ACCUJOB - JOB SEARCH AND OPTIMIZATION WEBSITE

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Abstract: Internet is a resource which has become so important that we cannot imagine our lives without it in the today’s modern era. Internet has various function. This resource can be effectively used for the job searching process. The conventional methods should be modified and moved online. The concepts of software engineering have been applied to develop a website that can help in the job search process and make it easy and less time consuming as compared to the conventional methods. This website gives the percentage chances of the person getting recruited and tells them if they are qualified, under-qualified or over-qualified for the wide range of jobs that they have selected from the website. All the stages of the software development processes from requirements specification to testing have been documented and summarized in this paper.

Index Terms - internet, recruitment, qualification, job.

I. INTRODUCTION

In today's world, everything has become online and making everything available online is something that everyone is working on. In the times of pandemic when people were not able to go out, it was very difficult for them to find jobs and it is during this time that there have to be some websites or applications which can provide opportunities for job seekers to find the job they are looking for.

Considering this, we have decided to build a website called "Accu Job". This website helps the people who are searching for jobs in showing them the list of the jobs that they are eligible for helping them in finding their jobs quickly and also improving on the skills they have presently so that they can improve on the skills and develop themselves so that they will be industry ready.

While building this process, Software development life cycle was followed properly in order to achieve the goals that are needed in a proper manner. The SDLC model chosen was Waterfall and all the phases of the waterfall model were followed as the project demands. Following the Software development processes made the path leading to the application very understandable and easy.

Diving right into the project without having proper knowledge about the requirements and other stuff will only lead to the improper functioning of the application.

II. PROBLEM STATEMENT

AccuJob is a web app which aims at solving the area of uncertainty in the regular job-portal market. By uncertainty we mean, suppose that one candidate applies for a job and then he/she has to wait for a long time till they hear back from the company, or they might not hear back from the company at all. This means a lot of time has been wasted already which could be utilized doing skill development or job searching. AccuJob solves this problem by using two algorithms. A sorting and a scoring algorithm. The scoring algorithm scores the applicant based on the qualifications they have entered in the website and then the sorting algorithm ranks these applicants based on this score whenever they apply for a specific job. This tells the user the chance of them securing a job and if they feel it is less, they can apply for another job.

III. OBJECTIVE

In the current world having a job is really necessary for living a comfortable life. Getting a job is not at all an easy task as there is so much competition in the current world and also specifically due to this pandemic situation. This project tells the people their chances of being recruited in the company they have applied for.

IV. LITERATURE REVIEW

Internet usage has increased from practically zero to 70% of the population in the last ten years. Although research has lagged behind popular opinion, many people believe that the Internet has improved job search efficiency for job seekers. Additionally, it appears that effort has been divided between different job seeking activities as a result of the Internet. However, there is some
indication that the unemployed are getting more choosy about the positions they finally apply to. The unemployed are now more likely to have looked at adverts and to have contacted an employer directly.[7]

Proposed System

The system's objective is to enable job seekers to search for positions based on their talents, geography, and desired role. The job seekers are competent in all fundamental tasks, including updating and adding information as well as retrieving information. To ensure that they are shortlisted, job seekers can provide an updated version of their resume based on the capabilities the employer needs. The website also assists job seekers in creating a resume that adheres to standards and meets the level at which employers anticipate it to be. “The benefits include data centralization, real-time status reporting, user-friendliness, convenience, and protection, among others. This programme lessens the burden of managing and keeping track of the workings of individual departments in a university.[5]. The job seeker's submitted email address will be used to alert them of any updates pertaining to the job seeker. The employer can update the roles he needs filled as well as view and evaluate all of the candidates who have applied for open positions. The applicant will be notified through email of any updates on their application for the position the company is seeking. The list of candidates who have applied to the organization with all of their information, including the role they have applied for and a resume, will appear on the employers' dashboard.

Fig. 1. System Overview

V. SOFTWARE REQUIREMENTS SPECIFICATION (SRS)

5.1 Product Perspective

This is a new, self-contained product. Waterfall model has been chosen for the project. The reason for choosing Waterfall Model are Waterfall model is also known as the linear sequential life cycle model. In this model the whole operation is divided into phases and one phase is started only when the previous phase has been fully completed. Waterfall model is implemented when the following conditions occur: When the system requirements are known, clear and fixed. Product definition is stable in nature. Technology is understood. No ambiguous requirements. Project is short. Ample resources with expertise available freely. Waterfall model was chosen because - We are aware of our system requirements, which amounts to only a PC and a webhosting service. The product definition is a job portal that uses a simple arithmetic algorithm to rank job preferences for suitable candidates.

The technology needed here is a PC, a web hosting service and a working and functional knowledge of the following languages: Java-script, PHP, HTML. As of yet, there are no ambiguous requirements in the project. However there arises any, will be intimidated in the further versions of the SRS. The project is a small web application, and thus short.
5.2 Product Functions
Some of the major functions of the product are:

- The under-qualified candidates will get a message that they are not qualified enough for the job and they need to apply for some other positions and will be given some suggestions according to their skills.
- The over qualified people also will also receive a message that they are over qualified for the job and will be given suggestions.
- While the qualified people will be given ranks according to their skills that will in turn give them their chances of being recruited and similarly reduce the time consumed for the recruiter by giving them the best possible options.
- The percentage chances of the person getting recruited is another major attraction of the website.

5.3 User Classes and Characteristics
Majority of the users using our website are assumed to be of age group 21-25, these are the students who have freshly graduated from their colleges and now are in search of the jobs. This is the group that is well aware of the technical advancements as compared to other age groups. This can be used by student from any background either B Tech, BSc, BA or any other field. The people in other age groups looking for job are lesser so these are people who will use the website the least. The user here is expecting to find a job that suits him and also for which he’s equally qualified (not under-qualified or over qualified) such that he can live a peaceful life ahead.

5.4 Operating Environment
This is a web-based system and hence will require operating environment for a client and server GUI. This will be operating in the following:

i) Distributed Database \(\rightarrow\) Use of distributed database helps in
   a) Management of data with different levels of transparency.
   b) The performance of the website gets improved.
   c) It is easy to expand i.e., increasing database size, adding more data.
   d) The reliability on the website is increased because of the distributed database.

ii) Client / Server System \(\rightarrow\) We are client server system because
   a) All the data is concentrated in a single place i.e., the server so there will data protection and security.
   b) It will be easy to upgrade, replace or relocate the nodes in the client server.

iii) Operating System: Windows \(\rightarrow\) We are using Windows because majority of the people use Windows laptops only so it will be easy, but any other operating system is totally fine as it works in all kinds of Operating Systems.

iv) Database: MongoDB \(\rightarrow\) We are using MongoDB because:
   a) Data Security is more
   b) The performance is good.

v) Platform: NodeJS and JavaScript \(\rightarrow\) Java and is used for Back-End Development and HTML5, JavaScript and CSS for Front-End.

5.5 Design and Implementation Constraints

i) The speed of the website can be an issue. The page might generally take more than 5 to 7 seconds to load if we put more graphics (i.e., images or videos of bigger sizes) into the page or that will be fine.

ii) One more important design constraint may be the viewing mode of the website. The website is actually built for a normal screen size but if it is viewed from a mobile phone, it might be a problem in some cases only.

iii) The UI/UX part maybe an issue.

iv) As this is a basic web page, data security can be an issue. Data can be leaked.

v) The user needs to know English as the website is written in English language only.

vi) Sometimes there may be a delay in the delivery of OTP or any message or any mail to the user because of some issues.

vii) The responsibility of maintaining the website will fall completely on the maintenance team.
5.6 Interfaces

5.6.1 User Interface
As soon as the site opens on the top there is the logo of the website. Right next to it are many options like jobs, recruiters, companies, tools and login options available. In the jobs option you can see all the jobs that are available in the country from all fields. In the recruiter option you can see all the companies that are recruiting currently. Then in the tools section you can make changes in your profile sign out or see the notifications. The last option is the sign in option through which you can sign into your account. There is also a option of the preferred city of the user and also the area of his job search like Engineering, Teaching, Research etc. If any image is not displayed and if “Image” is displayed, the user needs to assumethat there was an image over there but due to some reasons the image is not opening in the particular user’s system. There will be an error message popping up if you don’t enter a proper valid email ID. The email ID must work.

5.6.2 Hardware interfaces
There are no major hardware requirements. Just the basic ones like a computer or laptop or mobile with internet connectivity will work.

5.6.3 Software interfaces
i) The system that the customer is using must have an HTML editor to view all the code that we have for developing the website. There are many available like Brackets, Visual Studio Code etc.
ii) Some tools are needed to upload files to the website like uploading Resume, CV.
iii) The communication between the database and the web portal consists of operation concerning both reading and modifying the data.

5.6.4 Communication interfaces
The communication between the systems is an important part as every page is dependent on another but in way the communication is achieved is not important as it handled by the underlying operating systems for the web portal. There are only two communication requirements:
Email: The person will be notified via email on every step of the job search process.
Mobile Number: The person will be notified via message on every step of the job search process.

5.7 System Features

5.7.1 Finding Jobs according to your wishes
5.7.1.1 Description and Priority
The stakeholders of this project are the End Users i.e. Employee, Employer, Database Administrator, Front End Developer, Back End Developer, Government. This website allows the users to find the jobs according to their wishes and tell them their percentage chances of getting employed according the required qualifications mentioned by the recruiter.

5.7.1.2 Stimulus/Response Sequences.
According to the qualifications entered by the user and the qualifications mentioned by the recruiter, both of them are compared and points are given on the basis of similarities of the qualifications and then the percentage is given, which determines whether the person is under-qualified, over-qualified or enough qualified.
5.7.2 Functional Requirements User Sign Up or Login:
5.7.2.1 Description and Priority:
This is for the user. If the user is first time user then he must create a new account for himself. If he has an account, he can directly login into the account. The priority of this particular requirement is high.
5.7.2.2 Stimulus/Response Sequences:
This can be stimulated by going to the top right of the page i.e. the right side of the navigation bar and click on either Sign Up or Login. On clicking it takes to a new page where the details are to be entered.

5.7.3 Functional Requirements:
The user has to do it to go the next page for uploading his documents. The user must have a valid email account.
5.7.3.1 Description and Priority:
After logging in, there will be options to enter your details like the name, DOB, Skills, interests, hobbies and also an option to upload the certificates which are a must and the priority is high
5.7.3.2 Stimulus/Response Sequences:
The options to enter the details will be visible properly on any screen and the user can understand easily on seeing it and there will be option after the details where you can upload the certificates and after writing everything, there will be a submit button which on clicking displays uploaded successfully.

5.7.4 Functional Requirements: Retrieve Password
These particular details can be used to find the percentage chances of him getting placed in a company.
5.7.4.1 Description and Priority:
If the user has forgotten his/her password and if he wants to login again and reset the password, he can use the forgot password button in the Login page. The priority of this step is medium as it is completely based on the user
5.7.4.2 Stimulus/Response Sequences:
The Forgot Password option will be available in the Login Page and on clicking the button, he/she will be redirected to another page where he has to enter either his email or phone number to which an OTP will be sent and on entering the correct OTP, he/she will be able to reset the password.

![Use Case Diagram](image)

Fig. 3. Use Case Diagram

VI. SOFTWARE DESIGN SPECIFICATION (SDS)

6.1 Design Methodology
Some principles to be followed while making the website are:
- The design must be consistent across web pages. For example, each page of the site will have a navigation bar with all the links.
- The website must be responsive or mobile compatible.
- For easy navigation we will have a navbar which can be used to navigate to all the pages of the website.
- To establish effortless communication with the visitors, information will be organized by making good use of headlines and sub-headlines, cutting the waffle, and using bullet points.

6.2 Pseudocodes for core components
SCORING ALGORITHM TO DETERMINE QUALIFICATION SCORE FOR EMPLOYEE
Step 1 - START
Step 2 - Import numpy, mysql.connector
Step 3 - Declare cursor function // This function helps us iterate through the rows //
Step 4 - Import reference database
Step 5 - Import database containing qualifications
Step 6 - Start a WHILE loop
Step 6.1 - In the FOR function, iterate through each row of the employee table containing qualifications.
Step 6.2 - For each iteration, search for matching qualification in the reference database.
Step 6.3 - Allocate the allotted point of the qualification in the reference database to the similar database in the employee table.
Step 6.4 - Keep adding the scores till iteration stops.
Step 6.5 - Assign variable a = (sum of scores)
Step 6.6 - End the WHILE loop
Step 7 - Repeat the same process for all the employees
Step 8 - Create a table which contains all the EmployeeIDs (primary key) and their respective total scores.
Step 9 – STOP

SORTING ALGORITHM TO SORT THE EMPLOYEE BASED ON THEIR SCORE
Step 1 - START
Step 2 - Import numpy, mysql.connector
Step 3 - Declare a cursor function // This function helps us iterate through the rows //
Step 4 - Import the database created by the scoring algorithm
Step 5 - Read the data of each rows containing the employee ID and their respective score.
Step 6 - Apply QUICKSORT to this data.
Step 7 - Create a new table with the sorted list.
Step 8 - This list determines the applicant's scope of securing a job.
Step 9 - STOP

6.3 Architecture
The AccuJob system architecture is designed to maintain a database server which stores the information of all our clients and all the processes, a login/logout type interface, a server to run our sorting and scoring algorithms which determines job probability and a visual interface to display the end result of our processes. All this is carried out in synchronicity using transfer protocols, such as TCP/IP, FTP, HTTP etc.

6.4 Subsystem and Components
The user sees the homepage of the website, on it there are many options like jobs which will show all the available job titles or posts available on the website. Next option is recruiters which shows all the companies which have posted jobs on the site. Under the services section there are two options one is Sample Resume and another is Interview Questions. The former gives the job seekers some sample resumes from which the users can design their own resumes and the other options gives the list of interview questions which the user can see in order to prepare for his/her interview. Then there is a LOGIN and a signup option. Clicking on either gives two options for employee or for company.

For Job Seeker:
On clicking the Signup option for employee, the user is directed to the signup page, where the user needs to fill up some basic information like Name (first and last), email ID, phone number, password, address (line 1 and line 2), city, state, ZIP code and country. After filling up the details, user is taken to the profile page.

On clicking the sign in option, the sign in page opens where the user needs to enter a email ID and password. If the password and email ID is correct then dashboard opens which displays the jobs.

On the profile page the user needs to fill his/her name, qualifications, skills, area of interest (Field in which user wants to pursue his/her career), prefereed location for the job(city). After this is done, dashboard opens.

On the dashboard all the available jobs are available on the basis of area of interest and preferred location given by the user. Here the name of the company, job title, pay per month and last date to apply all these details are available. If the users like the mentioned things he/she can click on view details button.

On clicking view details, the details given by the company are available including salary, company logo, company name, last date to apply, job title, about the company, skills required for the jobs and most importantly it shows the percentage chances of user getting recruited for the job. If the user likes everything, he can click on Apply now option.

On clicking apply now a page opens up where the user needs to upload his/her resume and submit. For Company

On clicking the Signup option for company, the user is directed to the signup page, where the user needs to fill up some basic information like Company Name, company’s email ID, phone number, password, address (line 1 and line 2), city, state, ZIP code and country. After filling up the details, user is taken to profile page.

On clicking the sign in option, the sign in page opens where the user needs to enter the email ID and password. If the password and email ID is correct then dashboard opens which displays all the candidates.

On the profile page the user needs to fill the name of the company, Job title, available posts, salary, skills required, Job description, logo of the company and the last date to apply. After this is done, dashboard opens.

On the dashboard the Employers can see the list of people who have applied for the job along with their skills and qualifications. If the company is interested, they can click on View details. This page will show name of the candidate, the post he/she has applied for, about the candidate section includes Skills and qualifications of the candidate. It also shows the percentage chances of the candidate getting selected to the company. If the company likes it there is an option download resume from which the company can download the person’s resume. After reading the resume, if the employer likes the candidate, they can call him/her for the interview.
6.5 Database Schema
MongoDB database has been used for this project. New tables have been made for storing data. They are:
- Employee – Employee table is related to all the data of the particular employee.
- Employer – Profile table is related to all the data of the particular employee.

VII. ANALYSIS MODELS

Fig. 4. Activity Diagram

Fig. 5. State Transition Diagram
Fig. 6. Class Diagram

Fig. 7. Entity Relationship Diagram
VIII. IMPLEMENTATION AND TESTING

In this part of the paper, we shall be able to see the testing methods, testing processes, and the test results that we obtained when performing these tests on AccuJob. To facilitate testing, Cyclomatic Complexity, and automated testing tool Selenium has been used.

8.1 Routes or Modules

There were various algorithms that facilitated the execution of Cyclomatic Complexity. The pseudocode for these algorithms are numerous, and we have provided the codes which facilitate the Cyclomatic Complexity.

\[ \text{Cyclomatic complexity} = E - N + 2P \]

Where,

- \( E \) = number of edges in the flow graph
- \( N \) = number of nodes in the flow graph
- \( P \) = number of nodes that have exit points

So cyclomatic complexity = 12 – 10 +2 = 4

8.2 Testing

Testing is a stage in software development that is as important as implementation. Testing helps us uncover error, flaws and defects in our code and implementation of the project. Based on the Cyclomatic Complexity calculated, test cases were generated. Manual testing was carried out on these components first and the results were noted down. The results of manual testing are summarized in the following table.
<table>
<thead>
<tr>
<th>Test Case ID</th>
<th>Test Objective</th>
<th>Test Data</th>
<th>Expected Results</th>
<th>Actual Results</th>
<th>Test Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST CASE 1</td>
<td>LOGIN (Employee)</td>
<td>username: root password: cmpt@123</td>
<td>Employee Dashboard</td>
<td>Display Employee Dashboard</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 2</td>
<td>LOGIN (Employer)</td>
<td>username: apple password: apply@123</td>
<td>Employee Dashboard</td>
<td>Display Employee Dashboard</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 3</td>
<td>SIGN UP (Employee)</td>
<td>FirstName: Rohit LastName: Barry username: rbt PhoneNumber: 867-684-3211 Skills: C++, Python...</td>
<td>Employee Login</td>
<td>Display Employee Login</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 4</td>
<td>SIGN UP (Employer)</td>
<td>CompanyName: Apple username: apple PhoneNumber: 867-684-3211 Skills Required: C++, Python...</td>
<td>Employee Login</td>
<td>Display Employee Login</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 5</td>
<td>Employee Dashboard</td>
<td>View Details of the Company button</td>
<td>Apply Page (Employer)</td>
<td>Display Resume Upload Page (Employees)</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 6</td>
<td>Apply Page (Employee)</td>
<td>Apply Now button</td>
<td>Resume Upload Page (Employees)</td>
<td>Display Resume Upload Page (Employees)</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 7</td>
<td>Resume Upload Page (Employees) before uploading</td>
<td>Upload file option</td>
<td>Resume Upload Page (Employees) after uploading</td>
<td>Display Resume Upload Page (Employees) after uploading</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 8</td>
<td>Resume Upload Page (Employees) after uploading</td>
<td>Submit button</td>
<td>Employee Dashboard (without the details of the company applied)</td>
<td>Display Employee Dashboard (without the details of the company applied)</td>
<td>Pass</td>
</tr>
<tr>
<td>TEST CASE 9</td>
<td>Employer Dashboard</td>
<td>View details button</td>
<td>Call for interview page displaying the details</td>
<td>Display Call for interview page displaying the details</td>
<td>Pass</td>
</tr>
</tbody>
</table>

Fig. 10 Test Case Table part 1

<table>
<thead>
<tr>
<th>Test Case 10</th>
<th>Call for interview page displaying the details of the particular employer (before downloading the resume)</th>
<th>Download resume button</th>
<th>Call for interview page displaying the details of the particular employer (after downloading the resume)</th>
<th>Display Resume Page (Employees)</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST CASE 11</td>
<td>Call for interview Page displaying the details of the particular employer (after downloading the resume)</td>
<td>Submit button</td>
<td>Employee Dashboard</td>
<td>Display Employee Dashboard</td>
<td>Pass</td>
</tr>
</tbody>
</table>

Fig. 11 Test Case Table part 2

There are total 17 test cases. They have been displayed in the above tables. We will look at the program flow diagram for the create new profile route to understand how the test cases were derived from it.

Once the user (employee/employer) finishes registration and uploaded the relevant skills that are required for the creation, maintenance, and functioning of the account then we can use the inserted information as a part of the testing processes.
The testing tool used for the testing of AccuJob was the automated testing software, Selenium. It tested various aspects of the website, such as the time duration of each request, errors, failed tests, passed tests, DNS and SSL behavior, etc.

Here are a few screenshots of the testing results obtained.

![Test Report for Employee Login](image)

In Fig. 14 we can see the various tests that the automated software has performed and the test targets that the test was supposed to perform.
The testing results hence help us understand that the website is reliable and can maintain its efficiency under high pressure conditions. It is also fairly accurate and errorless.

IX. RESULTS AND DISCUSSION

Fig. 14. Automated Testing Results for Employee Home page

Fig. 15. Index Page
Fig. 16. Home Page

Fig. 17. Employee login page

Fig. 18. Employee Dashboard
The AccuJob team treats this project as a journey, because at the starting of the project, this was just an idea and then each member realized the skills required, learnt it and also successfully implemented it. The team has gotten exposed to an in depth level as to how to make a web app and how to make it user friendly and intuitive.

By implementing the things learnt in the subject, the path became easier, as we knew how to proceed and what model to follow (Waterfall model) and how to conduct testing, how to manage documentation, etc.

Another important technical aspect the team learnt in this time was designing and implementing a user friendly and intuitive GUI (Graphic User Interface) which makes the web application attractive as well as functionally fluid.

As taught in the subject, testing and planning were not treated as two separate entities nor were there any specific phases to execute these operations. They were maintained and executed all along the development of the application, at times when the modules were independently created and also when they were joined to function as a whole.

At the end, it is necessary to say how the team has experienced Software Engineering. The whole team feels that it is an essential subject, as everybody can learn how to code, however, without knowing how to document things properly, or what model to follow so as to get the best results in the shortest time, things can become a mess. Software Engineering Methodologies helps us prevent that and increase efficiency to the optimum level.

X. ACKNOWLEDGMENT

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