How do you usually prepare your CV, and what kind of help would you like to receive?	I usually present it the same, without changing it, because I apply for jobs without a specific job title. **Observations:** Job seeker struggling with CV creation and preparation
Q4: How do you usually prepare for interviews?	I focus on the skills that I told them I know because they will definitely ask me about them, so I practice the way I answer on myself. **Observations:** Providing a way to practice for the interview is very good.

Q5: What features would you expect from mock interviews or interview practice tools, and if you tried them what improvements would you expect from them?	I haven't tried it, but I expect it to be a virtual environment with a complete simulation that makes me feel the atmosphere and live the full experience and the same pressure, and at the same time it might be helpful. **Observations:** Job seekers are already familiar with mock interviews
Q6: What type of feedback would be most useful for you after an interview?	I want it to give me feedback about my self-confidence, the tone of my voice, did I answer correctly? And can I be accepted? **Observations:** Accurate and clear results are the most important thing.
Q7: What feature would make a recruitment app valuable enough for you to use it regularly?	The CV improvement alone is enough to make me use it. **Observations:** Job seeker struggling with CV creation and preparation

Table 14: 10-5 Interview's Transcription for fifth Interviewee

10.2 Appendix B (Questionnaires):

Also, for the survey, we collected information from the two types of **Jadeer** users. Here are the questions we presented in the **company survey**, which was directed to Human Resources employees:

Link: Companies Survey Sheet

Companies Questionnaire Questions:

1) What is your name?
2) What is your organization's name?
3) What type of sector does your organization belong to?
4) On average, how many applicants do you receive per job posting?
5) Which stage of the hiring process takes the most time in your company?

6) Do you currently use any digital tools or platforms to assist in hiring? If yes, which tool do you use and for what purpose?
7) How much would you trust an AI system to conduct initial job interviews on behalf of your company?
8) What concerns would you have about AI-generated interview questions?
9) If the platform generated analytical reports after AI-assisted interviews (strengths, weaknesses, suitability score), how useful would that be for you?
10) What information would you find most useful in a candidate performance report?
11) Would you use this report as a final decision-making tool or just as an assistant?
12) Do you have any suggestions or ideas that could improve **Jadeer** app?
13) If you are interested in trying **Jadeer** app in the future, please leave your email so we can stay in touch.

As for the job seeker, here are the questions we presented to them in the survey:

Link: Job seeker Survey Sheet

Job seeker Questionnaire Questions:

1) What is your age group?
2) What is your gender?
3) What is your current employment status?
4) How often do you rely on applying for jobs online?
5) Which platforms do you use most when applying for jobs?
6) What are the biggest challenges you face when applying for jobs?
7) Do you usually customize your CV for each job application?
8) How important is it for you to receive AI-generated feedback on your CV?
9) What type of CV enhancement do you value most?
10) How do you usually prepare for job interviews?
11) How do you feel about having a mock interview with AI before the actual one?
12) When would you prefer to use an AI mock interview?
13) How comfortable are you with the idea of AI evaluating your interview answers based on content and voice?

14) What concerns do you have about AI-based interview evaluation?
15) What type of feedback would be most helpful for you after an interview simulation?
16) Do you have any suggestions or ideas that could improve **Jadeer** app?

10.3 Appendix C (Important links):

- Git-Hup link: GitHub Link
- Jira link: Jira Link

10.4 Appendix D (UAT):

Link: Companies UAT Survey Sheet

Companies Questionnaire Questions:

1) I needed previous experience to use the app.
2) I found the application easy to use.
3) I found the navigation between pages smooth and clear.
4) I found the color palette and visual design comfortable.
5) I found the interface design clear and intuitive.
6) Some icons or labels were unclear to me.
7) The app responded quickly and did not lag.
8) Pages and features loaded without noticeable delays.
9) I was able to create a job post correctly, easily, and clearly.
10) I found the AI-generated job descriptions useful and relevant.
11) The AI-generated interview questions were relevant to the job post.
12) The difficulty level and clarity of the questions were appropriate.
13) I was able to view, edit, or add to the AI-generated questions easily.
14) I was able to edit my profile correctly, easily, and clearly.
15) I was able to reset my password without any difficulty.
16) The pop-up messages I got from the app were helpful and clear.
17) I think I will use this application frequently.
18) I will recommend this application to others.

Link: Job seeker UAT Survey Sheet

Job seeker Questionnaire Questions:

1) I needed previous experience to use the app.
2) I found the application easy to use.
3) I found the navigation between pages smooth and clear.
4) I found the color palette and visual design comfortable.
5) I found the interface design clear and intuitive.
6) Some icons or labels were unclear to me.
7) The app responded quickly and did not lag.
8) Pages and features loaded without noticeable delays.
9) I was able to upload my CV to my profile correctly, easily, and clearly.
10) I found the AI CV enhancement helpful and easy to understand.
11) The AI suggestions I received after enhancing my CV were clear, relevant, and helpful.
12) The system correctly identified missing or incomplete information in my CV and helped me understand what to add.
13) I liked having the option to choose jobs so the AI could tailor the CV enhancement toward those roles.
14) The enhanced CV I received (PDF) was clear, well-formatted, and improved compared to my original one.
15) I was able to browse and search for job posts easily and clearly.
16) The job recommendations I received based on my CV were relevant and useful.
17) I was able to save or favorite job posts correctly and easily.
18) I was able to find my previous CV enhancements on the History page easily.
19) I was able to edit my profile correctly, easily, and clearly.
20) I was able to reset my password without any difficulty.
21) The pop-up messages I got from the app were helpful and clear.
22) I think I will use this application frequently.
23) I will recommend this application to others.