

**IBM NALAIYA THIRAN 2022-23 PROJECT REPORT**  
**SKILL AND JOB RECOMMENDER**  
**TEAM ID - PNT2022TMID04440**

## **1. INTRODUCTION**

### **1.1 PROJECT OVERVIEW**

The Skill recommender system allows new or experienced employees to log in and look for positions through the search option, or they can directly communicate with the chatbot to locate their dream job. An end-to-end web application is developed that displays the current job vacancies depending on the user's skill set. The database stores the user and their information. When there is a job vacancy that matches the user's skill set, an alert is delivered. Users will communicate with the chatbot, and suggestions will be made depending on their skill. By using a job search API which pulls the data straight from website job seekers can acquire the most recent job vacancy in the market.

### **1.2 PURPOSE**

The recommender system technology attempts to assist users in finding jobs that fit their own interests; it has been successfully used in e-commerce applications to efficiently deal with challenges connected to information overload. Skill and Job Recommender systems helps the job seekers to get personalized recommendations of job vacancies based on their skill set.

## **2. LITERATURE SURVEY**

### **2.1 EXISTING PROBLEM**

Hiring a qualified candidate for a certain job is a time-consuming and labor-intensive procedure. Both businesses and job seekers are dealing with an increase in data overload and a time-consuming recruitment procedure. Because candidate profiles are so different, it is difficult for recruiters to locate the appropriate competencies. As a result, it is critical to determine the most important characteristics of each job candidate. The online recruitment specialist confronts significant hurdles in identifying relevant profiles among a large number of applications. This approach adds more manpower costs, time, and difficult-to-fill vacancies in the company.

## 2.2 REFERENCES

Sridevi, G. M., and S. Kamala Suganthi. "AI based suitability measurement and prediction between job description and job seeker profiles." *International Journal of Information Management Data Insights* 2, no. 2 (2022): 100109.

Mhamdi, D., Reda Moulouki, Mohammed Yassine El Ghoumari, M. Azzouazi, and L. Moussaid. "Job recommendation based on job profile clustering and job seeker behavior." *Procedia Computer Science* 175 (2020): 695-699.

Giabelli, Anna, Lorenzo Malandri, Fabio Mercorio, Mario Mezzanzanica, and Andrea Seveso. "Skills2Job: A recommender system that encodes job offer embeddings on graph databases." *Applied Soft Computing* 101 (2021): 107049.

Usabiaga, Carlos, Fernando Núñez, Lukasz Arendt, Ewa Gałęcka-Burdziak, and Robert Pater. "Skill requirements and labour polarisation: An association analysis based on Polish online job offers." *Economic Modelling* 115 (2022): 105963.

Aljohani, Naif Radi, Ahtisham Aslam, Alaa O. Khadidos, and Saeed-UI Hassan. "Bridging the skill gap between the acquired university curriculum and the requirements of the job market: A data-driven analysis of scientific literature." *Journal of Innovation & Knowledge* 7, no. 3 (2022): 100190.

Lord, Rhiannon, Ross Lorimer, John Babraj, and Ashley Richardson. "The role of mock job interviews in enhancing sport students' employability skills: An example from the UK." *Journal of Hospitality, Leisure, Sport & Tourism Education* 25 (2019): 100195.

## 2.3 PROBLEM STATEMENT DEFINITION

Though the person is Graduated they are not able to find the job based on their skillset. Not knowing where to search. Freshers are trying to explore in various fields but keep on failing in finding the right job which leads to lack of self confidence. Through email only the job seekers are directed to the concerned department since there is no particular platform for raising their queries for their respective skill based jobs.

### 3. IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP AND CANVAS

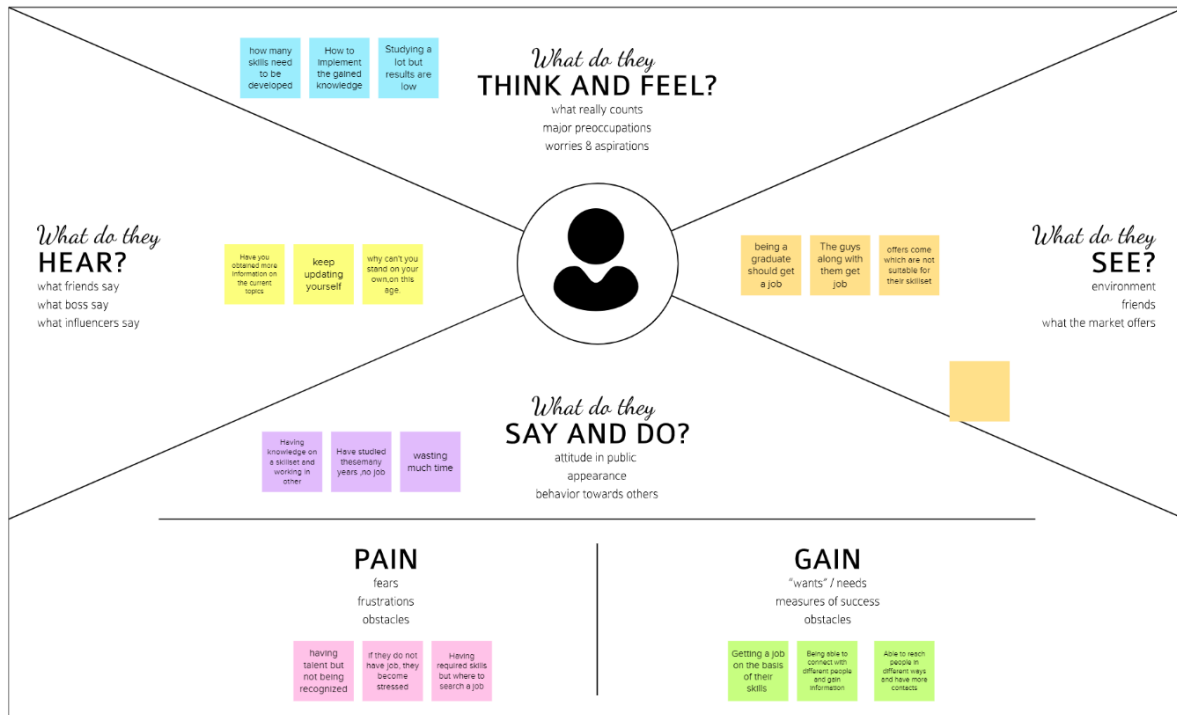


Figure 1 : Empathy map for Skill and Job Recommender

## 3.2 IDEATION AND BRAINSTORMING

1

### Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

Graduates are not aware of the way of searching the jobs

2

### Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

#### TIP



You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

#### Nandhidha

|                                      |   |
|--------------------------------------|---|
| Not knowing the platform to find job | What job will be suitable for my knowledge? |
| When will I get a job?               | How do I get assurance of the job?          |

#### Nandhinidevi

|                                     |                                    |
|-------------------------------------|------------------------------------|
| How will be my working environment? | Is it safe place to work?          |
| Do this job improve my knowledge?   | What are the benefits of this job? |

#### Nanthini

|  |   |
|--|---|
| How they provide a salary?                           | Is this approved organization?              |
| Don't know how to communicate with higher authority? | What are pre requisites needed for the job? |

#### Parkavi

|   |                          |
|---|--------------------------|
| If any free courses available to prepare for job? | How will be the job ?    |
| Is it safe to directly interact with third party? | Is the site interactive? |

#### Sasikambigai

|                               |   |
|-------------------------------|---|
| How to prepare to get the job | How to communicate with the experienced employees in the organization |
| Can I utilize all my skills   | Does the job fits with me?  |

3

## Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes

If any free  
courses  
available to  
prepare for  
job ?

Is the site  
interactive?

What are pre  
requisites  
needed for  
the job?

Don't know  
how to  
communicate  
with higher  
authority?

What are the  
benefits of  
this job?

Is this  
approved  
organization?

How will be  
the job ?

If any free  
courses  
available to  
prepare for  
job ?

4

## Prioritize

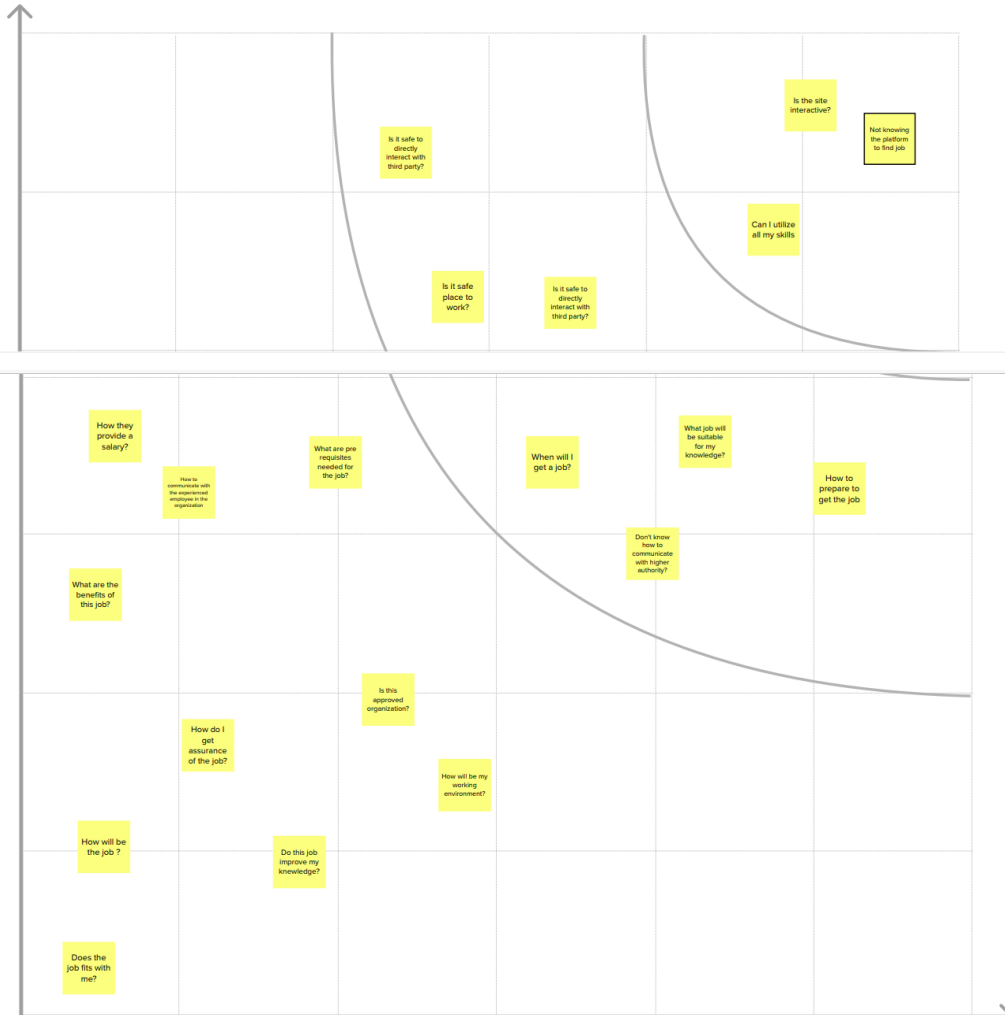
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes

3

**Importance**

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?



### 3.3 PROPOSED SOLUTION

Project team shall fill the following information in proposed solution template.

| S.No. | Parameter                                | Description  |
|-------|--|--|
| 1.    | Problem Statement (Problem to be solved) | Difficulties for finding the platform for job availability             |
| 2.    | Idea / Solution description              | Making a easier platform in finding jobs suitable to individual skills |
| 3.    | Novelty / Uniqueness                     | According to the skills updated the job availability will be displayed |
| 4.    | Social Impact / Customer Satisfaction    | Searching the Job availability will be easier                          |
| 5.    | Business Model (Revenue Model)           |  |
| 6.    | Scalability of the Solution              | highly scalable  |

## 3.4 PROBLEM SOLUTION FIT

Project Title: Job/Skill Recommender

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID04440

|  |  |   |  |  |
|--|--|---|--|--|
| Define CS, fit into CC                   | <b>1. CUSTOMER SEGMENT(S)</b><br><small>Who is your customer?<br/>i.e. working parents of 0-5 y.o. kids</small>  | <b>6. CUSTOMER CONSTRAINTS</b><br><small>What constraints prevent your customers from taking action on your idea?<br/>What obstacles of solutions? i.e. spending money, budget, no cash, network, connectivity, available devices</small> | <b>5. AVAILABLE SOLUTIONS</b><br><small>What solutions are available to the customers when they face the problem?<br/>or need to get the job done? What have they tried in the past?<br/>What pros &amp; cons do these solutions have? i.e. pen and paper is an alternative to digital note-taking</small> | Explore AS, differentiate                |
|  | Job seekers who are in seek of job   | 1.Scope<br>2.Cost<br>3.Time<br>4.Quality<br>5.Customer satisfaction<br>6.Resources  | Application designed with chatbot facility to clarify customer queries when needed   |  |
| Focus on J&P, tap into BE, understand RC | <b>2. JOBS-TO-BE-DONE / PROBLEMS</b><br><small>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides.</small> | <b>9. PROBLEM ROOT CAUSE</b><br><small>What is the real reason that this problem exists? What is the back story behind the need to do this job?<br/>i.e. customers have to do it because of the change in regulations</small>             | <b>7. BEHAVIOUR</b><br><small>What does your customer do to address the problem and get the job done?<br/>i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</small>       | Focus on J&P, tap into BE, understand RC |
|  | make user friendly for customers   | The increase in unemployment rate and not having guidance on available platforms  | 1. Identify the problem<br>2. Analyze the problem<br>3. Identify decision criteria<br>4. Develop multiple solutions<br>5. choose the optimal solution  |  |

|   |  |   |
|---|--|---|
| <b>3. TRIGGERS</b><br><small>What triggers customers to act? i.e. seeing their neighbor installing solar panels, reading about a more efficient solution in the news.</small>   | <b>10. YOUR SOLUTION</b><br><small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.<br/>If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small> | <b>8. CHANNELS of BEHAVIOUR</b><br><b>8.1 ONLINE</b><br><small>What kind of actions do customers take online? Extract online channels from #7</small><br><b>8.2 OFFLINE</b><br><small>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</small> |
| not knowing the platform to find job and increasing unemployment  | The user informations are stored in the Database. An alert is sent when there is an opening based on the user skillset. Users will interact with the chatbot and can get the recommendations based on their skills.  | -user can log into web API<br>they can search for the jobs<br>-by using chatbot recommendation also they can find the job based on their skill  |
| <b>4. EMOTIONS: BEFORE / AFTER</b><br><small>How do customers feel when they face a problem or a job and afterwards?<br/>i.e. lost, insecure &gt; confident, in control - use it in your communication strategy &amp; design.</small> |  |   |
| Emotions: Before unemployment increased time for searching job<br>Emotions: After Information about the jobs is easily available  |  |   |



## 4.REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task)  |
|--------|-------------------------------|---|
| FR-1   | User Registration             | Registration through emails or phone number<br>Registration through emails or phone number Email IDs.   |
| FR-2   | User Confirmation             | Configuration via email.<br>Configuration via OTP to phone number   |
| FR-3   | User requirement:             | Chat bots gets information properly.<br>It process quickly and easily.<br>It response depends on user's information.<br>It gives multiple languages to get information. |

### 4.2 NON-FUNCTIONAL REQUIREMENTS

Following are the non-functional requirements of the proposed solution.

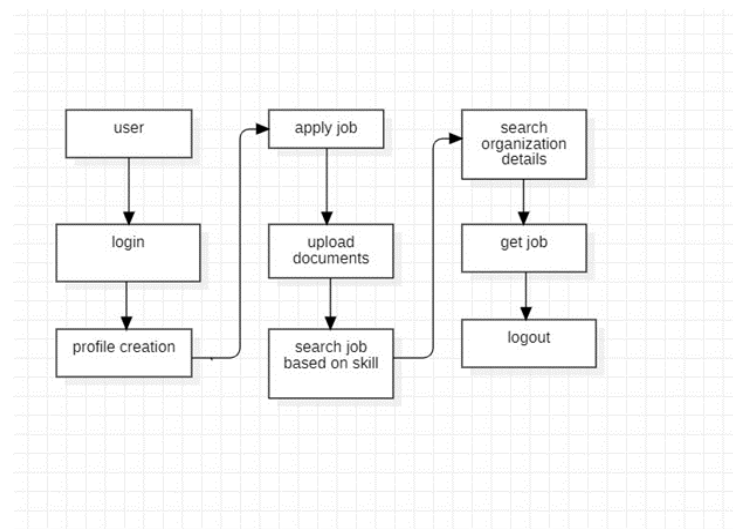
| FR No. | Non-Functional Requirement | Description  |
|--------|----------------------------|--|
| NFR-1  | Usability                  | Developers can put buttons that users get access easily. People with no understanding of French must be able to use the web. |
| NFR-2  | Security                   | Access permissions for the particular system information may only be changed by the system's data administrator.             |

|       |                     |   |
|-------|---------------------|---|
| NFR-3 | <b>Reliability</b>  | The database of the chatbot software must be updated frequently.  |
| NFR-4 | <b>Performance</b>  | The loading must be no more than 2 seconds for users that access the website using an LTE mobile connection.  |
| NFR-5 | <b>Availability</b> | New module deployment mustn't impact any issues in its performance.<br>And give the restore timings to display.<br>It should not take more than one to restore. |
| NFR-6 | <b>Scalability</b>  | The website traffic limit must be scalable enough to support more users at a time.  |

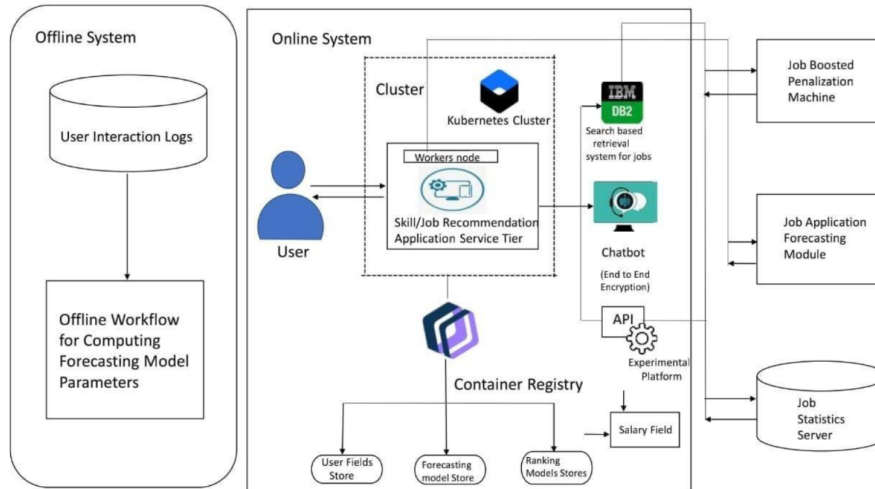
## 5.PROJECT DESIGN

### 5.1 DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE



**Table-1 : Components & Technologies:**

| S.No | Component            | Description   | Technology   |
|------|----------------------|---|--|
| 1.   | User Interface       | How the user interacts with the application e.g. Web UI, Mobile App, Chatbot etc. | HTML, CSS, JavaScript / Angular Js / React Js etc. |
| 2.   | Developing Interface | Developing application for the task   | Java / Python                                      |
| 3.   | Voice Assistance     | Voice commands instead of typing.   | IBM Watson STT service                             |
| 4.   | Chatbot Assistance   | Conversational Interface  | IBM Watson Assistant                               |
| 5.   | Database             | Data Type, Configurations etc.  | MySQL, NoSQL, etc.                                 |

|    |                                 |  |  |
|----|---------------------------------|--|--|
| 6. | Cloud Database                  | Database Service on Cloud  | IBM DB2, IBM Cloudant etc.                                     |
| 7. | File Storage                    | File storage requirements  | IBM Block Storage or Other Storage Service or Local Filesystem |
| 8. | Machine Learning Model          | Purpose of Machine Learning Model  | Object Recognition Model, etc.                                 |
| 9. | Infrastructure (Server / Cloud) | Application Deployment on Local System / Cloud Local Server Configuration:<br>Cloud Server Configuration : | Local, Cloud Foundry, Kubernetes, etc.                         |

**Table-2: Application Characteristics:**

| S.No | Characteristics          | Description  | Technology  |
|------|--------------------------|--|---|
| 1.   | Open-Source Frameworks   | List the open-source frameworks used   | Technology of Open source framework                 |
| 2.   | Security Implementations | List all the security / access controls implemented, use of firewalls etc.                     | e.g. SHA-256, Encryptions, IAM Controls, OWASP etc. |
| 3.   | Scalable Architecture    | Justify the scalability of architecture (3 – tier, Micro- services)                            | Artificial Intelligence (AI)                        |
| 4.   | Availability             | Justify the availability of application (e.g. use of load balancers, distributed servers etc.) | RAID(redundant array of independent disks)          |

| S.No | Characteristics | Description   | Technology           |
|------|-----------------|---|----------------------|
| 5.   | Performance     | Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc. | DRAM or flash memory |

### 5.3 USER STORIES

Use the below template to list all the user stories for the product.

| User Type              | Functional Requirement (Epic) | User Story Number | User Story / Task   | Acceptance criteria                                       | Priority | Release  |
|------------------------|-------------------------------|-------------------|---|---|----------|----------|
| Customer (Mobile user) | Registration                  | USN-1             | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account / dashboard                       | High     | Sprint-1 |
|                        |                               | USN-2             | As a user, I will receive confirmation email once I have registered for the application                   | I can receive confirmation email & click confirm          | High     | Sprint-1 |
|                        |                               | USN-3             | As a user, I can register for the application through Facebook  | I can register & access the dashboard with Facebook Login | Low      | Sprint-2 |
|                        |                               | USN-4             | As a user, I can register for the application through Gmail   |   | Medium   | Sprint-1 |
|                        | Login                         | USN-5             | As a user, I can log into the application by entering email & password                                    |   | High     | Sprint-1 |
|                        | Dashboard                     | USN-5             | As a user, I can access my dashboard after logging in into the account                                    | I can access my dashboard                                 | High     | Sprint-1 |
| Customer (Web user)    | Access                        | USN-6             | As a user, I can access, setup my profile and basic details by logging in                                 |   |          |          |

|                         |                                      |                          |  |   |                 |                |
|-------------------------|--------------------------------------|--------------------------|--|---|-----------------|----------------|
|                         |                                      | USN-7                    | As a user I can upload my required documents and resume            | I can use the application to complete a variety of tasks. | Medium          | Sprint-1       |
| <b>User Type</b>        | <b>Functional Requirement (Epic)</b> | <b>User Story Number</b> | <b>User Story / Task</b>   | <b>Acceptance criteria</b>                                | <b>Priority</b> | <b>Release</b> |
| Customer Care Executive | chatbot                              | USN-9                    | As a user, I can consult with the customer service representative. |   | High            | Sprint-1       |
| Administrator           | Application                          | USN-10                   | As a Administrator I can manage the application                    | I can fix the problem arise from customer and application | High            | Sprint-1       |

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 SPRINT PLANNING AND ESTIMATION

Use the below template to create product backlog and sprint schedule

| <b>Sprint</b> | <b>Functional Requirement (Epic)</b> | <b>User Story Number</b> | <b>User Story / Task</b>  | <b>Story Points</b> | <b>Priority</b> | <b>Team Members</b> |
|---------------|--------------------------------------|--------------------------|---|---------------------|-----------------|---------------------|
| Sprint-1      | Registration                         | USN-1                    | As a user, I can register for the application by entering my email, password, and confirming my password. | 2                   | High            | Nandhidha GC        |
| Sprint-1      |                                      | USN-2                    | As a user, I will receive confirmation email once I have registered for the application                   | 1                   | High            | Nandhinidevi S      |
| Sprint-2      |                                      | USN-3                    | As a user, I can register for the application through Facebook  | 2                   | Low             | Nanthini PL         |

|          |           |        |   |   |        |                |
|----------|-----------|--------|---|---|--------|----------------|
| Sprint-1 |           | USN-4  | As a user, I can register for the application through Gmail                       | 2 | Medium | Parkavi M      |
| Sprint-2 | Login     | USN-5  | As a user, I can log into the application by entering email & password            | 1 | High   | Sasikambiga CJ |
| Sprint-2 | Dashboard | USN-6  | As a user I can find the Jobs available according to my skills                    | 5 | High   | Nandhidha GC   |
| Sprint-3 |           | USN-7  | As a user I have rights to know about the availability of job vacancies           | 3 | Medium | Parkavi M      |
| Sprint-3 | Admin     | USN-8  | Admin can be updated with job availabilities and collaboration with new companies | 4 | High   | Nanthini PL    |
| Sprint-4 | For help  | USN-9  | Users can contact admin for any help on the bot                                   | 5 | High   | Nandhinidevi S |
| Sprint-4 | Reviews   | USN-10 | feedback for the website used can be provided by the users                        | 5 | Medium | Sasikambiga CJ |

## 6.2 SPRINT DELIVERY SCHEDULE

| Sprint   | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
|----------|--------------------|----------|-------------------|---------------------------|---|------------------------------|
| Sprint-1 | 20                 | 6 Days   | 20 Oct 2022       | 26 Oct 2022               | 20  | 30 Oct 2022                  |

|          |    |        |             |             |    |  |
|----------|----|--------|-------------|-------------|----|--|
| Sprint-2 | 20 | 6 Days | 26 Oct 2022 | 02 Nov 2022 | 20 |  |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 |    |  |
| Sprint-4 | 20 | 3 Days | 16 Nov 2022 | 19 Nov 2022 |    |  |

## 7. CODING & SOLUTIONING

### FEATURE 1: INTEGRATING CHATBOT TO HTML PAGE

```

<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta http-equiv="X-UA-Compatible" content="IE=edge">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Document</title>
</head>
<body>
<h1>My Chatbot</h1>
<blockquote>Click the bottom right corner to chat</blockquote>
<script>
window.watsonAssistantChatOptions = {
integrationID: "01ca5fe5-3f42-4a97-8965-332afedd97be", // The ID of this
integration.
region: "au-syd", // The region your integration is hosted in.
serviceInstanceID: "5683f375-e95c-4fa1-8471-5b76177675c2", // The ID of your
service
instance.
onLoad: function(instance) { instance.render(); }
};
setTimeout(function() { const t=document.createElement('script');
t.src="https://web-chat.global.assistant.watson.appdomain.cloud/versions/" +
(window.watsonAssistantChatOptions.clientVersion || 'latest') + "/WatsonAssistantChatEntry.js";
document.head.appendChild(t); });

```



## **8.TESTING**

### **8.1 TEST CASES**

- Verify the user is able to login to the application or not
- Validating the user with username and password
- Verifying the user database

### **8.2 USER ACCEPTANCE TESTING**

The application enables users friendly requirements and satisfies the user requirements completely

By distributing the application to remote users and requesting them to utilise it, real-world testing was also carried out. Up until all of their concerns were resolved, their challenges were corrected and tested once more.

## **9.RESULTS**

### **9.1 PERFORMANCE METRICS**

The Performance metric of the application is measured based on how the job seeker can effectively find the job based on their skill set.

## **10.ADVANTAGES & DISADVANTAGES**

- The advantage of this application includes a chatbot feature for finding the suitable job based on their skills and consumption of time is less for searching for a job on a website.
- The disadvantage may include the application is unable to detect the fake document.Chatbots can be costly to operate: due to the learning curve, it may require a dedicated human to manage and maintain it. The user's profile was left incomplete.

## **11.CONCLUSION**

Artificial intelligence-powered chatbots and personal assistants are fundamentally altering business. Numerous chatbot development platforms are available for a variety of businesses, including e-commerce, retail, banking, leisure, travel, healthcare, and so forth. Chatbots are more effective than humans at reaching out to a large audience via messaging apps. They have the potential to become a capable information-gathering tool in the near future.

## **12.FUTURE SCOPE**

Chatbots' future scope may encompass numerous benefits for organizations, but experts warn they must be carefully steered in the proper path for firms to realize these benefits.

Andy Peart, chief marketing and strategy officer of Artificial Solutions, a global software business, sees training data as a significant barrier to entry for organizations looking to implement chatbots.

This is especially true for increasingly complex chatbots that attempt to grasp intent and answer in natural language emulating human speech.

### **12.1.VOICE INTERFACE**

If the future requires smart chatbots that do more than employ programmed, single-turn dialogues, their interface must also evolve.

A voice interface can help users with impairments or those who are distrustful of technology, but it also necessitates the creation of another layer of NLP.

### **12.2.FUTUREBOTS**

Although voice interface is optional, chatbots have been in use long enough for developers and experts to decide which aspects of chatbots are essential.

NLP(Natural Language Processing) development, human-like conversational flexibility, and 24-hour support are critical to chatbot survival in business contexts.

Chatbots are AI devices, and in the future, they must stay up with AI developments such as automatic machine learning, simple system integration, and rising intelligence.