

ONLINE JOB APPLICATION WITH JOB RECOMMENDATIONS

By

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ABSTRACT

This project is an Online Job Application with Job Recommendation project for academic purposes. This is a development-based project, and the area of study is Information System. This project is a platform to help job seekers find a suitable and satisfied job. Besides that, this project also allows recruiters to post their recruitment inside the application. On the other hand, if those job seekers have prepared their own CV, they can upload it into the application at the profile, and the system will save the original CV in the account. Besides, the system will extract that important information from the CV and store it in the user database. Therefore, the application also provides a job-matching feature. The system will automatically match the job with the job seeker's technical and non-technical skills. After the system has done the matching, it will recommend some related and satisfied jobs to the user and let them choose. When the job seeker applied for the job, the recruiter was allowed to see the job seeker's resume and their personal information. The recruiter needs to respond to the user by either making an appointment for an interview or rejecting the user request. On the other hand, if the job recruiter instantly needs some workers, there is a feature to view the potential user which are not applying to the job, recruiter can provide offer to those potential users, then make an interview with them, a notification will be sent to the user to inform the user about the job offered. The hardware that will be used in this development is an Acer brand laptop, and the software will be Visual Studio 2022 (C# UWP Framework), Firebase as the database to store the unstructured data (pdf file, profile images) and Microsoft SQL Server Management (MSSQL) to store the structured data (user data, job detail data, etc.).

Area of Study (Minimum 1 and Maximum 2): Information System

Keywords (Minimum 5 and Maximum 10): Job Recommendation System, Skill-based Job Matching, User-friendly Application, Windows Application, Hiring System, Skill Extraction

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LIST OF ABBREVIATIONS

<i>API</i>	Application Programming Interface
<i>CV</i>	Curriculum Vitae
<i>IT</i>	Information Technology
<i>MSSQL</i>	Microsoft SQL Server
<i>OCR</i>	Optical Character Recognition
<i>PDF</i>	Portable Document Format
<i>UWP</i>	Universal Windows Platform

CHAPTER 1

Introduction

The topic is Online Job Application with Job Recommendation. Online Job Application is an online platform that can let recruiters or company human resources department staff recruit. Besides that, this application can help those who are finding a job, such as unemployed workers, fresh graduates, and interns. With this Online Job Application people who are looking for jobs might be easier to get a job. On the other hand, it can also be easier for the company to recruit new employees by using the application. Therefore, the additional feature, which is Job Recommendation will make the application more efficient for the user who is finding a job. Some of the examples of Online Job Application are JobStreet [1], Indeed [2], LinkedIn [3], and so on.

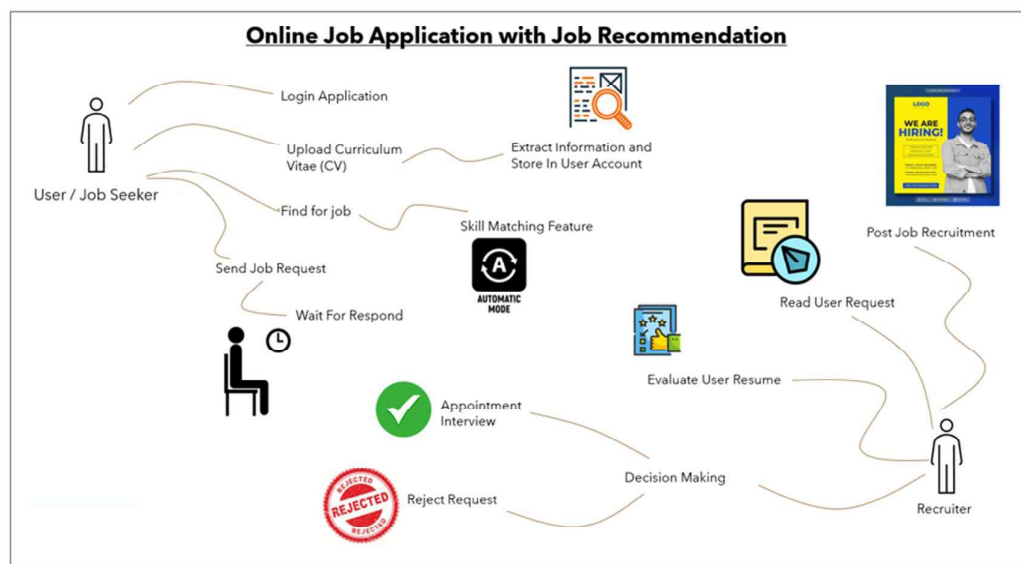


Figure 1.1 Block Diagram

1.1 Problem Statement

The first problem is the existing system **does not support information extraction from CVs**. Nowadays, the number of people who are seeking a job is increasing, and when they are seeking a job, they need to send their Curriculum Vitae (CV) to the company by uploading it to the Online Job Application to find a job. Besides that, the CV should include a lot of information, such as education qualifications, working experience, skills, and abilities. Therefore, recruiters need to go through the whole CV to understand the job seeker's qualifications. The CV will not only include important information, but they might also include some less important information in their CV. So, it might happen that some of the recruiters will spend a few minutes reading the CV patiently, and some of them will just read it for a few seconds and reject the CV sent by the job seeker. In this problem, the recruiter might overlook some important or valuable information mentioned in the job seeker's CV.

On the other hand, the existing system **lacks resume scoring for job seekers**. This is because the system cannot recognize which information in the job seeker's CV is important. The reason is job seekers will include a lot of information in their CV, so after extracting the information, there is still a lot of not related information. But the system is not able to detect which skills and abilities are most preferred by the job seeker. So that, the system will randomly match the available skills and abilities with the job requirements of the job offer by each company. For example, if a job seeker had five skills and five abilities, it would be hard for the system to find a job that matched all of the job seeker's skills and abilities. Therefore, the system will simply choose and suggest the jobs available to the job seeker. In this problem, the system might not be able to provide the job seeker with the best and most satisfied job.

1.2 Motivation

The motivation is to develop a better online job application specifically designed for Information Technology (IT) field job seekers and recruiters to use. This is because the current online job application lacks a few important features. By developing this online job application, IT job seekers can easily find a job, and at the same time, IT recruiters are also able to find some qualified employees from this online job application. After developing this online job application, it may help recruiter on automatically filtering and ranking incoming job seekers based on how well the skills match the job requirements' skills. This reduces the need for manual screening and allows recruiters to quickly identify the most qualified candidates, saving time and improving hiring accuracy. Besides that, it may help job seekers automatically match their resumes to job postings based on relevant technical skills. By extracting IT related skills from their resumes and comparing them to the required skills using the Weighted Scoring Technique, which will calculate the matching score for each job matching, this can increase their chance of getting shortlisted.

1.3 Project Objectives

1.3.1 Enhance Automated Skill Extraction Features

The first project objective is to enhance automated skill extraction features. This is because job seekers will upload their CV into the application and use it to apply for jobs. So, when the job seeker uploads their CV into the application, the application will start to perform automated skill extraction from the CV. This feature can utilize text processing techniques to extract skills. After the automated skill extraction has been done, it will show the skills extracted from the CV to the job seeker. Besides that, those skills extracted from the CV will be used to match and recommend the relevant job to the job seekers. With this enhancement, recruiter able to see the job seeker's skills while the job seeker applied to the job or in the find potential job seeker page.

1.3.2 Enhance Job Matching and Job Recommendations Features

The second project objective is to enhance job matching and job recommendations features. An online job application with accurate job matching and job recommendations based on job seeker's skills can improve the user experience. Therefore, with the job matching and job recommendation features, job seekers can find a job that is totally matched to their abilities. With the job matching and job recommendation features, job seekers can avoid those not suitable jobs. On the other hand, for the recruiter, with the job matching score, they can trust the list of qualified applicants provided by this proposed online job application. This may help recruiters not miss out on those qualified applicants.

1.4 Project Scope and Direction

The project's scope is to create an online job application with job recommendations for the public to use. This online job application will include a job seeker module and a recruiter module. Both modules have different roles in this online job application. The job seekers module is a module to let users search and apply for jobs. But for the recruiter module, recruiters can post their recruitment on the online job application. Skill extraction, weighted scoring, and resume scoring will be involved in both modules.

Module 1: Job Seeker Module

To develop a Job Seeker Module is to let users access the proposed system. With this module, users can create an account and upload their resume. Besides that, users were also allowed to perform a few of the actions. For example, users can search and filter the job by company name, position name, location, etc. Furthermore, users can apply the satisfaction job by clicking a few buttons. At the end, users can follow up on their application's progress.

Module 2: Recruiter Module

To develop a Recruiter module, recruiters must be able to access the proposed system and post their recruitments. Besides that, recruiters can set the weighted score based on the technical or soft skills required by the job position. Other than that, recruiters can view the list of applicants that are qualified for the job position and send an invitation to them. Furthermore, recruiters can view the list of applicants that apply to the job position, and they can reject or proceed with the job seeker's application. At the end, they will update the status of the job seekers.

1.5 Contributions

The proposed web application enhances the job matching, job recommendation and recruitment process by providing an efficient platform for job seeker to find jobs and for recruiters to identify qualified candidates. The key contributions of this application are as follows:

1. **Information Extraction from Resumes Using PDF-to-Text Conversion and Skill Matching Technique**

There is a challenge for the recruiter to manually extract the important information from the job seekers' resumes. To address this, the proposed application implements PDF to Text Conversion using Syncfusion, followed by a skill extraction process using Skill Matching Technique based on the existing skill dataset. This automated information and skill extraction process able to reduce the recruiters' workload of manually reading resumes and provide a clear overview of a job seekers' skills and abilities.

2. **Resume Scoring Using Weighted Scoring Technique**

Another problem is lacking an effective resume scoring mechanism. To solve this problem, this application developed with the Weighted Scoring Technique. Weighted Scoring Technique is used to assign the score to each skill. Besides that, with Weighted Scoring Technique, it can calculate the total matching score between the job seeker's skills and required skills mentioned by the recruiter. With this Weighted Scoring Technique, when job seekers find a job, they can see how their skills match with the job, and at the same time for the recruiter, they can view which job seeker has the highest matching score with the required skills mentioned.

1.6 Report Organization

This report contains five chapters. In Chapter 1, it is to describe the Project Background which includes the problem statement, motivation, project objectives, project scope, and contributions. The research and literature review are presented in Chapter 2, which includes the strengths and weaknesses of all the existing systems. Chapter 3 defines the proposed method and approach, for example, the hardware and software that will be used in the whole proposed system. Besides that, Chapter 3 will also mention all the calculations that will be used in the proposed system. Next, the preliminary work will be presented in Chapter 4, which describes the preliminary work that has been carried out and demonstrates that the project is well-planned. After that, Chapter 5 is about system implementation which shows the user interface in the proposed system and describes how each page works. Chapter 6 focuses on system evaluation and discussion. Which in Chapter 6 will perform the black box testing for the functions in the proposed solution. Besides that, in Chapter 6 it explains about the project challenges and objectives evaluation. Lastly, Chapter 7 is the conclusion for this project, summarizes the key findings and outcomes of the project and recommendations for the future improvements.

CHAPTER 2

Literature Reviews

2.1 System Reviews

2.1.1 JobStreet by SEEK



Figure 2.1.1.1 JobStreet by SEEK Logo

JobStreet by SEEK is an online job application established in Malaysia in 1997 [4]. This online job application is developed on both a website and a mobile application. This application provides a service for job seekers to apply for jobs, and at the same time, it also provides a service for recruiters to recruit qualified applicants.

STRENGTH

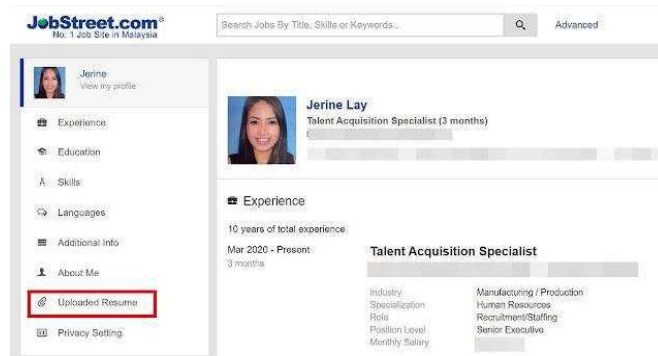


Figure 2.1.1.2 Upload Resume Interface

The strength of JobStreet is that it provides the **feature of uploading resumes** for job seekers [5]. The function of uploading a resume is very useful for a job seeker; they can provide all important information by uploading a resume. If the information in the resume is clear, they are more likely to get a job interview. The second strength is that job seekers can **check the company profiles** before they send a request for a job or an interview [6]. By using this feature, job seekers can filter out the company based on ratings and reviews. The last strength for the application is **to search for jobs by**

specialization [7]. This feature will gather all the live job postings on JobStreet. When the user inserts the specialization or location, it will display a list of jobs matched with the specialization or location inserted by the job seeker.

WEAKNESS

The weakness of JobStreet is that it **does not provide the feature of information extraction from resumes**. Without this feature, JobStreet can only provide the whole list of job categories for users to choose from. This might cause the system to be inefficient because users need to analyze job by job to find the most suitable job. The second weakness is **not well managing the status of job applied**. When job seekers apply for the job, the progress might be just mentioned as 'Viewed by employer', but the time of waiting for the updated progress, either 'Success to proceed' or 'Your application has been rejected', might take a long time and up to infinity. The job seekers do not know what the status of the application is.

PROPOSED IMPROVEMENT

The proposed improvement to overcome the weakness of does not provide the feature of information extraction from resumes is to implement the technology of **converting the PDF document into text**, then based on the technical skills and soft skills dataset to **extract the skills from the resume** and store into the database. Besides that, for the weakness of not well managing the status of job applied, the proposed improvement is to **implement a progress bar with label** to show the job seeker what is the status of the job application.

2.1.2 Indeed



Figure 2.1.2.1 Indeed Application Logo

Indeed, an online job application is the top-ranked job site in the world, as of September 2021, with over 350 million visitors every month [8]. Besides that, Indeed will focus on those job seekers, and the system will provide those job seekers with free access to search for jobs, upload their resumes, and search for the company and job position.

STRENGTH

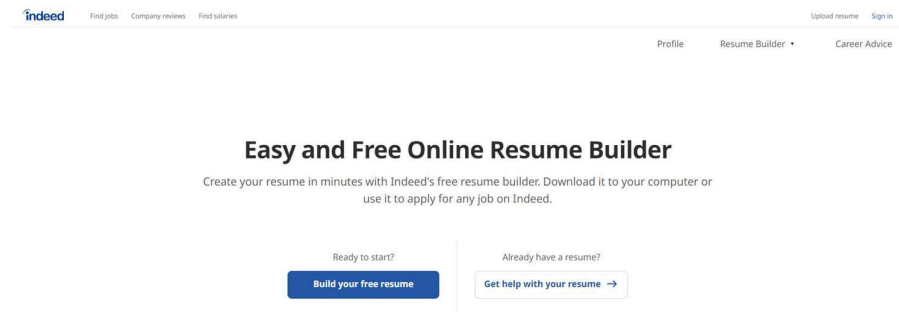


Figure 2.1.2.2 Indeed Resume Generator

The strength of Indeed is that it **provides a resume generator** [9]. Job seekers just need to follow the steps and fill in all the required fields, and then the resume will be created successfully. The second feature of the Indeed online job application is they have **push notifications**. The push notification can be a reminder or promotional [10]. For the Indeed application, a push notification will be sent to job seekers once a new related job has been posted. Besides, the push notification will remind job seekers to complete viewing the information from their last incomplete job application visit. The third feature of Indeed is that it will **provide more detail on each job posting** [11]. When a job seeker has selected a job, it will expand it and show more information about the job scope and the company.

WEAKNESS

The weakness of Indeed online job applications is that there is **no way for recruiters to search for applicants**. Therefore, the recruiters are not able to find the job seekers

who are the most qualified. Besides that, Indeed online job applications **do not have the feature of extracting important skills from the resume**. This will cause the recruiter to overlook the resume because the information is not clearly stated and irrelevant information is included in the resume, which causes the recruiter to get the wrong information from their resume.

PROPOSED IMPROVEMENT

The weakness of does not providing recruiters to search for applicants is to implement the view potential user based on the matching score between the job seeker's skills and job required skills. In this case, the matching score is **calculated by Weighted Scoring Technique** with the skills and skills' weightage assigned by the recruiter. Besides that, the weakness of does not able to perform feature extraction has the proposed improvement with implement the technology of **converting the PDF document into text**, then based on the technical skills and soft skills dataset to **extract the skills from the resume** and store into the database.

2.1.3 LinkedIn



Figure 2.1.3.1 LinkedIn Company Logo

LinkedIn is a social network for the business community. It was founded in 2002. LinkedIn is an online job application that helps job seekers and recruiters achieve their goals. There are a few main features of the LinkedIn application: keeping in touch, which means people can often change jobs and find a new opportunity; searching for jobs; and hiring new employees. These features will be beneficial for both job seekers and recruiters [12].

STRENGTH

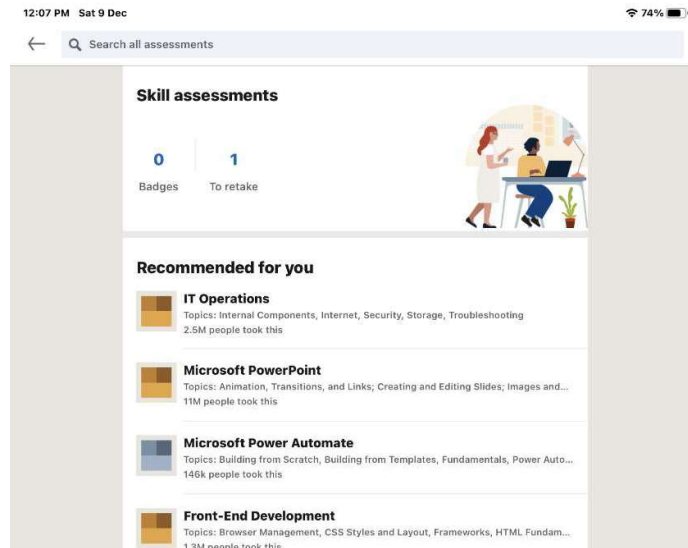


Figure 2.1.3.2 Skill Analysis Interface


The strength of the LinkedIn application is that it has a feature of **skill analysis** [19]. This feature is a test for the job seeker to evaluate their skills and abilities. Besides that, the recruiter can understand the skills and abilities that the job seeker has. It can help recruiters more easily filter out qualified applicants. The second strength of a LinkedIn application is **higher employment opportunities**. The LinkedIn application provides users with access to job opportunities all around the world. For those students who studied overseas, they can enter their field to find suitable jobs. Besides, the companies will regularly update their profiles to find new talent [13].

WEAKNESS

12:02 PM Sat 9 Dec 74%

Apply to DoubleTree by Hilton

Contact info

 **JIN XING GOH**
Universiti Tunku Abdul Rahman (UTAR) 学生
Temerloh District, Pahang, Malaysia

Email*
johnny0622@tutar.my

Phone country code*
Malaysia (+60)

Phone*
0/20

Resume
Be sure to include an updated resume

Upload resume

DOC, DOCX, PDF (5MB)

☒ Follow DoubleTree by Hilton to stay up to date with their page

Figure 2.1.3.3 Interface of Upload Resume in Each Job Apply

The weakness that can be found in the LinkedIn online job application is that this application is **not able to let job seekers upload their resume and store it in their profile**. This application only allows users to upload their resumes when they want to apply for jobs. This will cause the application to become inefficient. Besides that, this application **does not have the feature of extracting information from a resume**. It will still upload the whole resume and send it to the company. Therefore, the chance for job seekers to successfully get a job will decrease. On the other hand, this application **does not have the feature of skill matching** for the job with the user's qualifications. Job seekers need to search for their jobs themselves by using the searching feature.

PROPOSED IMPROVEMENT

The weakness of does not able job seeker to upload resume and store in the system. The proposed improvement to overcome the weakness is to implement the **upload resume feature in the application and will store it in the firebase storage** for the job seeker. Besides that, the weakness of does not able to perform feature extraction has the proposed improvement with implementing the technology of **converting the PDF document into text**, then based on the technical skills and soft skills dataset to **extract the skills from the resume** and store into the database.

2.2 Limitation of Previous Studies

	JobStreet by SEEK	Indeed	LinkedIn	Proposed System
Able to upload resume and store in profile	Yes	Yes	No	Yes
Skill Analysis	No	No	Yes	Yes
Resume Generator	Yes	Yes	No	Yes
Feature of Information Extraction from resume	No	No	No	Yes
Accuracy of Matching Job	Low	Low	None	High
Able to view company detail	Yes	Yes	No	Yes
Calculate resume scoring	No	No	No	Yes

Table 2.2 Comparison between Existing System and Proposed System

The limitation of the previous study was that the application had a lot of weaknesses. The first weakness or limitation is that the system might not provide the feature of information extraction from the resume uploaded by job seekers. This limitation might cause the recruiter to need to spend more time reading the job seeker's resume. This limitation will also make it easy for job seekers to get rejected by the company because they are not able to extract the important information listed in their resume.

The second limitation from the previous study is that some of the applications do not have the feature of matching the important information of the job seeker with the job scope or requirement listed. This will cause the job seeker to be matched to a

job that is not their best preference. It will cause the job seeker to not be satisfied with the job assignment.

Besides that, some of the applications are not providing the resume generator. If the application has a resume generator, job seekers can just enter their details into the generator, and with a few clicks, the resume will be generated for them. This is convenient for the job seekers.

Lastly, all the existing systems do not provide the feature of calculating resume scoring. Without this feature, recruiters cannot view the applicants by their rank of scoring. Therefore, recruiters need to investigate each resume to find the best applicant. Compared to the proposed system, it provides the features of calculating resume scoring, which, for those job seekers whose skills and abilities match the job requirements, will be shown in the top ranking. Thus, it helps recruiters filter out qualified applicants.

2.3 Proposed Solutions

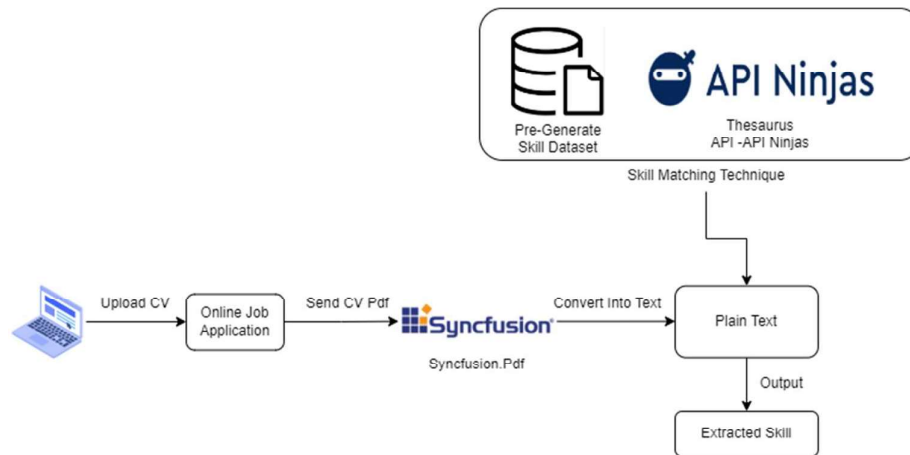


Figure 2.3.1 Diagram of PDF to Text Conversion and Skill Matching Technique

Due to the problem stated in the problem statement, current systems do not support information extraction from CVs. To solve this problem, the solution is to apply information extraction techniques to unstructured data found in CV. First, **convert the PDF into text by applying Syncfusion.Pdf API [14]**. After converting the PDF into text, **using Skill Matching technique [20]** with the pre-generated dataset file as a directory to match the same skills that appear in the CV. But if the CV does not have the same word in the dataset, there is another technique to overcome this problem, which is **word synonyms technique** using Thesaurus API -API Ninjas [15] and **word relationship technique [18]**. This can prevent job seekers from getting a zero score because the computer cannot detect the skill or ability they have.

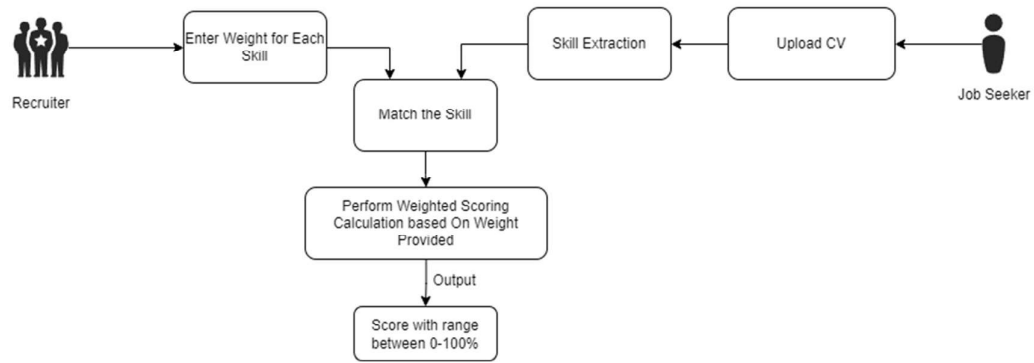


Figure 2.3.2 Diagram of Weighted Scoring Technique

Another problem stated in the problem statement is a lack of resume scoring for job openings. To solve this problem, the solution is to apply **Weighted Scoring Technique** based on different categories of skill for job scoring and recommendation. For this solution, the system will ask the recruiter to fill in the weight based on the category of skill. Then, the system will be able to extract the skill from the previous solution and provide the scoring for each category. After all the scoring has been provided, it will multiply the scoring with the category weight, and the final output will be between 0 and 1 (0% and 100%). From this result, recruiters can clearly decide who the best applicants are that they want to recruit. With resume scoring, it can increase the chance of getting a job for those job seekers who are experts in the skills.

CHAPTER 3

Proposed Method/Approach

The project's goals include giving job seekers a convenient way to find a suitable job related to their skill and recruiters can more easily filter out the job seeker based on their skills by using the system. The features listed in my proposed system were the ability to perform skill extraction from the resume, make apply for job, search and filter functions, and generate offer letters for job seekers. After the project work, the way of recruiters recruiting new workers might be easier and job seekers have more opportunities to find the job match with their preferences.

3.1 Methodology



Figure 3.1.1 Agile Development Lifecycle

This project is a development-based project. The methodology that I used for this project was agile development. The Agile Development Lifecycle is a continuous process that emphasizes collaboration, flexibility and continuous improvement. By breaking the project down into different modules and more manageable sprints, so that it can focus on delivering high-quality features. Besides that, if any feedback or requirements changes, using Agile Development Lifecycle can more easily be handled. Next, it is also a frequent delivery software over the period of weeks to months. A sprint is a brief, repeatable and segmented project period using the Agile Development approach. Each sprint should provide a prototype, draught, or usable version of the ultimate product. Furthermore, the reason for choosing Agile Development Lifecycle

is because it can reduce the risk along the period of development of the project. Agile Development Lifecycle provides the opportunity for feedback and validation. Therefore, if any issue is possible to identify during early stage in development process, which can help to avoid costly mistake or delays of the project. Hence, Agile Development Lifecycle emphasizes continuous improvement, which developers able to improve the product quality iteratively. The development team can continuously improve the product quality by getting feedback from others. Project management using agile methodology is approached gradually, with each process cycle leading to improvements. High-quality solutions have been developed due to ongoing attention to quality assurance and improvement.

3.2 System Design Diagram/Equation

3.2.1 Formula of Weighted Scoring

Criteria	Weight	Product idea 1		Product idea 2		Product idea 3		Product idea 4	
		Score	Weighted score	Score	Weighted score	Score	Weighted score	Score	Weighted score
Idea feasibility	20%	8	1.6	7	1.4	9	1.8	6	1.2
Market demand	40%	6	2.4	9	3.6	7	2.8	8	3.2
Competitive advantage	30%	7	2.1	8	2.4	6	1.8	9	2.7
Total weighted score		6.1		7.4		6.4		7.1	

Figure 3.2.1 Example of Weighted Scoring

The figure above is a sample of the Weighted Scoring table [16]. In the proposed system, it will replace the criteria with the skills needed for the job. The recruiter will mention the criteria that are needed for the job position. For example, ‘Technical Skill’, ‘Gender’, ‘Age’, ‘Soft Skill’. After that, the recruiter needs to provide the weight for each criterion they have filled out. Then, from the information extraction and skill matching, it will calculate the score for each criterion mentioned by the recruiter. After the score calculation, it will proceed to calculate the Weighted Score, the formula stated below:

$$\text{Weighted Score} = \sum_{i=1}^n (S_i \times W_i)$$

$$\text{Total Weighted Score} = \text{Weighted Score} / n$$

where

n = number of criteria

S = score of the criteria

W = weight of the criteria

3.2.2 Use Case Diagram

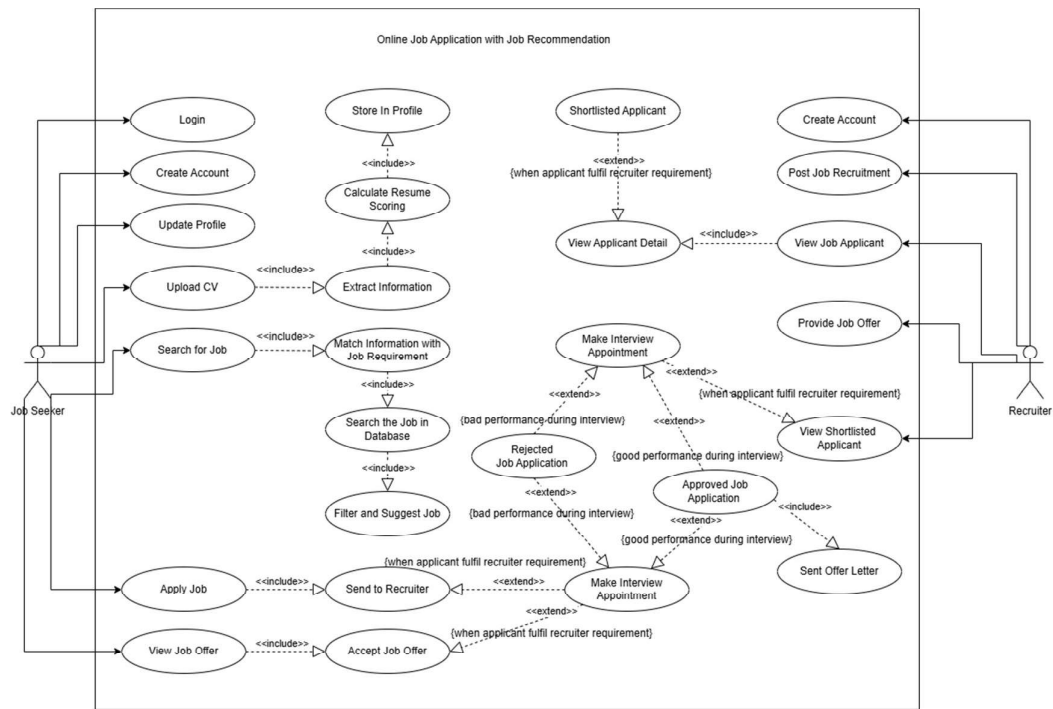


Figure 3.2.2 Use Case Diagram

3.2.3 Activity Diagram

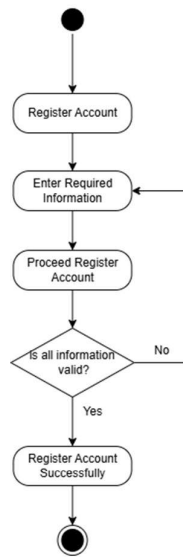


Figure 3.2.3.1 Register Account Activity Diagram

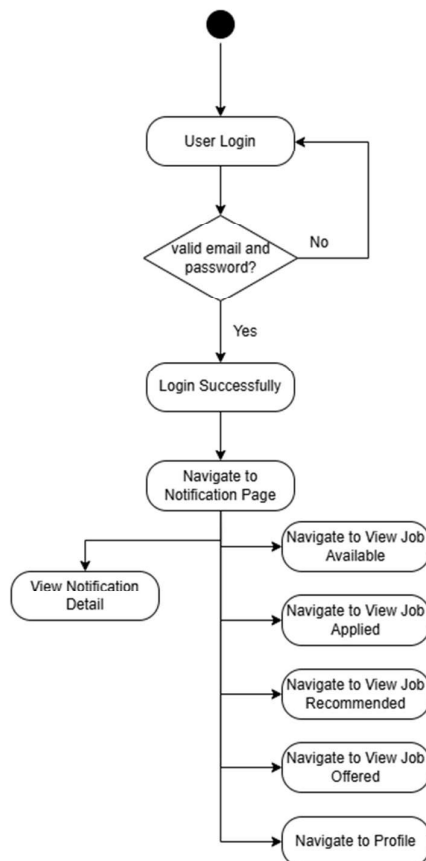


Figure 3.2.3.2 Login and Notification Activity Diagram

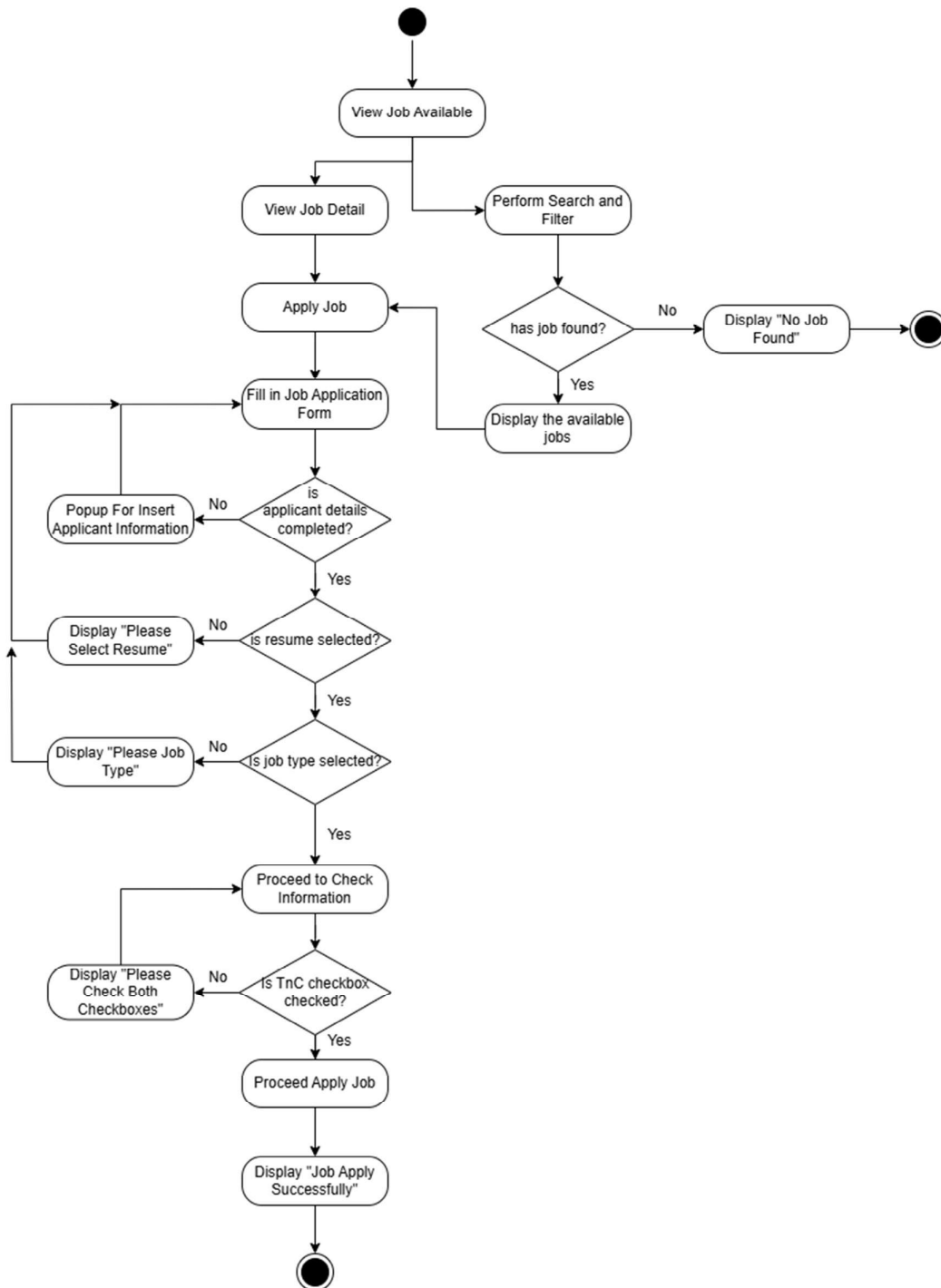


Figure 3.2.3.3 View Job Available Activity Diagram

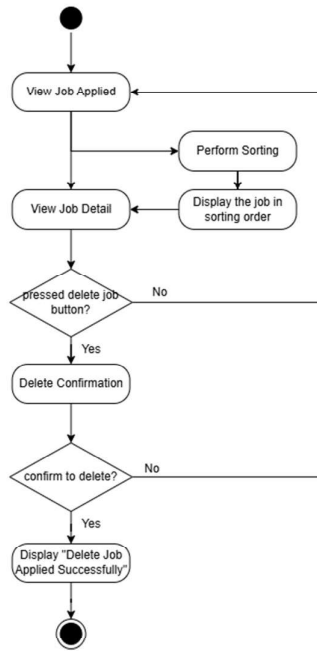


Figure 3.2.3.4 View Job Applied Activity Diagram

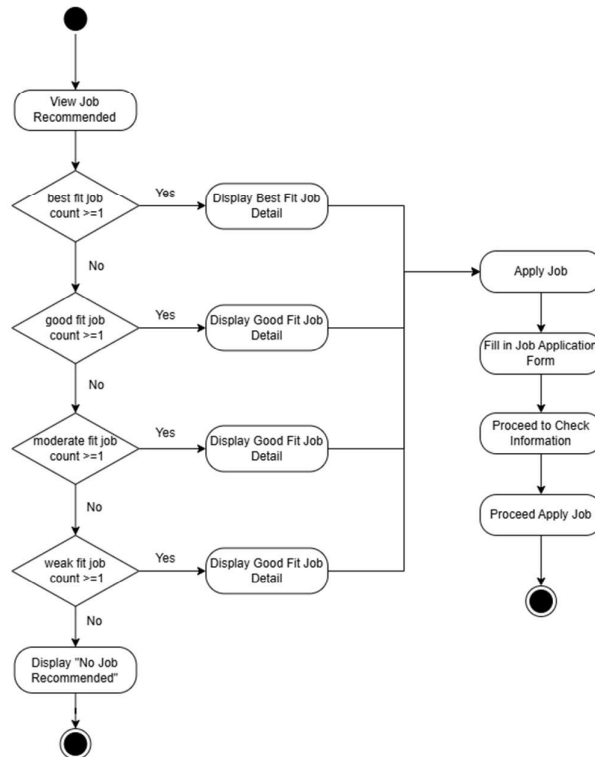


Figure 3.2.3.5 View Job Recommended Activity Diagram

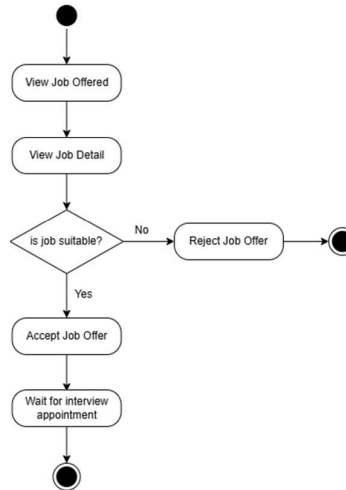


Figure 3.2.3.6 View Job Offered Activity Diagram

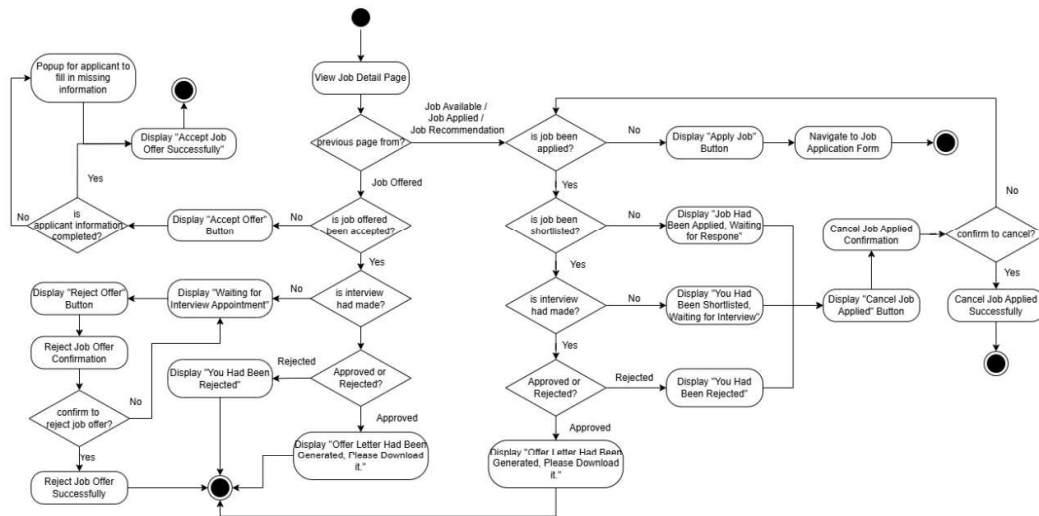


Figure 3.2.3.7 View Job Detail Activity Diagram

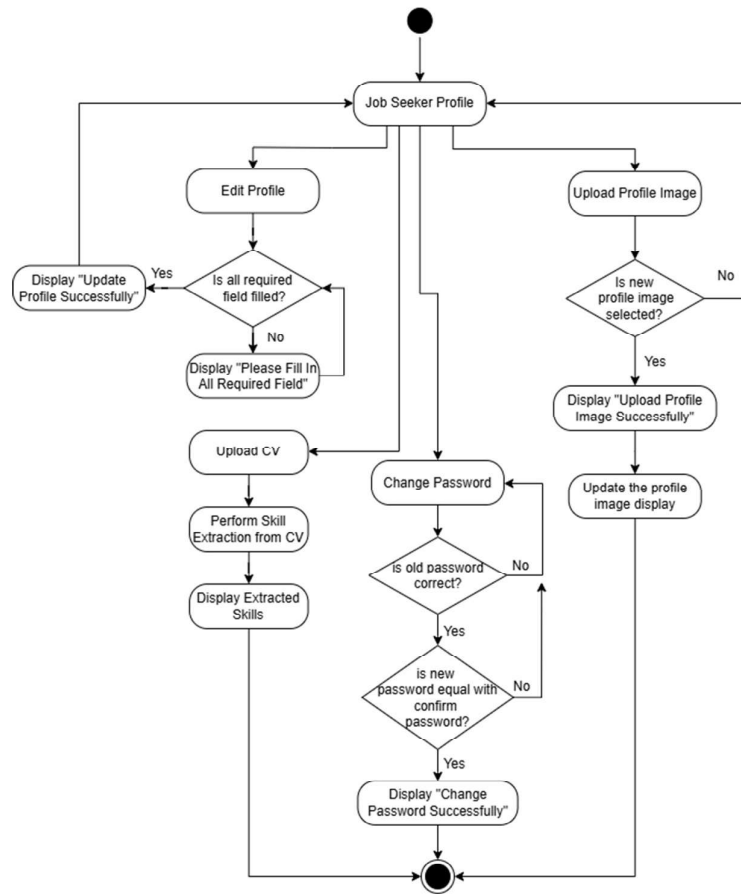


Figure 3.2.3.8 Job Seeker Profile Activity Diagram

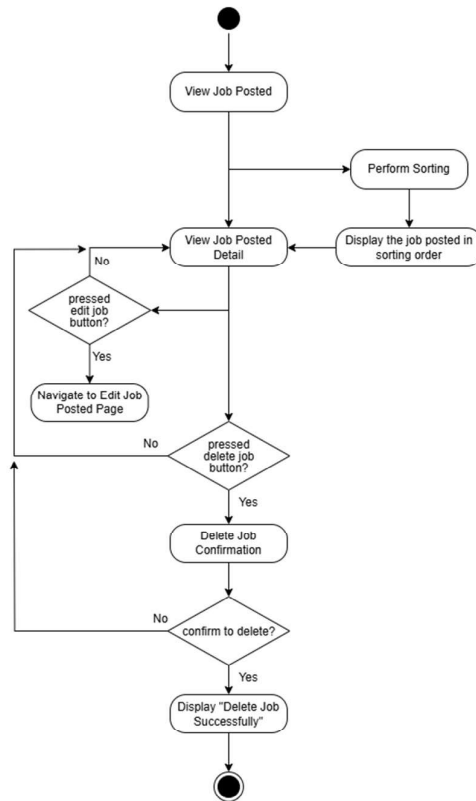


Figure 3.2.3.9 Recruiter View Job Posted Activity Diagram

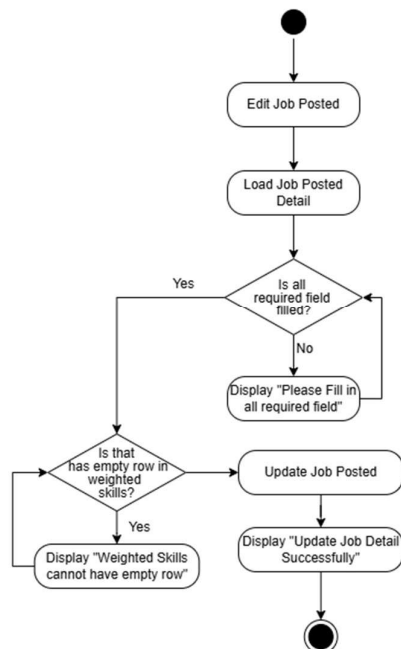


Figure 3.2.3.10 Recruiter Edit Job Posted Activity Diagram

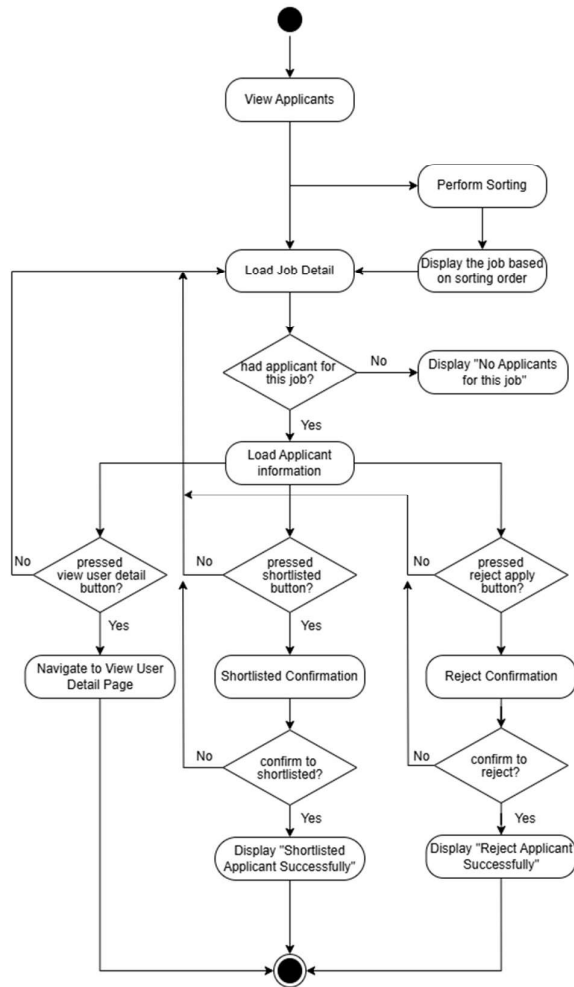


Figure 3.2.3.11 Recruiter View Applicant Activity Diagram

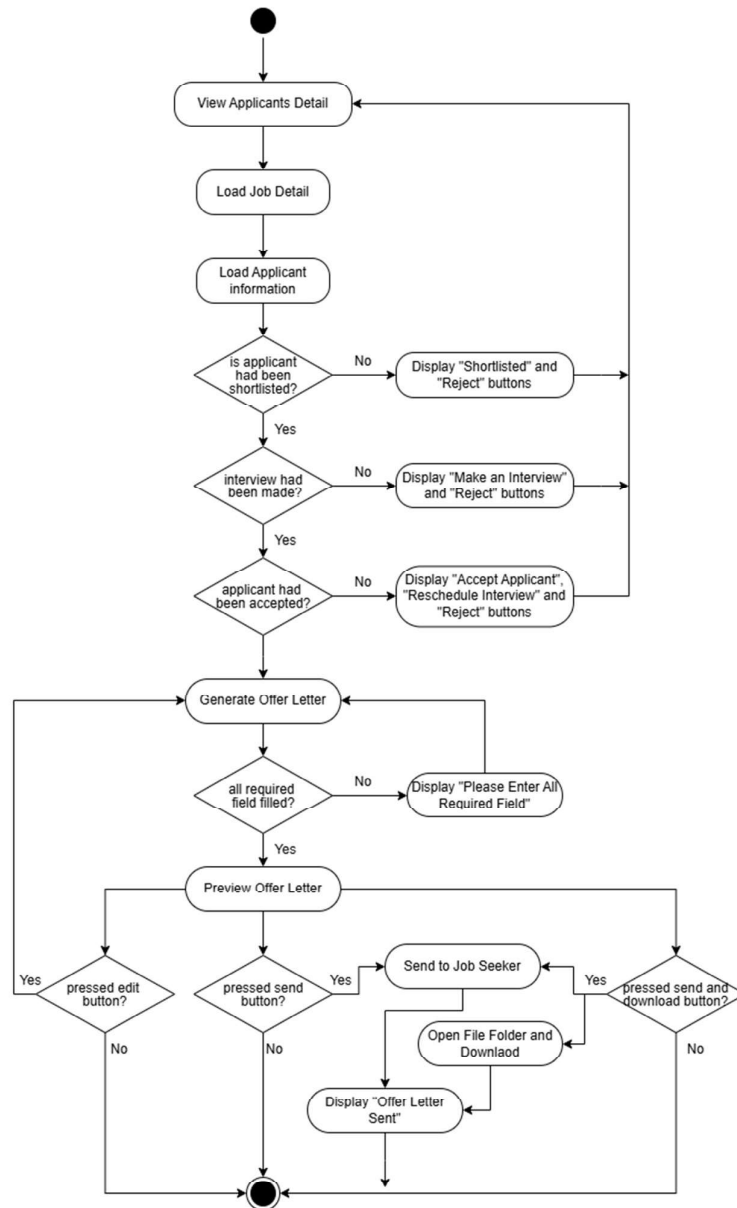


Figure 3.2.3.12 Recruiter View Applicant Detail Activity Diagram

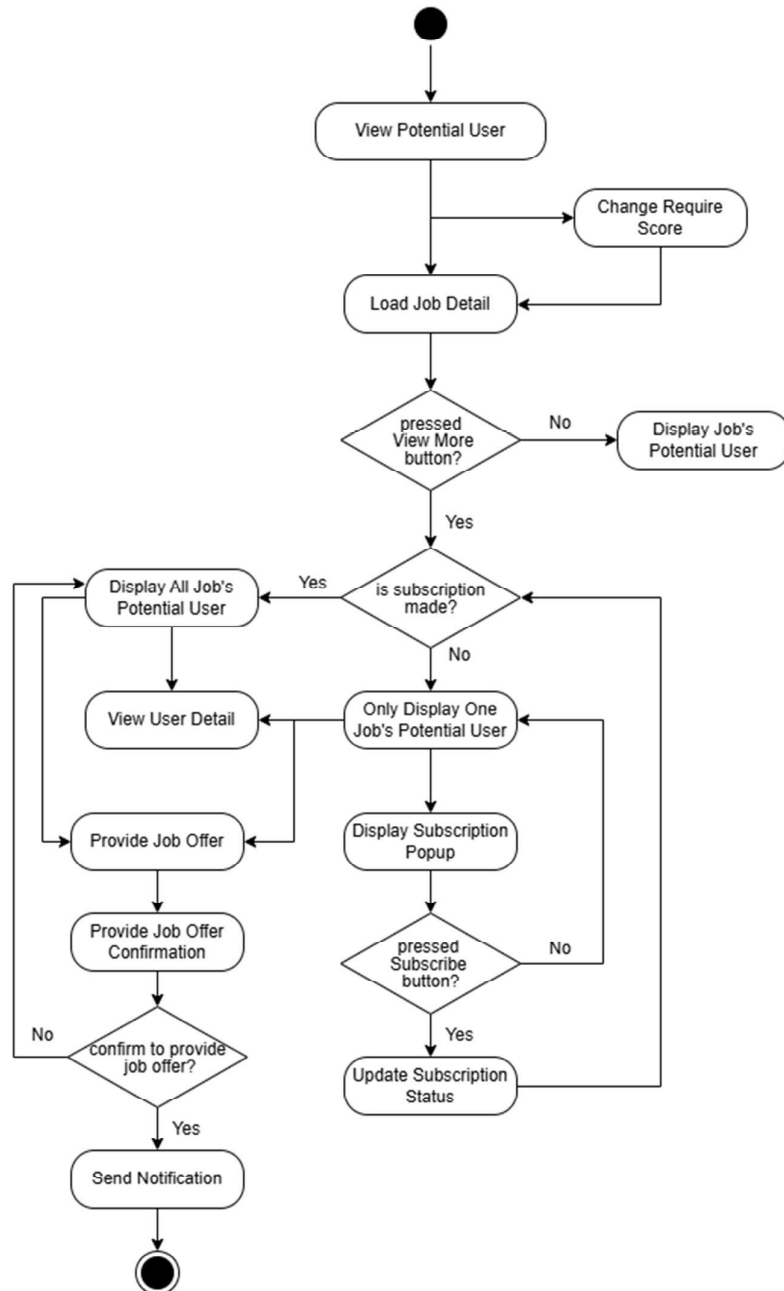


Figure 3.2.3.13 Recruiter View Potential User Activity Diagram

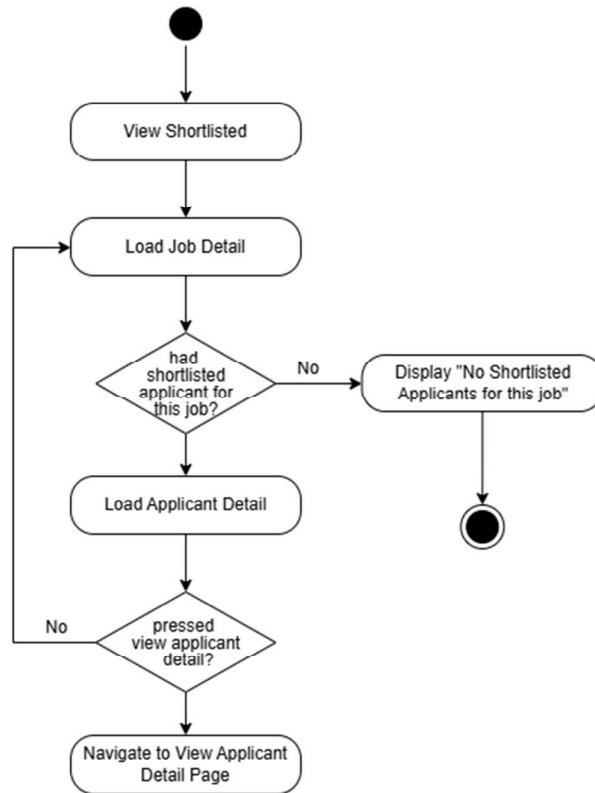


Figure 3.2.3.14 Recruiter View Shortlisted Activity Diagram

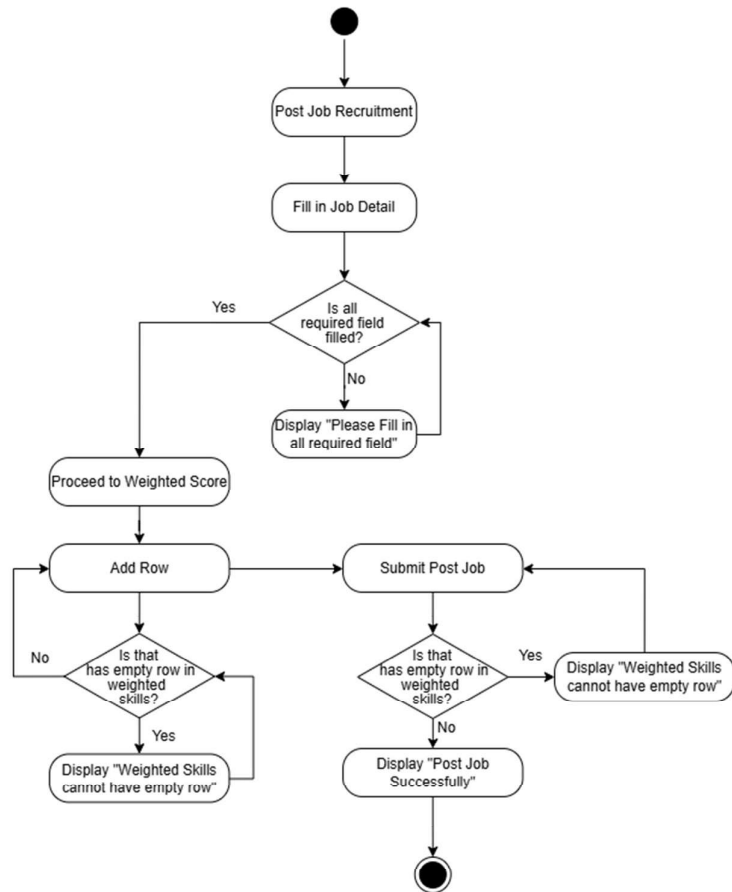


Figure 3.2.3.15 Recruiter Post Job Recruitment Activity Diagram

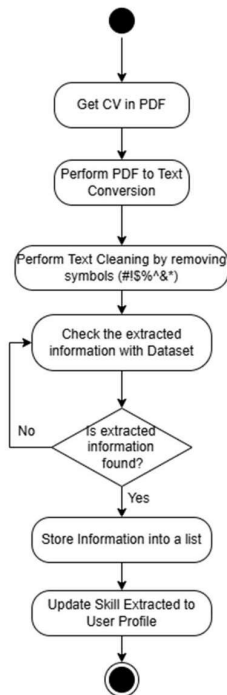


Figure 3.2.3.16 Skills Extraction Activity Diagram

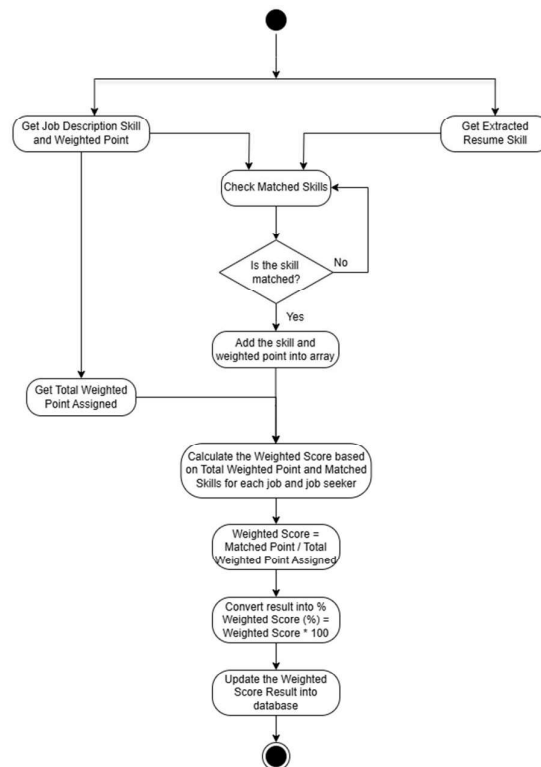


Figure 3.2.3.17 Calculate Weighted Scoring Activity Diagram

CHAPTER 4

SYSTEM DESIGN

4.1 Block Diagram

4.1.1 Job Seeker Block Diagram

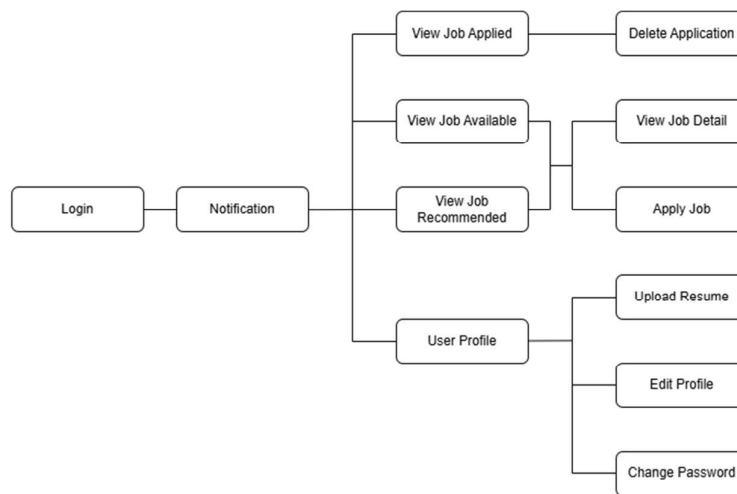


Figure 4.1.1 Job Seeker Block Diagram

4.1.2 Recruiter Block Diagram

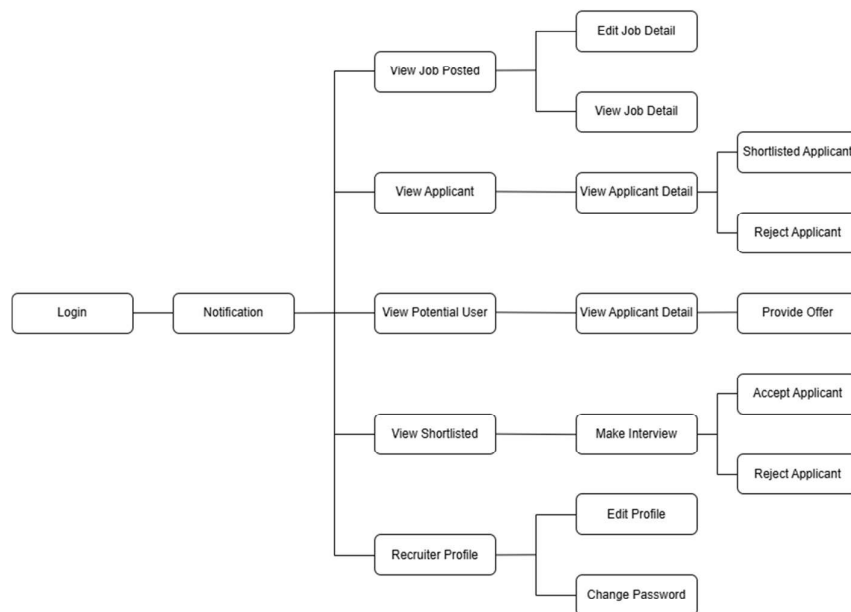


Figure 4.1.2 Recruiter Block Diagram

4.1.3 Owner Block Diagram

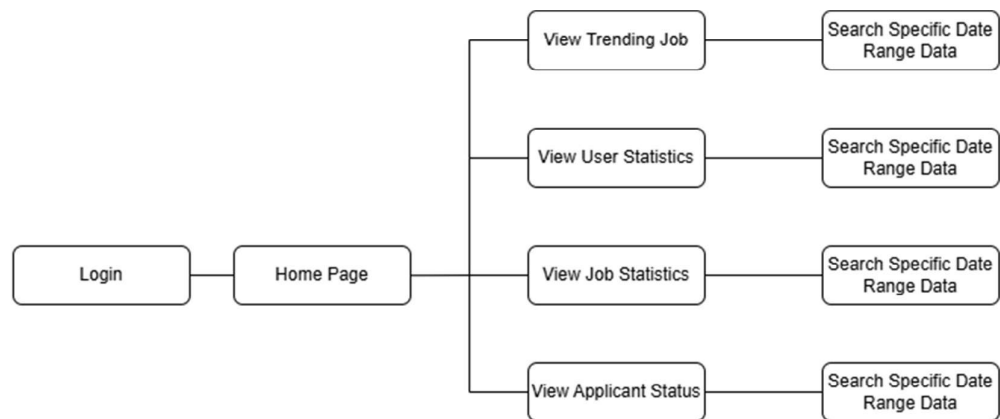


Figure 4.1.3 Owner Block Diagram

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 Hardware Setup

The following is the hardware specification which is my laptop. This hardware will be involved in the whole development process.

Description	Specification
Model	Acer Nitro 5
Processor	AMD Ryzen 5 5600H with Radeon Graphics 3.30 GHz
Operating System	Windows 10
Graphic	NVIDIA GeForce GTX 1650
Memory	16GB
Storage	1TB M.2 SSD

Table 5.1 Specification of Laptop

5.2 Software Setup

Description	Specification
Programming Language	C#
Database	Firebase, Microsoft SQL Server (MSSQL)
Software	Visual Studio 2022

Table 5.2 Software and Technologies

- **Programming Language (C#)**

In the proposed system, the main programming language will be C# UWP Framework. The C# UWP Framework form provides a user-friendly user interface design that allows the user to drag and drop the element into the design space. At the same time, the user interface design can be directly connected to the backend programming.

- **Firebase**

For the Firebase [17], the proposed system will proceed with Firebase store the unstructured data. In Firebase, it can create storage to store all the files and images needed in the proposed system. Such as job seeker's CV, company logo and user profile picture.

- **Microsoft SQL Server (MSSQL)**

For the Microsoft SQL Server (MSSQL) [22], the proposed system uses it to store the structured data. MSSQL is better than Firebase to store the structured data, it will be easier to do searching and sorting based on certain criteria. The data will store in MSSQL such as user email, extracted skills and recruiter information.

- **Visual Studio 2022**

The software chosen is Visual Studio 2022. The proposed system will be developed in Visual Studio 2022 because it contains the user interface and is more effective for developing a program. Besides that, Visual Studio 2022 also supports C# as the programming language.

5.3 Setting and Configuration

Before starting to develop the online job application with job recommendations system, there are two software needed to be installed and downloaded in my laptop. First is Visual Studio 2022, which mainly for writing and executing the code. Second was MSSQL, which is the database for the system to store all the structured data.

5.4 System Operation

5.4.1 Job Seeker Module

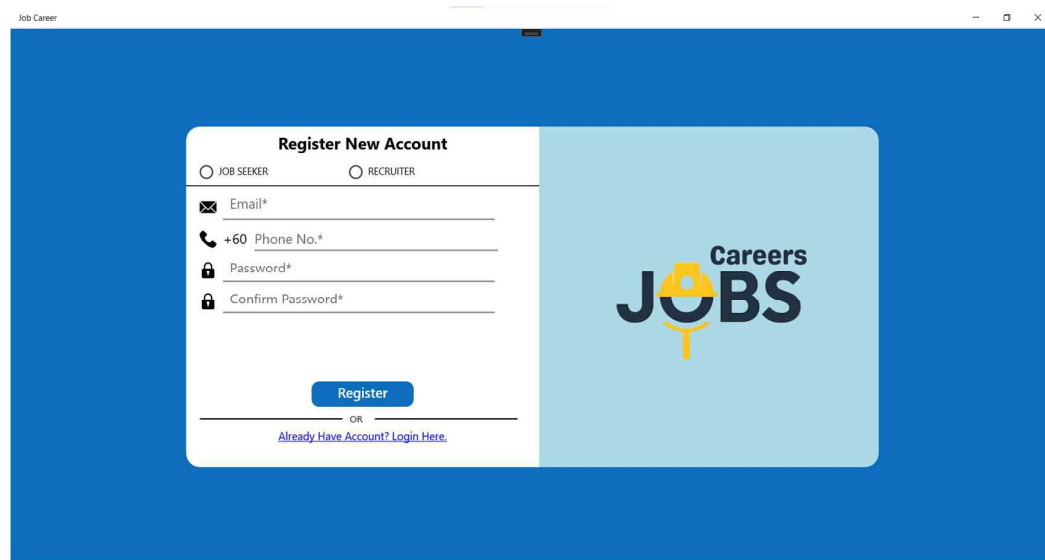


Figure 5.4.1.1a Register Page

Job Seeker need to register an account before use the application. The email address, phone number and password are required.

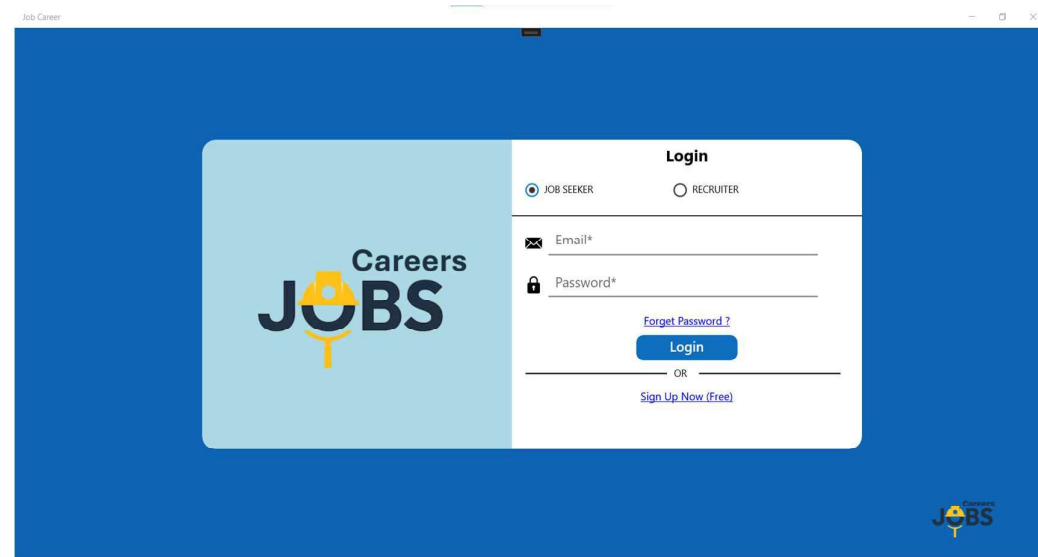


Figure 5.4.1.1b Job Seeker Login

Job Seeker need to enter the email address and password that had been set during register new account. Job Seeker also needs to check the radio button of 'JOB SEEKER' to login as Job Seeker.

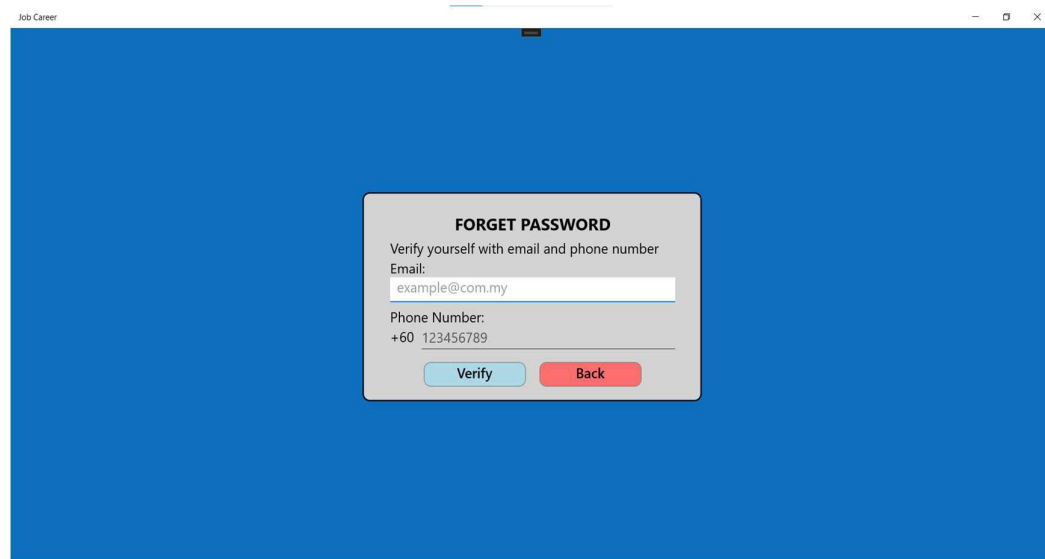


Figure 5.4.1.1c Forget Password

If the Job Seeker forgets his/her password, they able to perform forget password by entering email address and phone number for the validation purposes. After the validation is done, the Job Seeker able to reset the password.

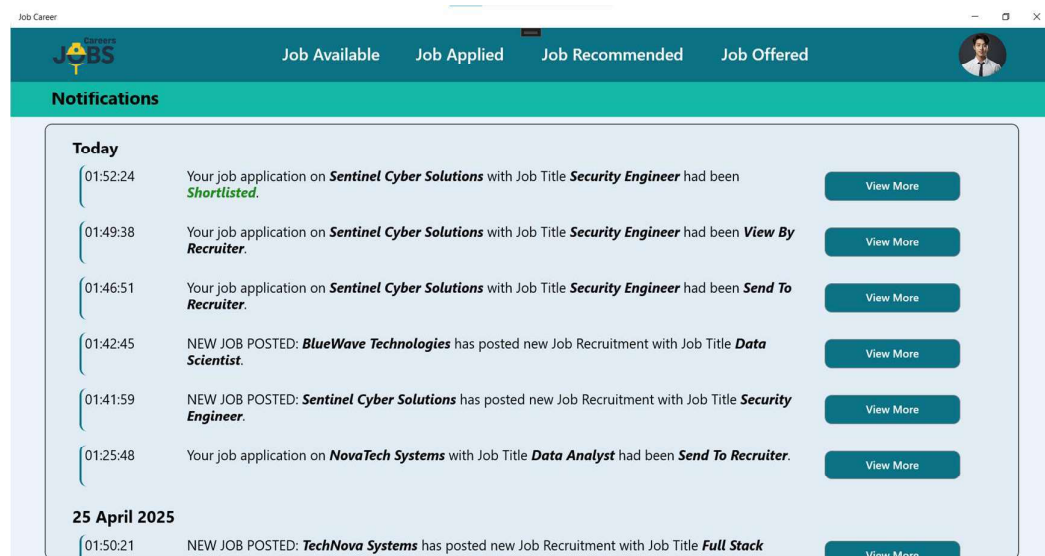


Figure 5.4.1.2 Job Seeker Notification

From the notification page, Job Seeker able to see the activity happen on this application. For example, when Recruiter posted new job, it will be showing in the notification. Besides that, if the Job Seeker apply to any job and the Recruiter has updated the application status, it also will show at the notification page to notify Job Seeker.

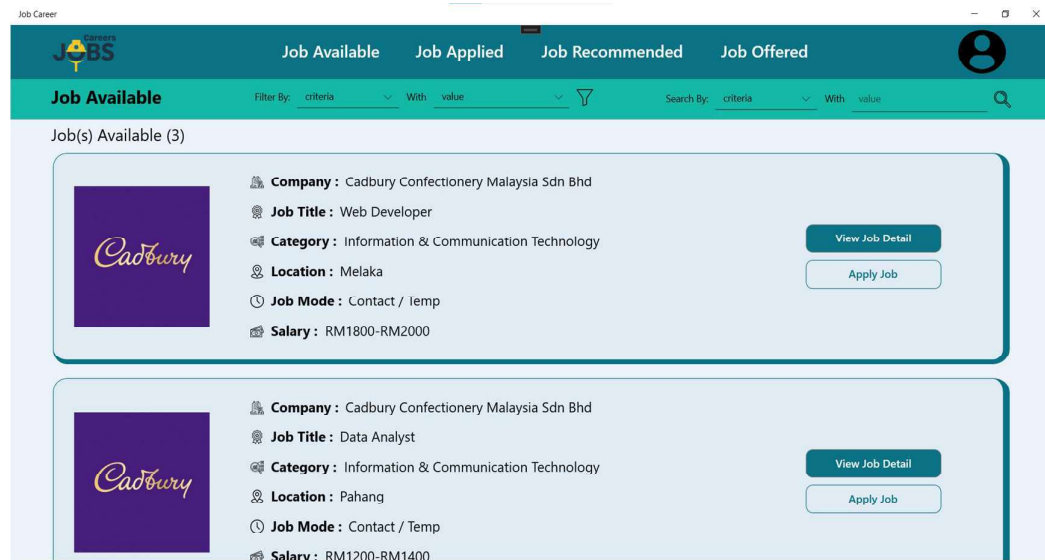


Figure 5.4.1.3 View Job Available

For view job available page, Job Seeker able to see the job that is still available and haven't been apply by the Job Seeker. From this page, Job Seeker can saw the company name and job title of each job posting. Besides that, Job Seeker also can perform filter and search to find the job posting related to their requirements.

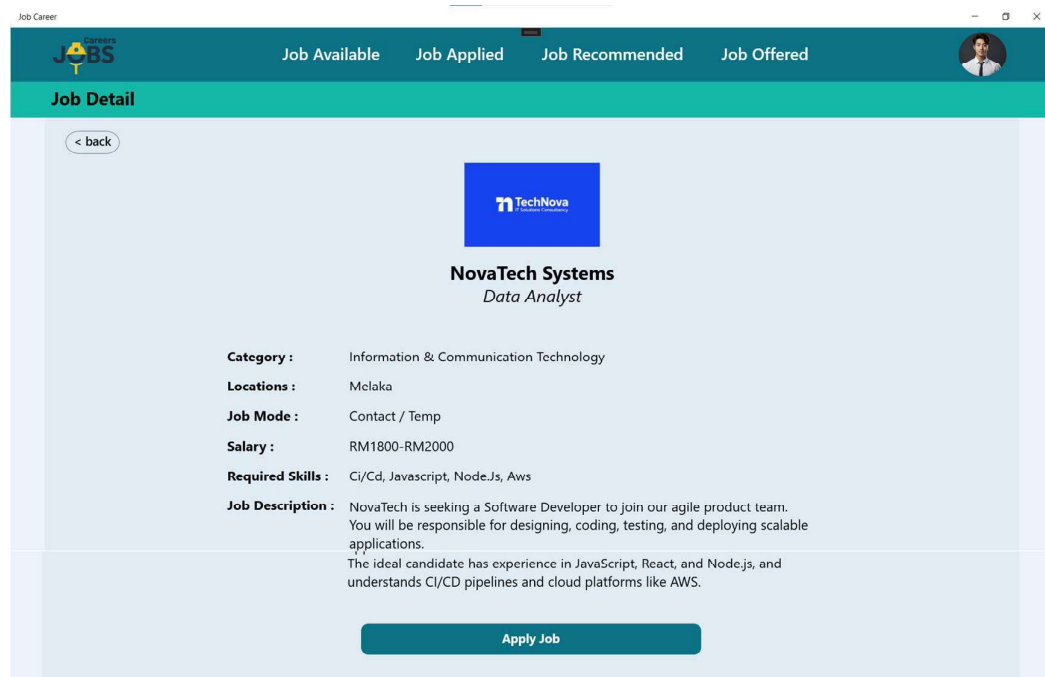


Figure 5.4.1.4 View Job Detail

For view job detail page, Job Seeker can view the Job in more detail such as the required skills of the job title and the content in the job description to understand the job title job scope.

Job Career

Jobs

Job Available Job Applied Job Recommended Job Offered

Job Application Form

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TechNova
IT Solutions Consultancy

Company Name: NovaTech Systems
Job Title: Data Analyst
Category: Information & Communication Technology
Location: Melaka
Job Mode: Contact / Temp
Salary: RM1800-RM2000

Applicant Detail [Edit Details](#)

Name : Jack Yong
Email : LiuDP@gmail.com
I/C No. : 121212-21-1212
Phone : +601926738262

Resume / CVs [Upload CV](#)

☒ JackYong Resume.pdf

Find Job For :

☒ Full Time

Date Able To Start Work

April	28	2025
-------	----	------

☐ Part Time / Contract / Internship

Proceed

Please Check All The Information Before Proceed
****After Apply, Information Are Not Allowed To Modify!**

Company Name : NovaTech Systems
Job Title : Data Analyst
Category : Information & Communication Technology
Location : Melaka
Job Mode : Contact / Temp
Salary : RM1800-RM2000
CV Selected : JackYong Resume.pdf
Start Working Date : 28 April 2025

Apply Job

☒ I had check all the information provided are correct and authenticated.
☒ I agree with this application using my information for the job matching purpose.

Figure 5.4.1.5 Job Application Form

This is an application form, which when Job Seeker found a job which is suitable for them, they need to fill up the information required then submit the job application to the Recruiter, after submission just wait for the response.



Figure 5.4.1.6 View Job Applied Status

For view job applied status page, if Job Seeker has done apply at least one job, in this page it will show the job that had been applied by the Job Seeker, at the same time, it also will show the status of the job application. Besides that, Job Seeker also can delete the job application which had been apply.

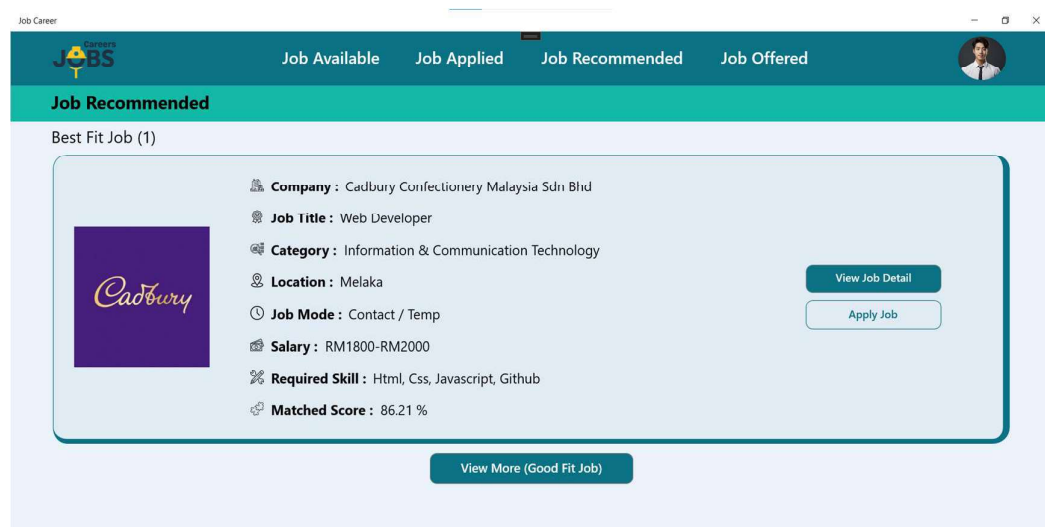


Figure 5.4.1.7 View Job Recommended

For view job recommended page, this page will show the job available based on the weighted score for each job posting and how well the Job Seeker is match with the job. Best fit job represents as the matching score is 75% and above. Good fit job represents as the matching score is 50% to 74.99%. Moderate fit job represents as the matching

score is 25% to 49.99%. Weak fit job represents as the matching score is 1% to 24.99%. From this page, Job Seeker can apply the job.

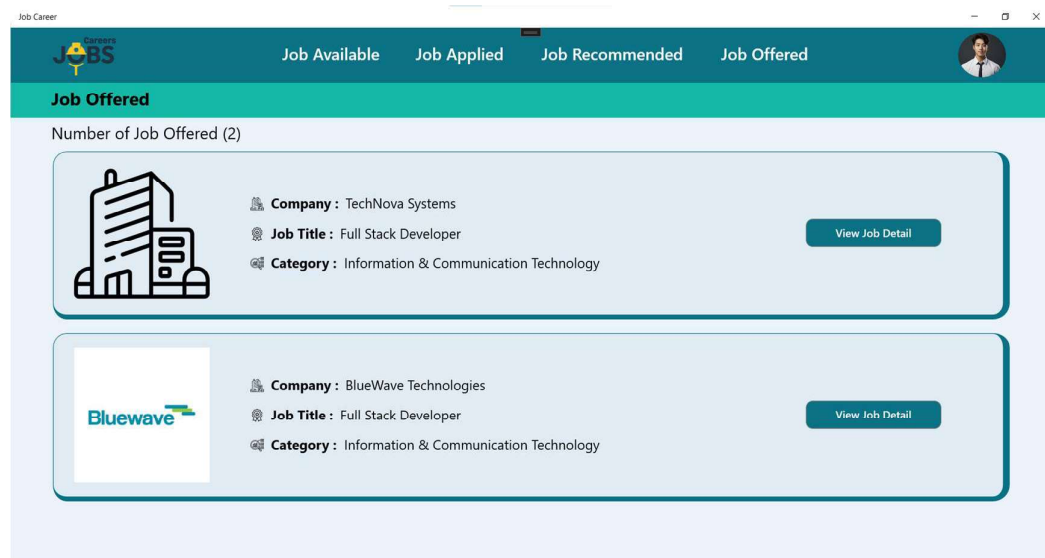


Figure 5.4.1.8 View Job Offered

For view job offered page, which shows the job that offered from the Recruiter, for the job in the job offered page, it will be more advantages compared to Job Seeker manually applying the job. Besides that, Job Seeker are skipped the step of apply the job, they just need to accept the job offer and wait for the interview arrangements.

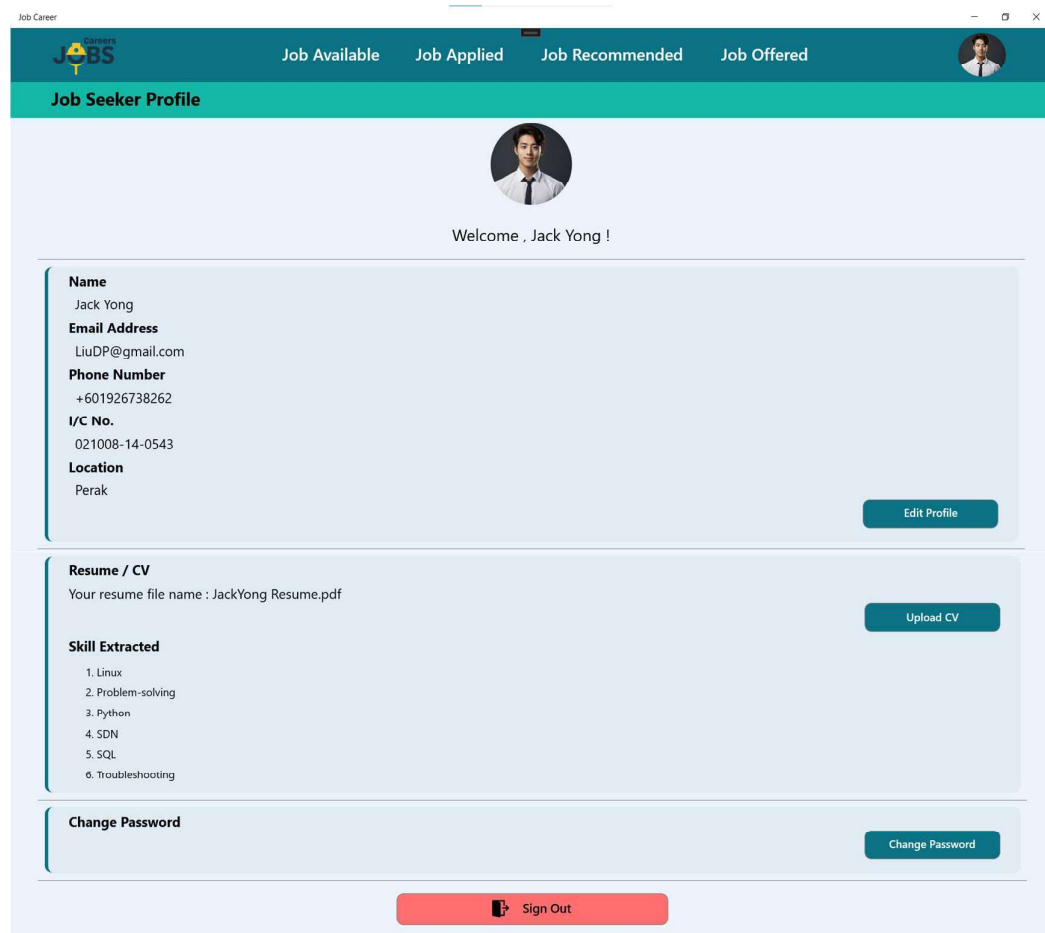


Figure 5.4.1.9 Job Seeker Profile

This is the Job Seeker profile page, which displays the Job Seeker information such as name, email address, phone number, i/c number and location. Besides that, Job Seeker are allowed to change profile picture, edit profile data, upload resume and change account password. For the uploading of resume, it also will perform skills extraction from the resume and display it.

5.4.2 Recruiter Module

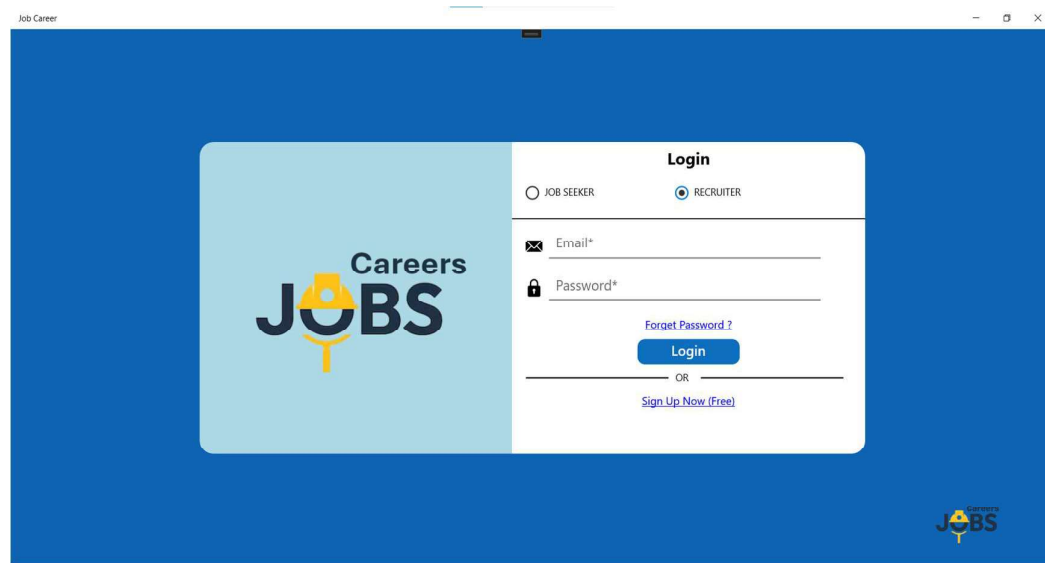


Figure 5.4.2.1 Recruiter Login

For Recruiter, they need to register an account at the register page (Figure 5.4.1.1a). After the registration had been completed, Recruiter need to enter the email address and password had been set in register page for the login purpose. If recruiter forgets the password, they also can perform forget password (Figure 5.4.1.1c) and reset password.

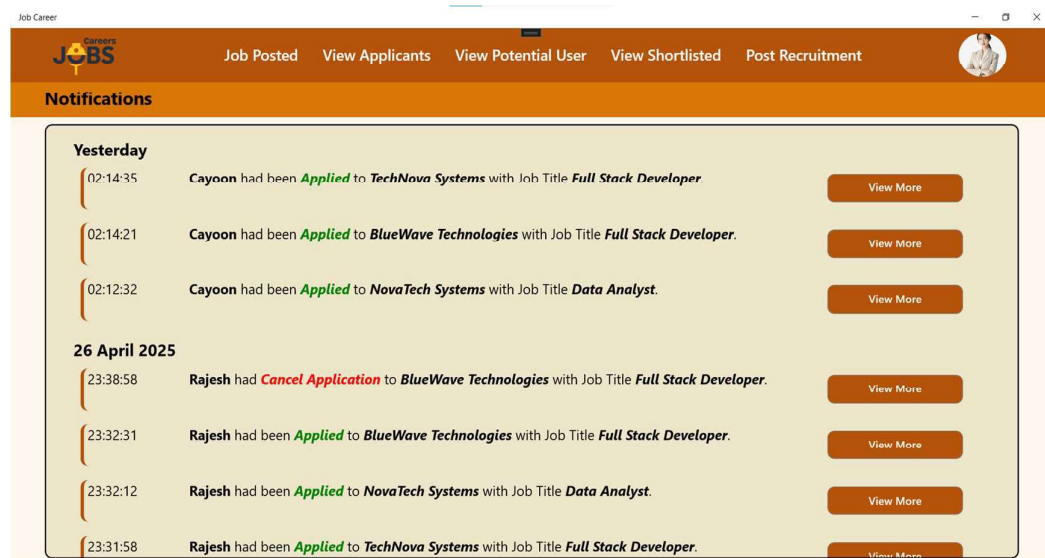


Figure 5.4.2.2 Recruiter Notification

The notification page will show the activity in the system related to the Recruiter. For example, if someone had applied for the job posted by the recruiter, it will send a notification to recruiter where they will show here. Other than that, is the Job Seeker rejects or cancels the job application, it also will show at notifications page.

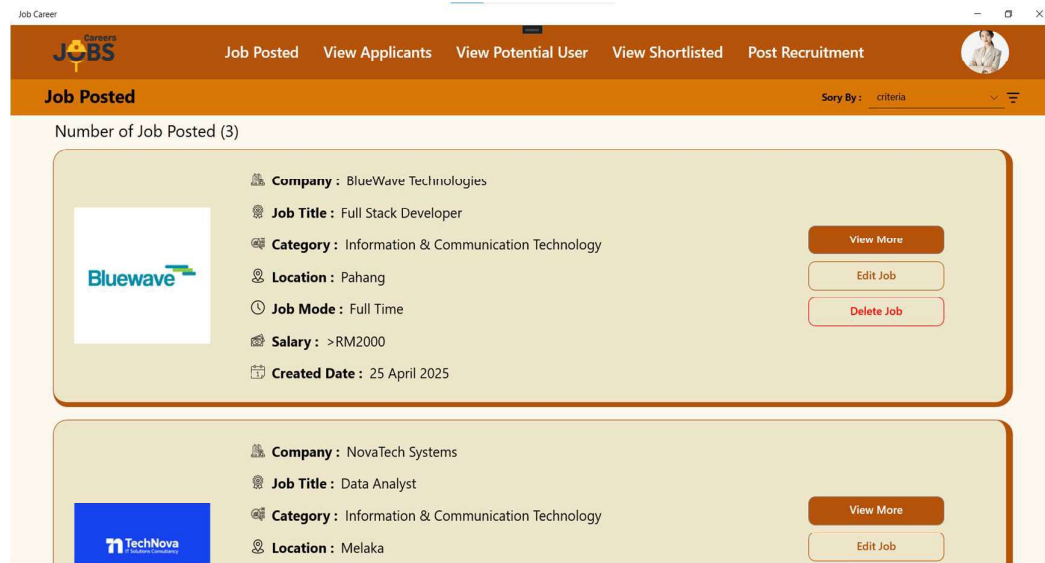


Figure 5.4.2.3 View Job Posted

For view job posted page, recruiters able to have a look of what job had been posted by them. Besides that, from this page, recruiters can navigate to edit the job details by pressing 'Edit Job'. Hence, if the recruiter wants to delete the job posted, they can click the 'Delete Job' and a confirmation message will pop up and the recruiter needs to confirm it.

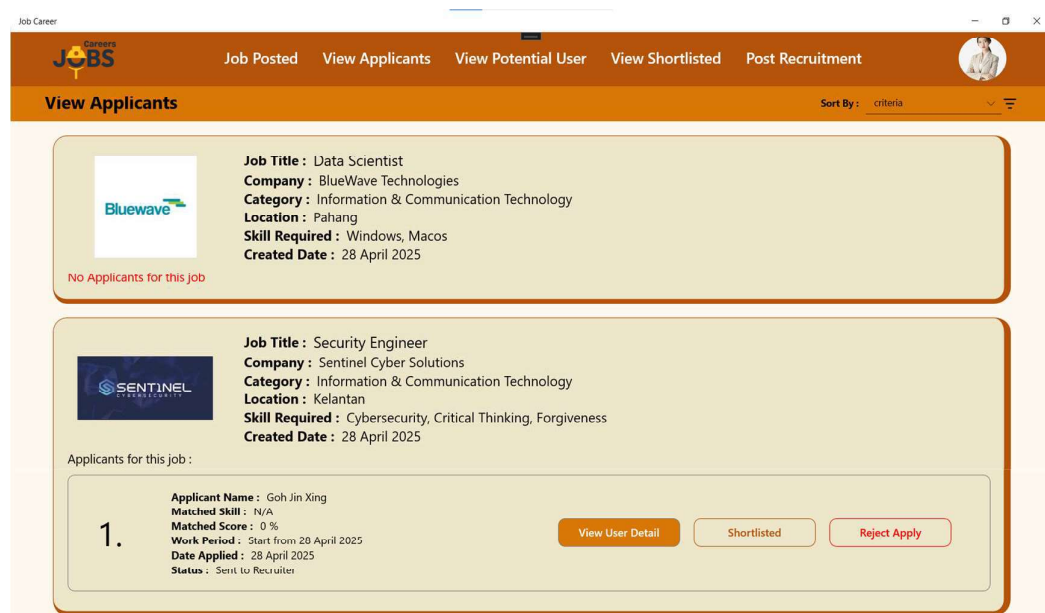


Figure 5.4.2.4 View Applicants

For view applicants page, recruiter able to see the list of applicants for each job. On this page, recruiter able to view the job seeker's details and information. Besides that, if the recruiter found that the job seeker has fulfilled the skills required, recruiter can shortlist

CHAPTER 5

them and wait for interview appointments. But, if the recruiter notices that this is not the applicant they want, they can directly reject the job seeker application.

Job Career

JOBS

Job Posted View Applicants View Potential User View Shortlisted Post Recruitment

View Applicant Details

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Applicant Applying To

Company Name : Sentinel Cyber Solutions
Job Category : Information & Communication Technology
Job Title : Security Engineer
Location : Kelantan
Salary : RM800-RM1000
Required Skills : Cybersecurity, Critical Thinking, Forgiveness

Applicant Detail

Name : Jack Yong
Email : LiuDP@gmail.com
Phone No. : 1926738262
Location : Perak
Matched Skills : N/A
Matched Score : 0.00 %

Applicant Curriculum Vitae (CV)

Tan Jack Yong
No. 15, Taman Setiawangsa, 54200 Kuala Lumpur, Malaysia
Phone : +60 12-9876543
Email: JackYong@hotmail.com

Objective:
Highly skilled and dedicated IT professional with a strong background in IT Analyst.
Looking For a part time job.

Education:
Bachelor's in Information Technology, Multimedia University (2019)

Professional Experience:

IT Analyst, Infotech Global Sdn Bhd (Feb 2020 - Present)
-Managed system integrations and performance software analysis.

IT Support intern, XYZ Corp (Jul 2019 - Jan 2020)
-Provided technical support and assisted in network administration.

Skills:

- Python
- Linux
- Network Troubleshooting
- System Integration
- SQL

Previous Page Page 1 / 1 Next Page

Do You Want To Download Applicant CV ?

Download Applicant CV

Recruiter Actions

Actions That You Can Perform : **Shortlisted Applicant, Reject Applicant**

Shortlisted Reject

Figure 5.4.2.5 View Applicant Details

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For view applicant details page, it will show the job seeker information, the skills matched with the job they applied. Besides that, this page also will show the job seeker resume. Recruiter able to download a copy of the resume if needed. After viewing the job seeker's information, recruiter can either shortlist the job seeker to wait for the interview or reject the job seeker.

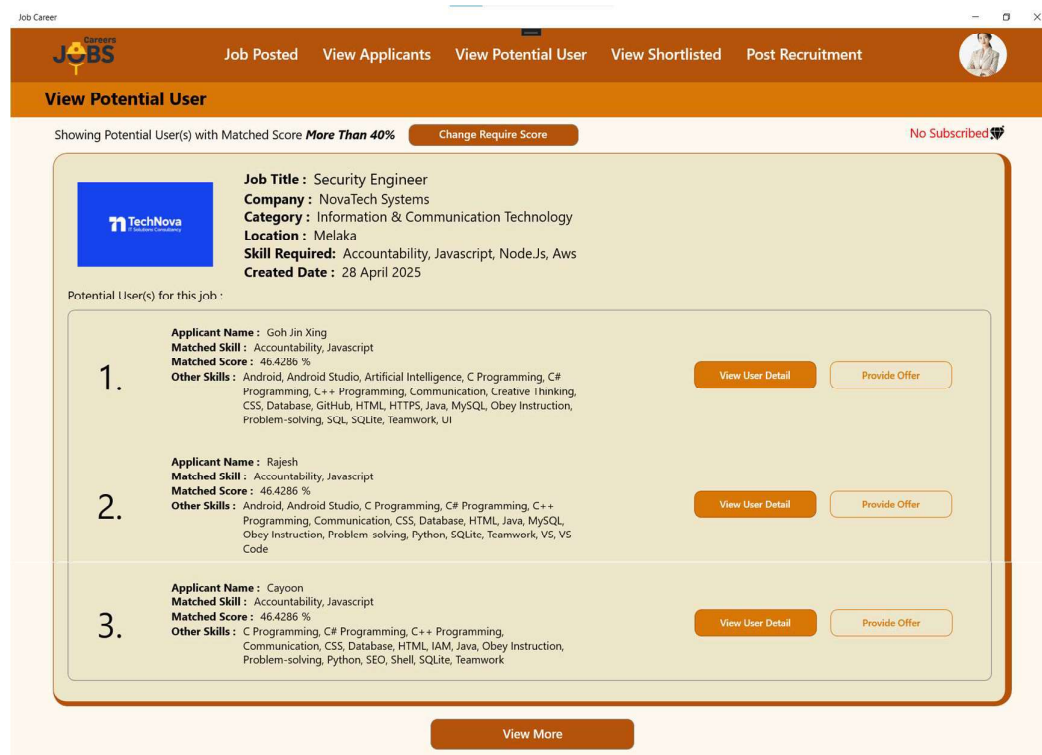


Figure 5.4.2.6 View Potential User

For view potential user page, it will show a list of job seeker that has fulfilled the matching score, which by default is 80% and above. But recruiters can change the required score based on their need to view the potential job seeker list. If a recruiter finds a job seeker is fulfilling the requirements, they can provide an offer to the job seeker. Once the job seeker accepts the offer from the recruiter, the recruiter can make an interview appointment with the job seeker.

CHAPTER 5

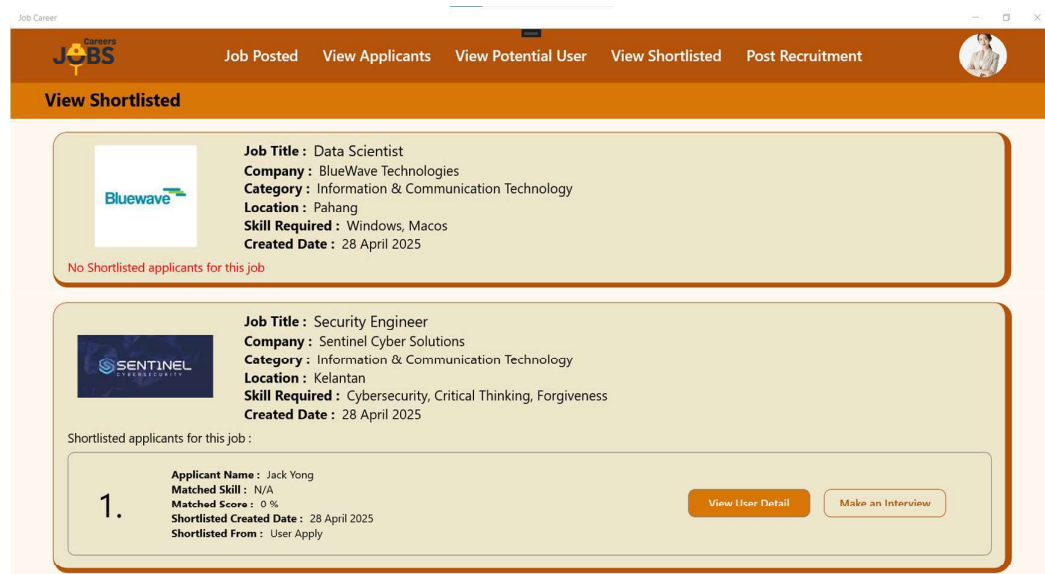


Figure 5.4.2.7 View Shortlisted

For view shortlisted page, this page will show the job seeker who had been shortlisted by the recruiter. Job seekers will be displayed at this page and waiting to make interview appointments.

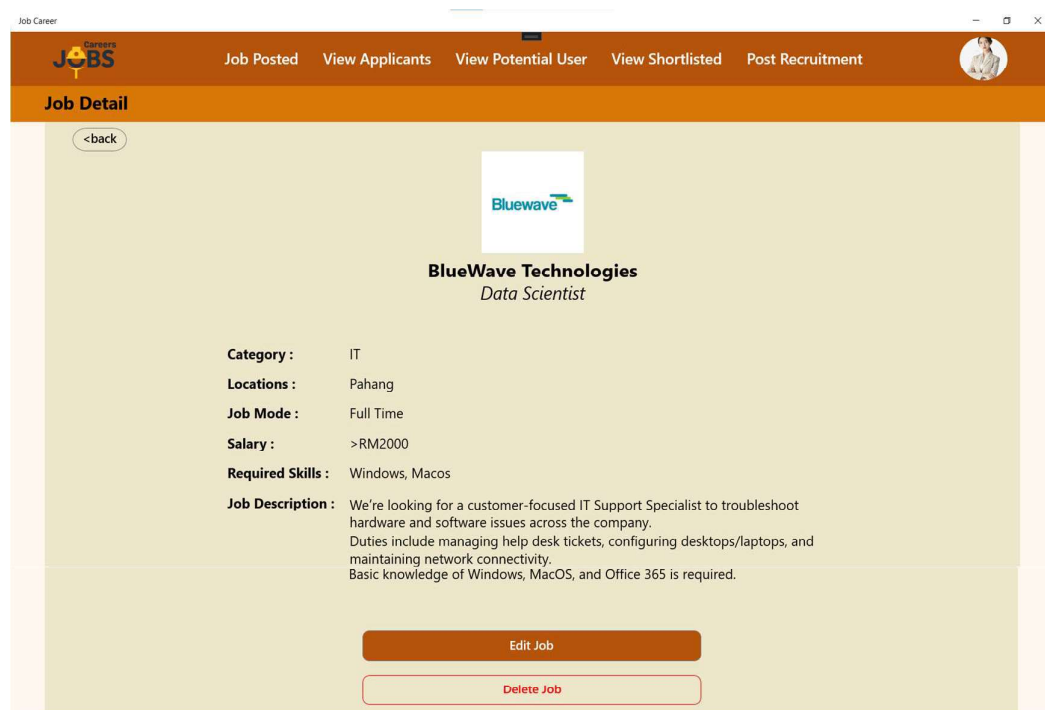


Figure 5.4.2.8 View Job Details

For the view job details page, this page is used to see the details of the job which will include the job description. Besides that, from this page, recruiters are also able to perform edit jobs and delete job posts.

PLEASE FILL IN THE DETAILS

Company Name : NovaTech Systems Upload Company Logo

Job Category : Information & Communication Technology eg. Information & Communication Technology

Job Title : Security Engineer eg. Senior Risk/Data Analyst

Job Mode : Contact / Temp

Salary Range : RM1800-RM2000

Location : Melaka

Job Description : NovaTech is seeking a Software Developer to join our agile product team. You will be responsible for designing, coding, testing, and deploying scala. The ideal candidate has experience in JavaScript, React, and Node.js, and t

[Edit Job Details](#)

Advanced Feature (Weighted Score For Skill)

Please select the skills needed:
NOTE : Only can assign the Weighted Between 1 (Least important) to 10 (Most important)

Skills	Weighted Assigned	
Javascript	6	
Agile	4	
Aws	8	

[+ Add More](#)

[Post Job](#)

Figure 5.4.2.9 Post Job Recruitment

For post job recruitment page, this page is for recruiters to post a job recruitment. Recruiters need to fill in information such as company name, job title, job mode, salary range and job description. After then recruiter needs to proceed to the Advance feature, which is the weighted score, recruiter needs to choose the skills are important then assign the weighted score for each skill.

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Job Career

Carers
JOBS

Job Posted View Applicants View Potential User View Shortlisted Post Recruitment

Edit Job Detail

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PLEASE FILL IN THE DETAILS

Company Name : Sentinel Cyber Solutions Upload Company Logo Remove

Job Category : Information & Communication Technology eg. Information & Communication Technology

Job Title : Security Engineer eg. Senior Risk/Data Analyst

Job Mode : Contact / Temp

Salary Range : RM800-RM1000

Location : Kelantan

Job Description : Join our elite cybersecurity team to monitor and respond to cyber threats. You'll use SIEM tools, perform vulnerability assessments, and respond to incidents. A strong understanding of network protocols, malware analysis, and security operations is required.

Edit Job Detail

Advanced Feature (Weighted Scoring For Skill)

Please select the skills needed:
NOTE : Only can assign the Weighted Between 1(Least Important) to 10(Most Important)

Skill	Weighted Assigned	
Cybersecurity	9	
Critical Thinking	5	
Forgiveness	4	

[+ Add More](#)

Update Post Job

Figure 5.4.2.10 Edit Job Posted

For the edit job posted page, recruiters able to edit all the information including the salary range, job mode, job title, job description and the weighted scoring for skill.

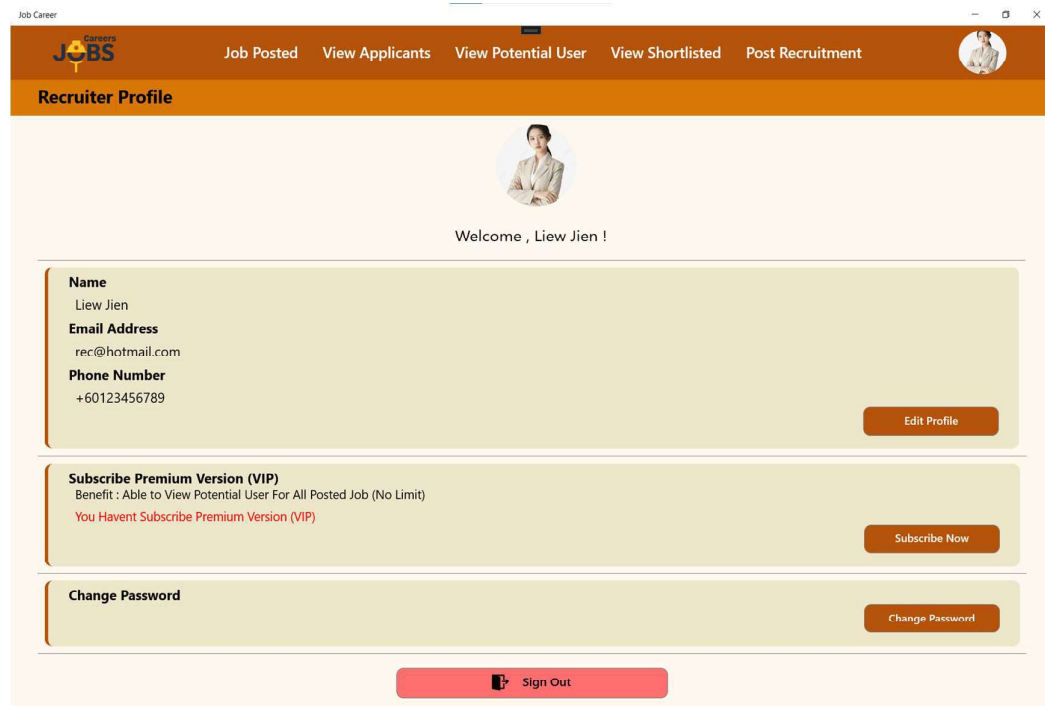


Figure 5.4.2.11 Recruiter Profile

For recruiter profile page, recruiter information will be displayed at this page. Besides that, recruiters are allowed to edit their personal information. This page also will show the subscription of premium version's status. If recruiter does not subscribe to the premium version, the number of job able to saw in the 'View Potential User' only has one, but if recruiter subscribe to the premium version, they able to see all the posted job's potential user. Other than that, recruiters are also allowed to change the account password.

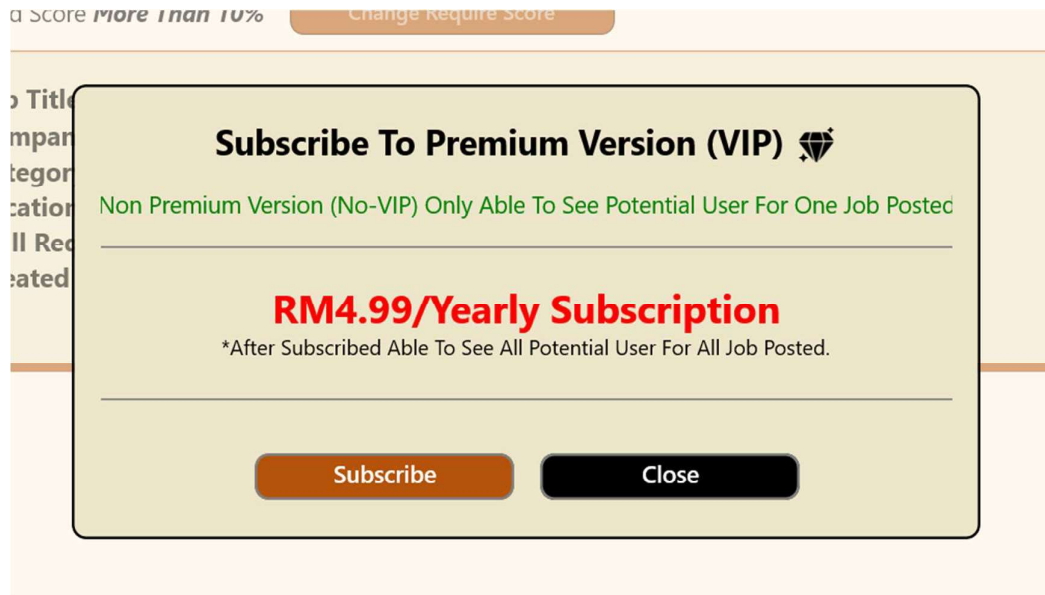


Figure 5.4.2.12 Subscription Premium Version

For subscription premium version, this pop-up window is for recruiters to subscribe to the premium version to see all the posted job potential users. The subscription will expire in 1 year period.

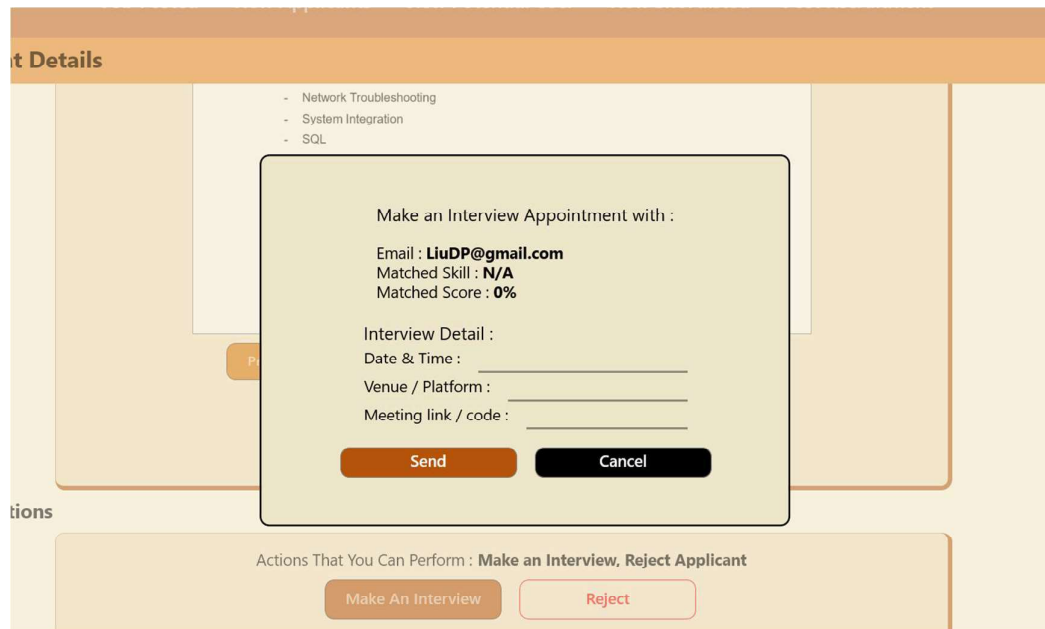


Figure 5.4.2.13 Make Interview Appointment

For make interview appointments, this pop-up window is for recruiters to enter the interview details. This interview details will be sent to the job seeker.

Job Career

Generate Offer Letter

<back

Company Logo

Company Description

eg. This Company is mainly on IT Support.

Allowance

RM 12,000.00 per Month

Employment Type

☒ Full Time
☐ Part Time / Internship

Working Period

Please select employment type.

Start From : month day year

Working Hours

Monday To Friday

9 00 AM To 6 00 PM

Preview Offer Letter

Figure 5.4.2.14 Generate Offer Letter

For generate offer letter page, after the recruiter is satisfied with the interview of the job seeker, recruiters can generate the offer letter by entering all the required information. After entering all the required information, recruiters can preview the offer letter and send the offer letter to the job seeker by clicking a button.

5.4.3 Owner Module

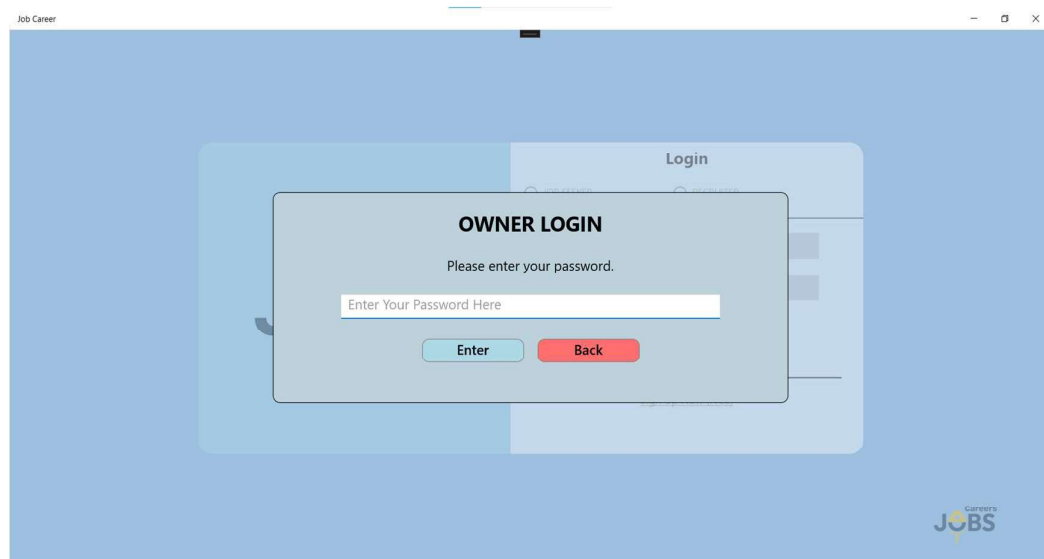


Figure 5.4.3.1 Owner Login

For the owner login page, the owner of the application needs to enter the password to login.

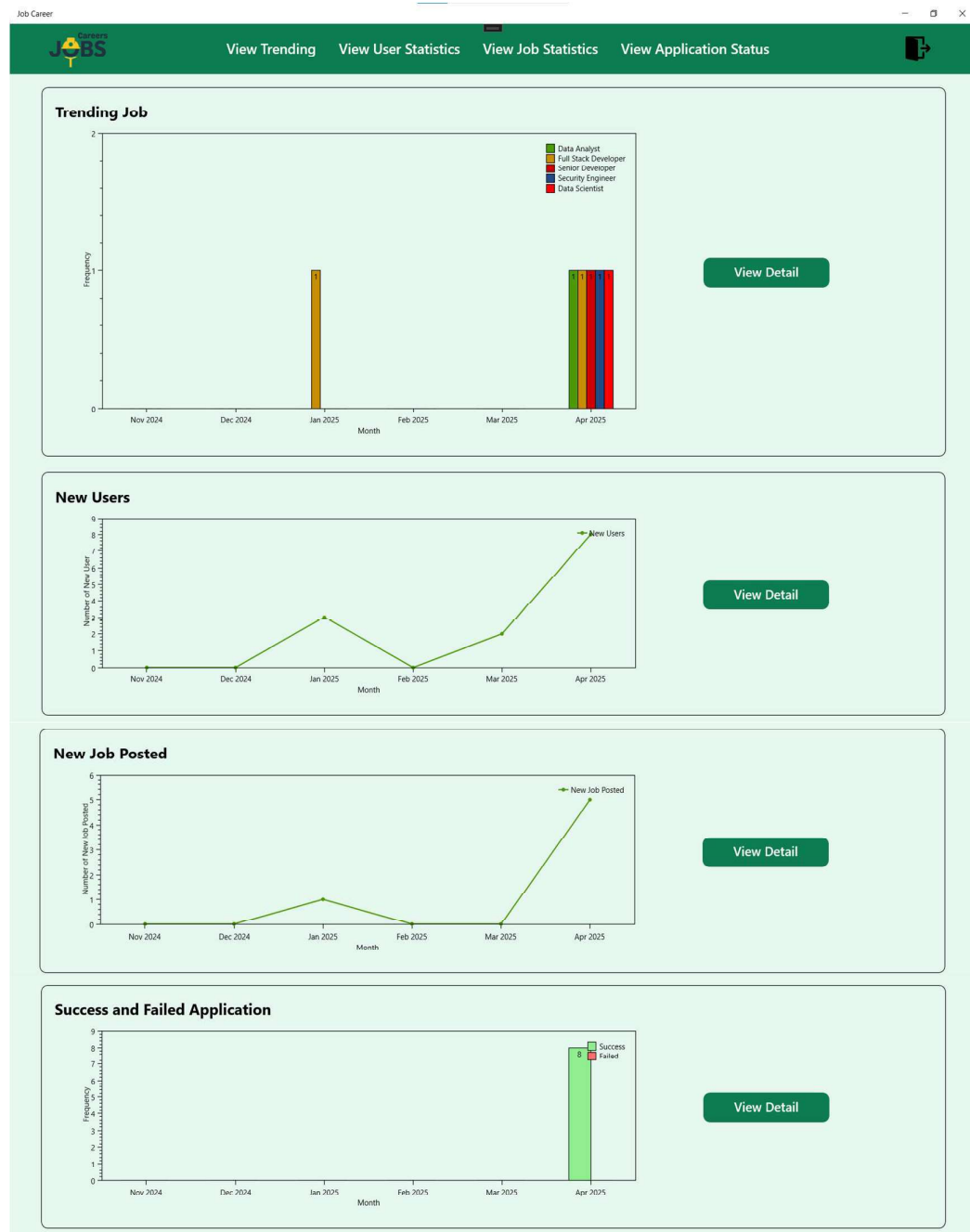


Figure 5.4.3.2 Main Page (Overall)

For the main page, this page shows the overall performance for the trending jobs, user statistics, job posted statistics and applicant apply status.



Figure 5.4.3.3 View Trending

For the view trending page, owner can view the trending job in this six month. Besides that, the owner can view the data for specific date by choosing the date range.

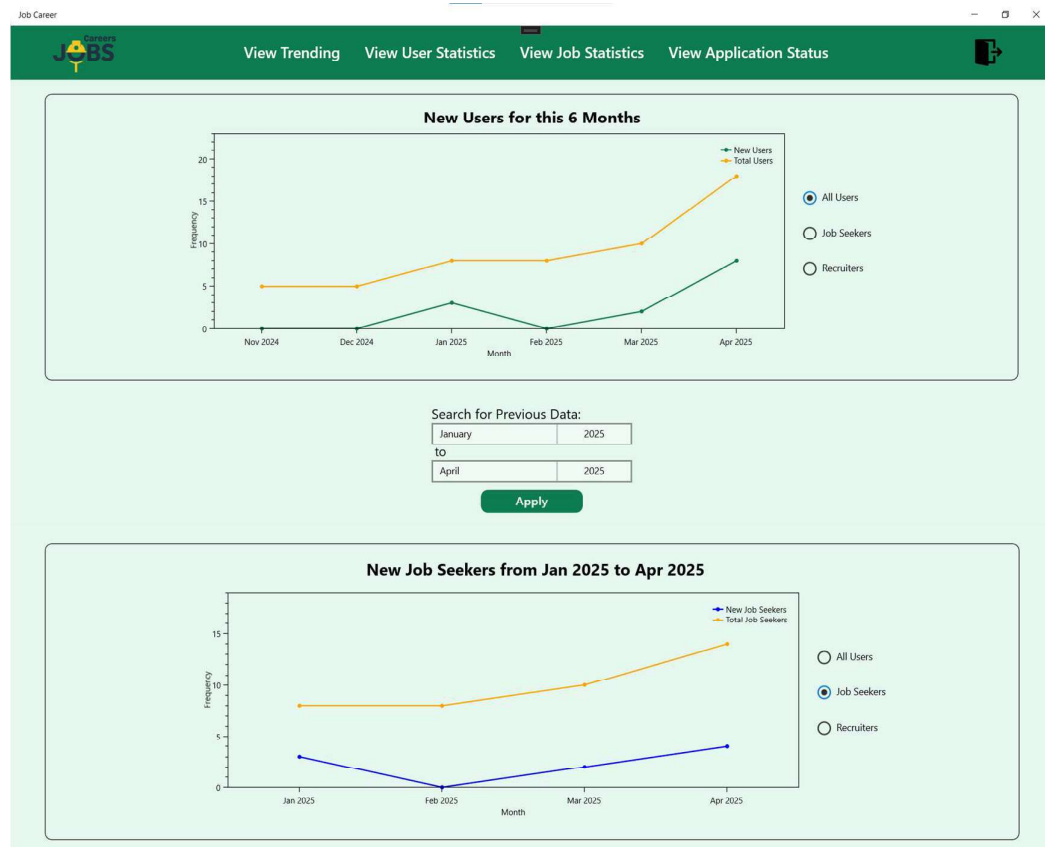


Figure 5.4.3.4 View User Statistics

For the view of user statistics page, owner can view the number of users in the application compared to the number of new job seekers and new recruiters based on each month. Besides that, the owner can view the data for specific date by choosing the date range.

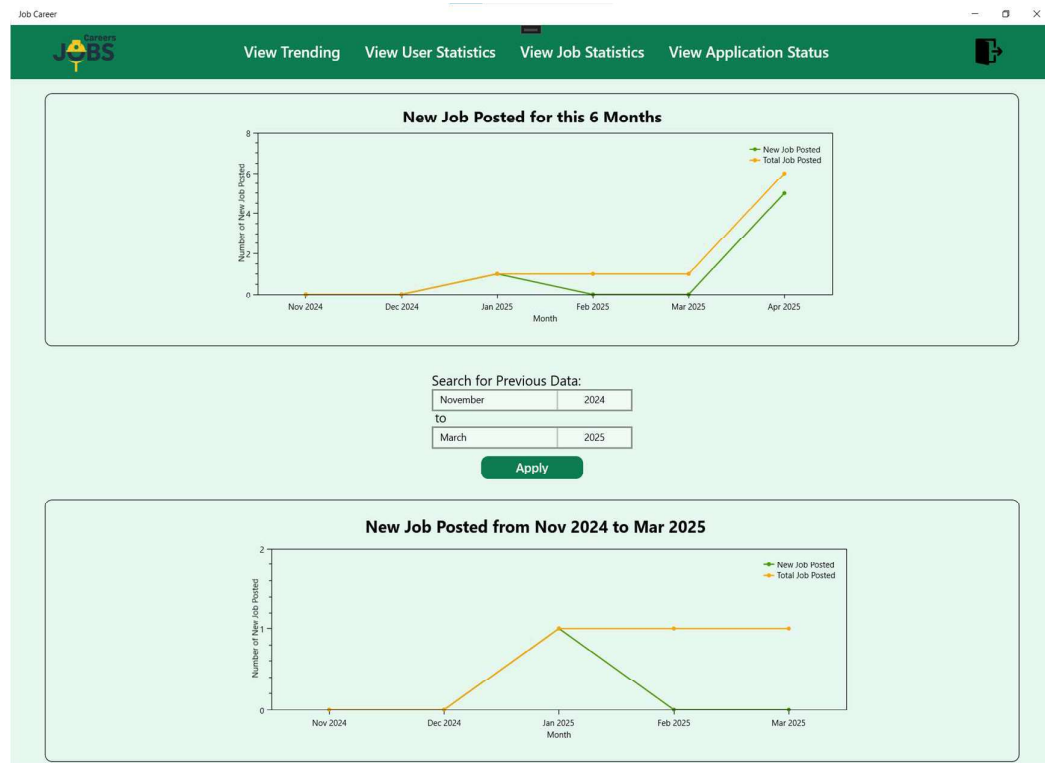


Figure 5.4.3.5 View Job Statistics

For the view job statistics page, owner can view the number of the total job posted in the system compared to the new job posted for each month in the system. Besides that, the owner also can perform the search by choosing the date range to see the data within the date range.

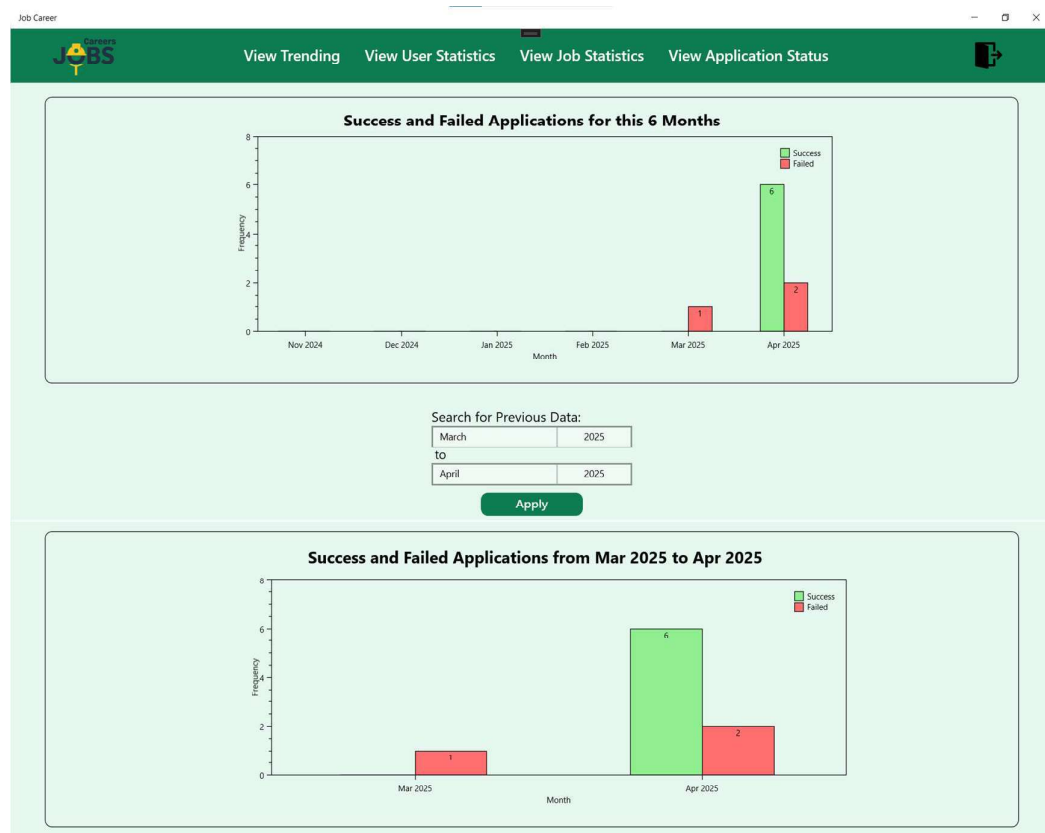


Figure 5.4.3.6 View Application Status

For the view application status page, owner can view the number of success and failed job applications that have been done in the application for each month. Besides that, the owner can search by the date range to see the data for the specific date range.

5.5 Implementation Issues and Challenges

The challenge that had been faced during the implementation and development is about the correctness of the dataset for technical skill and soft skill. Therefore, I need to go through the dataset for the skills to do adjustment for some redundant data and insert some missing data into the technical skill and soft skill dataset. This is because missing some skill might cause the system not efficient and the accuracy of the skill extraction will be lower.

CHAPTER 6

SYSTEM EVALUATION AND DISCUSSION

6.1 System Testing

Register Account

No	Test Case	Expected Output	Output	Action Needed
1.	Register Button Clicked with all field filled	Success message 'Register a new account successfully'	Success message 'Register a new account successfully'	Pass
2.	Register Button Clicked with email without '@' or domain name (.com, .my, etc.)	Warning message 'Invalid Email Format'	Success message 'Register a new account successfully'	Add on the checking is that '@' and domain name exists in the email or not
3.	Register Button Clicked with phone numbers less than 9 digit	Warning message 'Phone number must be 9 or 10 digits'	Success message 'Register a new account successfully'	Add on the checking on the phone number length
4.	Enter password '000', 'qwer1234', 'qwertyui'	Warning message 'Not fulfil the password requirement'	Warning message 'Not fulfil the password requirement'	Pass

Table 6.1.1 Register Account Testing

Forget Password

No	Test Case	Outcome	Result
1.	Enter wrong email or phone numbers	Warning message 'Incorrect email or phone number'	Pass
2.	Enter correct email and phone numbers	Success message 'Email and phone number had been verified!'	Pass
3.	Enter the password follow the required format	Success message 'Password Updated'	Pass

Table 6.1.2 Forget Password Testing**Login**

No	Test Case	Expected Output	Output	Action Needed
1.	Login Button Clicked with all field filled	Success message 'Login Successfully'	Success message 'Login Successfully'	Pass
2.	Login Button Clicked with enter the email without follow the register email casing	Success message 'Login Successfully'	Warning message 'Email not found'	Add on convert the email to lowercase for input and data from database then only perform the validation
3.	Login Button Click with all fields not filled	Warning message 'Please Enter Email and Password'	Application pauses	Add on the handling during button click with no field is filled.
4.	Login Button Click with wrong email	Warning message 'Email not found'	Warning message 'Email not found'	Pass
5.	Login Button Click with wrong password	Warning message 'Invalid Password'	Warning message 'Invalid Password'	Pass

Table 6.1.3 Login Testing

Job Seeker Search and Filter

No	Test Case	Expected Output	Output	Action Needed
1.	Filter Button Click with chosen criteria and value	Load the correct Job based on criteria and value	Load the correct Job based on criteria and value	Pass
2.	Filter Button Click without chosen criteria and value	Warning message ‘Both criteria and value must be filled’	No response	Add on the checking on the filter button to check is that criteria and value is selected or not
3.	Search Button Click with chosen criteria and value, got record found	Load and display job information	Load and display job information	Pass
4.	Search Button Click with criteria and value, but no record found	Warning message “Sorry does not have job match with the search”	No response, no warning message	Add on the checking, if not record return, then return the warning message

Table 6.1.4 Job Seeker Search and Filter Testing**Job Seeker Apply Job**

No	Test Case	Expected Output	Output	Action Needed
1.	Job Seeker details do not provide completely, and press ‘Proceed’ button	Warning message ‘Please fill your detail before proceed’	Able proceed to apply job	Add on the checking is that job seekers had provide all the information needed, else

				display warning message
2.	Job Seeker does not select the resume and press 'Proceed' button	Warning message 'Please select resume / cv'	Proceed without error	Add on the checking for resume section is that the radio button is check? Else display warning message
3.	Job Seeker does not select the job type and press 'Proceed' button	Warning message 'Please select job type'	Warning message 'Please select job type'	Pass
4.	Full Time - Select the start date before today	Warning message 'Please select the date greater or equal to today'	No warning message	Add on the checking for the date selected
5.	Part Time/Internship – Select the end date before start date	Warning message 'End date must be greater than Start date'	No warning message	Add on the checking for the start date cannot smaller than today and end date cannot smaller than start date
6.	Job seeker has select all the required field and check the checkboxes for term and conditions	Success message 'Job Apply Successfully'	Success message 'Job Apply Successfully'	Pass

Table 6.1.5 Job Seeker Apply Job Testing

Job Seeker Edit Profile Information

No	Test Case	Expected Output	Output	Action Needed
1.	Press 'Save Profile' button without filling in all the information	Warning message 'Please fill in all the information'	Success message 'Save Profile Successfully'	Add on the checking, make sure all field is enter value
2.	Enter email without '@' or domain name (.com, .my, etc.)	Warning message 'Invalid Email Format'	Success message 'Save Profile Successfully'	Add on the checking is that '@' and domain name exists in the email or not
3.	Fill in all the required information	Success message 'Save Profile Successfully'	Success message 'Save Profile Successfully'	Pass

*Table 6.1.6 Job Seeker Edit Profile Information Testing***Recruiter Post Job**

No	Test Case	Expected Output	Output	Action Needed
1.	Press 'Proceed' button without filling in any details	Warning message 'Please fill in all the required fields'	Warning message 'Please fill in all the required fields'	Pass
2.	Press 'Proceed' button with salary not selected	Warning message 'Please fill in all the required fields'	Success message 'Post Job Successfully'	Add on the checking is that the salary had been selected
3.	Press 'Post Job' button with empty row in the advanced feature (Weighted Score)	Warning message 'All the row in weighted score must be filled'	Success message 'Post Job Successfully'	Add on the checking, not allowed to post job if has empty row

4.	Press '+Add More' button with empty row in the advanced feature (Weighted Score)	Warning message 'Has empty row, not able to add new row'	Able to add new row	Add on the checking for each row is that any empty row, if yes prompt warning message 'cannot leave empty row before add new row'
5.	Press 'Delete Row' button when there is only one row in the advanced feature (Weighted Score)	Warning message 'Cannot delete, at least one skill is required'	Able to delete and cause no row in advance feature (Weighted score)	Add on the checking, if only has one row not allow to delete and prompt warning message 'not able to delete, at least one skill is required'

Table 6.1.7 Recruiter Post Job Testing

6.2 Project Challenges

The Challenges had been faced during developing this project is PDF generation. This is because PDF generation in this project is important which is used to generate the Offer Letter for the job seekers. Therefore, I have done research about how to generate the PDF [23], and it finally helped to solve the challenges that had been faced during the development. Besides that, another challenge during the development is selection of the theme color combinations. Because I do not have a strong skill in selecting suitable color combinations. So, I have done research to learn more about color combinations [24], after the research it gave me some idea and helped me to select the color combination to produce the project.

6.3 Objectives Evaluation

Basically, this online job application with job recommendations is developed to achieve the main objective. The first objective is to enhance automated skill extraction features. For the existing system, they do not provide the feature of extracting the skills from job seeker resume or job description. Thus, an online job application had been developed with the feature of automated skill extraction. With the features, job seeker's skills and the job description's skills can be extracted and displayed. The second objective is to enhance job matching and job recommendations features. For the existing system, they do not provide job matching and job recommendations features. Therefore, the proposed system had been developed with the feature of job matching and job recommendations. The system can perform job matching and recommendations based on the job seeker's skills and required skills from job description.

CHAPTER 7

CONCLUSION AND RECOMMENDATION

7.1 Conclusion

In conclusion, this proposed system (Online Job Application with Job Recommendations) carries out an efficient system to help job seekers find jobs and help recruiters to find the most qualified candidates for the job position. By providing skill extraction from the CVs, recruiters can save more time when reading job seekers CVs. Besides that, the proposed system also enhanced job matching and job recommendations by implementing Weighted Scoring Technique. With this technique, recruiter able to filter out those applicants by viewing their resume score. This will help job seekers increase their chances of getting a job. With these improvements, the proposed system might be useful and convenient for every user. The proposed system does not handle typing errors for the information extraction, this is because job applications need the correctness of any text including CVs.

7.2 Recommendation

The recommendation for the future improvement is to add on the word relationship during the matching skill process. With this recommendation, it might be able to increase applicant's resume score and the chance of applicant to get a job will be increased. Besides that, another future improvement that can be added into the proposed solution includes the OCR scanning to handle the resume is PDF image. Lastly, the last recommendation for the future improvement is to implement sending email as notification, due to the limitation of Universal Windows Platform (UWP) not allowed sent email automatically. For the future solution is to develop in another framework which allowed such as ASP.NET CORE and implement with EmailManager class [21], with the EmailManager class, recruiter can send email for them to inform they are highly matched with the job.

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POSTER



FACULTY OF INFORMATION COMMUNICATION AND TECHNOLOGY

Title : Online Job Application with Job Recommendations

INTRODUCTION

This Online Job Application is to provide job seekers and recruiter an efficient system to get a job or find worker



OBJECTIVES

1. Enhance automated skill extraction features
2. Enhanced job matching and job recommendation features



PROBLEM STATEMENT

1. Existing system does not support information extraction from resumes (CV)
2. Existing system lacks of resume scoring for job seekers

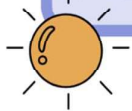


PROPOSED METHOD

1. Apply information extraction techniques on unstructured data from resumes (CV)
2. Apply Weighted Score calculation for resume scoring

WHY PROPOSED SYSTEM IS BETTER THEN EXISTING SYSTEM?

1. Effective - Upload the resume for information extraction rather than read the resume to get information
2. Resume score - System applies Weighted Scoring Technique for resume score calculation
3. User Friendly - Easy to use



CONCLUSION

By applying information extraction technique and weighted scoring technique, it able to enhanced the effectiveness and usability of the proposed application

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