

# **DEVELOPING A JOB APPLICATION TRACKING SYSTEM**

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A dissertation submitted to  
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in partial fulfilment of the requirements for the degree of  
**MASTER OF SCIENCE.**  
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## STATEMENT:

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# Abstract

A major issue faced by students during the last year of the graduation or after completion of their course is placement in desired companies. Students find it difficult to get a clear and consistent feedback on their job applications, affecting their employability substantially. Currently, there is no mechanism that helps students to get feedback on their Curriculum Vitae (CV), preventing students from updating their skills or being aware of the need of acquiring new skills, affects their career prospectus. Therefore, having an effective mechanism that helps students to get an insight of their job applications is vital for them to improve their career prospectus. The purpose of this project was to develop such a mechanism.

The project aimed to develop a job tracking system that addressing the prevailing problem by enabling students to inform about their job applications progress to instructors and professors, resulting in feedback from professors which will help students to acquire skills and make amendments to their resume to increase likelihood of getting a job.

The system is built using Node.Js for the middleware, and the front end of the system is built by using HTML5 and CSS3. The back end of the system is developed using PostGreSQL server.

The project has been successfully developed but with certain limitations such as static text messaging system, limited number of users can operate the system simultaneously, case sensitive search, vulnerability to cross site forgery, and is not only a web application.

In future, the system could be improved further by making a dynamic text messaging system, adding a feature of face-to-face meeting, increasing scalability by allowing more users to access the systems simultaneously. Additionally, the vulnerability associated cookie hijacking could be eliminated by incorporating appropriate codes to prevent cookie session hijacking. Lastly, a mobile application for the web application should be built to make the system more accessible to students.

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Finally, I am very grateful to my parents, who always keep hope in me and support me with their blessing. It is their beliefs that make me, who I am today. Whenever I feel low or face a lack of courage and confidence, I always seek guidance from them. They are true guardian angels.

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Norwich, UK.

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# **Chapter 1**

## **Introduction**

This chapter includes vital aspects of my dissertation such as Research background, Its Problem, Aim and objective ,Rationale, significance, motivation and layout . which is explained with keen research and focus.

### **1.1 Background**

Evidence informs that there is a substantial increase in number of 18-year-olds that aim to go to university after their schools (Adams 2022). Roughly 320,000 18-year-olds in United Kingdom applied to universities as per the data revealed by UCAS (Adams 2022). Moreover, applications from international students are also continuously rising in British Universities (Adams 2022), The rising number of applications by the students is primarily attributed to the willingness of the students to get better job opportunities that enables them to have good career opportunities in future (Molinsky & Pisman 2019b).

However, despite of the growth in the number of graduate applications, and the increase in graduates, the problem of unemployment continues to exist. As per the data published by British Government, unemployment among recent graduates has risen substantially (Molinsky & Pisman 2021). Unemployment from the recent graduates has continued to increase over the years, which is a trend rising since 2012. The reason for the increase in the unemployment rate of the recent graduates is not only attributed to the market conditions or the recession, but also to the poor job applications of the recent graduates which reflect their weakness in terms of preparedness for jobs, affecting their ability to get jobs. It is therefore becoming increasingly important for colleges to

## A record 320 thousand 18-year-olds in the UK applied to universities by the Ucas deadline in January

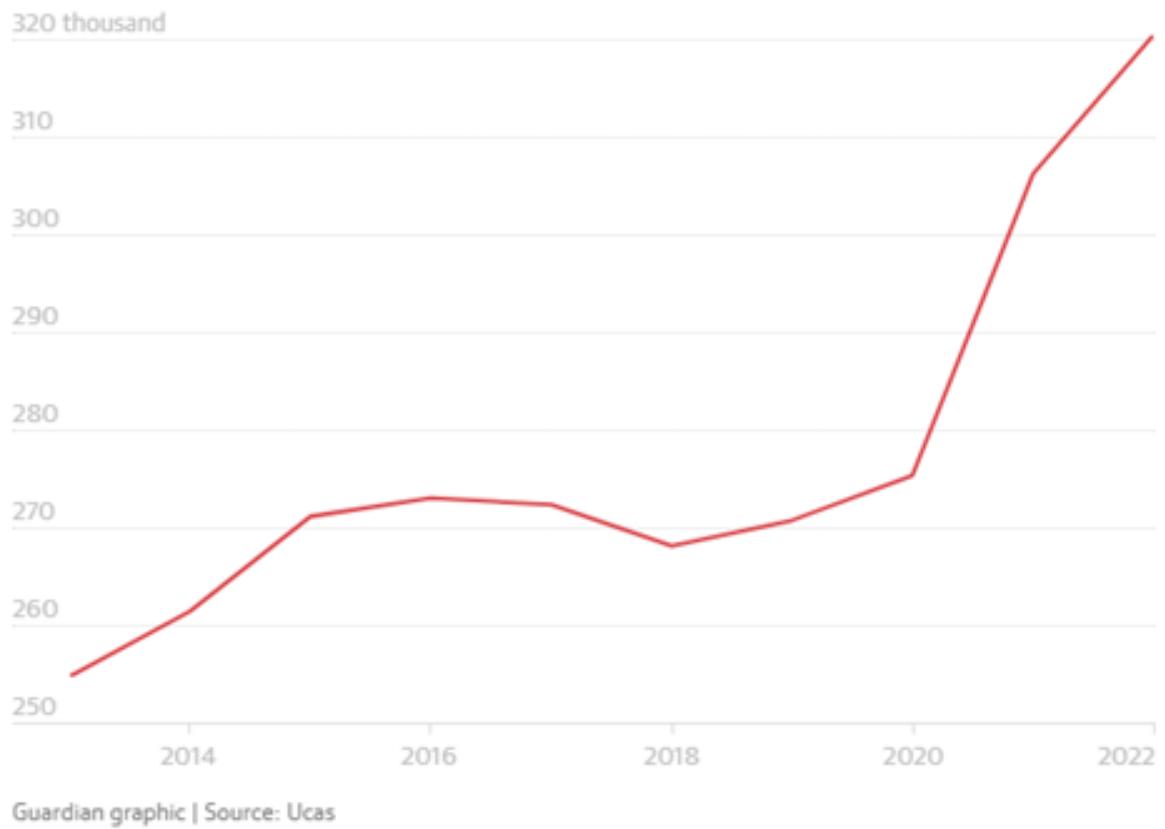


Figure 1.1: Rise in total applications of students applying for undergraduate courses.(Adams 2022)

ensure that students are adequately prepared to foray in the right career.

A career is a lifetime journey, and it is an important factor in lives of every individual. As the perceptions regarding career begin during the later years of schooling, it is not wrong to say that career issues are probably what individuals deal on a regular basis (Hirschi 2018). Career issues includes career indecision issues, career planning, difficulty in foraying in beginning career, career satisfaction issues, among others (Zainudin et al. 2020). Career counselling services are provided to individuals for various reasons which includes clarification regarding what to do in career, identifying and implementing career decisions, assisting individuals in identifying why they are not able to achieve their career goals among others (Papakota 2016). Definition on the concept of career counselling is offered from six major categories that are commonly covered during career counselling (Osborn et al. 2014). The core areas include “learning about the self, acquiring occupational, as well as educational information, improving decision-making,

as well as career planning, coping with career challenges, as well as transitional issues, and lastly, applying for job and undertaking training (Osborn et al. 2014) .

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), career counselling of youth comprises of four key factors – (A): offering assistance to individuals so that they can acquire higher self-awareness of their abilities, personality style, values, as well as interest, (B) linking the individuals with resources so that they are well-informed about the various professions and occupations, (C), involving individuals in the process of decision-making so that a desired career path which matches the individuals values, interests, abilities, as well as requirements could be selected, and (d) supporting the individuals so that they could be dynamic administrators of career paths including career transition management, balancing of different roles in life, and becoming lifelong learners for professional development (Watts 2013)

The need of career counselling is required when individuals are uncertain about their career after college (Watts 2013). It is important for individuals to have the knowledge on how they must manage their career management skills because career is a lifelong objective, and individuals need to regularly update their skills for managing their careers (Kapur 2019) .Therefore, simply put, career management skills are vital in every job, profession or field, which calls for considering some key aspects into account.

Firstly, an individual must realise that career management is vital for successful living, calling them students to become possessors of their career development. Secondly, it is vital to identify career goals, as well as objectives, enabling individuals to take action or search for the possible path to achieve the desired goals and objectives. Thirdly, The following must be remembered that career management is like professional development (Kapur 2019).Fourthly, it is important for an individual to be aware of their job requirements, capabilities and interests so that they can formulate an effective career development plan. Lastly, one should have awareness and knowledge, in terms of carrying out and getting involved in successful career conversations (Kapur 2019).

Over the years, the concept of career counselling has been substantially influenced, but the essential constituents of career counselling are preserving (Pordelan & Hosseiniyan 2022). The concept of career counselling was initially conceived so that youth can get

guidance on the process of identifying work, as well as identifying the types of jobs that are suitable for them (Strauser et al. 2018). These were initially undertaken through face-to-face meetings. However, with the passage of time, there is a substantial transformation in the way career counselling is being undertaken. In modern times, the role of computers, as well as information and communication technologies has increased substantially in career counselling.

Using computer, as well as information and communication technologies for career counselling is not a new concept and using computer program in career counselling services was first witnessed during 1960s (Zainudin et al. 2020). Use of information and counselling technology, in general, has had a substantial impact on our lives, and substantially transformed our lifestyles, learning modes, and future of younger generation who are substantially different from baby boomers (Roberts 2012). Irrespective of this, technology has emerged as an excellent tool that is an integral part of everyone's lives, and it is used as a medium for information gathering, communication, as well as entertainment (Detweiler 2013). Therefore, the growing reliance on technology, as well as internet, has emerged as a new opportunity for practitioners, as well as counsellors for enhancing the lives of everyone (Zainudin et al. 2019) . The use of technology, is therefore, assuming substantial importance in case of career counselling.

## 1.2 Research Problem

A major problem witnessed by students is that they find it difficult to get their desired jobs (Sterling et al. 2020). As per the study undertaken by Molinsky and Pisman (2019), students face numerous challenges in finding jobs. Molinsky and Pisman (2019) argue that in several colleges, students find it difficult to get a clear and consistent feedback on their job applications. Consequently, it is difficult to understand about personal performance, making it difficult to get an insight of one's strengths and weaknesses, which makes the process of recruitment difficult for graduates who are about to complete their course and search for career opportunities (Molinsky & Pisman 2019b). The absence of a mechanism that makes students aware of the strengths and weaknesses of their job applications prevents students from updating their skills or being aware

of the need of acquiring new skills, which affects their career prospectus. Therefore, having an effective mechanism that helps students to get an insight of their job applications is vital for them to improve their career prospectus. In this regard, it is vital to develop a solution that allows students to update their job progress, as well as add information about the company they have applied for, as well as the reason for job acceptance or rejection. This information could be used by the professors to check students' progress and reasons for rejection, enabling the professors to offer students feedback, as well as support to develop a better resume. Moreover, the professors could also help guide students to develop their skills using the courses available, based on the rejection reasons.

### **1.3 Research Aim and Research Objectives**

#### **1.4 Research Aim**

The purpose of the research is to develop a job tracking system that addressing the prevailing problem by enabling students to inform about their job applications progress to instructors and professors, resulting in feedback from professors which will help students to acquire skills and make amendments to their resume to increase the likelihood of getting a job.

#### **1.5 Research Objectives**

To develop a portal where students can update their job progress multiple times. Students will add information regarding their job progress like which company they have applied for job, and if they were appointed for the job or not. Furthermore, if they are rejected, they will mention why they were rejected like failed in an interview, resume not accepted, and so on. Students can update all things by their login account. There will be a professor portal as well where the professor can log in and check how many students get jobs and how many students got rejected for their job and in accordance with reasons they can give feedback and support to the students regarding their needs like needing help in making a resume, needing the help for the interview, and so on. Moreover, the professor/teacher can search the trends of placement of the students for

example why students are getting rejected for the job, and according to the report of the trends, they will make the report that can give suggestions to the academic department regarding which subject can be added to the curriculum. So new students will get help in the next job placement.

## **1.6 Research Rationale**

Numerous studies have been undertaken by researchers regarding the prevailing placement issues (Kauffman & Lloyd 2019) Tudor (2018) Hossain et al. (2018). However, there is lack of discussion on possible technical solutions that could be used for addressing this problem. In this regard, it becomes vital to address this problem by undertaking this research. This research is an attempt to address the prevailing problem by developing a solution that helps students to increase their employability.

## **1.7 Research Significance**

The research assumes significance in the light that the existing research prepare a solution that would enable students to improve their job prospectus, leading to an improvement in graduation employment rates. This will not only help the British colleges to ensure that graduate retention rates are high but will also enable British universities to market themselves to students. Moreover, the increase in graduate employment rates will also contribute to the global economy. Due to these factors the research becomes significantly important.

## **1.8 Research Motivation**

Most universities used the traditional method where they update about the job opportunity and cannot track the student's progress on the job placement. By tracking the student's job progress, feedback can be provided to students that will be very helpful for students. They will work on their limitation such as improving their resume, soft skills, and so on which will increase their chances of getting jobs and enhance the possibility of prosperous life, so that they can be capable of designing their career or profession as per their capability and desire.

## 1.9 Research Layout

This research comprises of Four chapters. In the first chapter, we have discussed about the research background, research problem, research aims and objectives, research rationale, research significance, and research motivation. Following this, the research layout is also determined in this chapter. Following this, the second chapter begins.

In the second chapter, the literature review is conducted. In this chapter, a literature review on previous studies, Relevant concepts for the development of a system and key concepts is conducted .

In the third chapter, the research methodology used in the dissertation is discussed. This chapter informs about the research approach used and the method employed for preparing the solution. furthermore, The proposed solution is discussed with visualizations, implementation, as well as an explanation of the visualization. In the fourth chapter of the dissertation, a conclusion is prepared. Here, a summary of the dissertation is offered. Furthermore, research limitations, future research opportunities, and recommendations are offered.

# **Chapter 2**

## **Literature Review**

### **2.1 Introduction to Literature Review**

In this chapter, the key concepts related with the research will be reviewed. Firstly, previous studies in career counselling and technology will be conducted. Following this, the concept of the software development life cycle will be explored. Further, the key concepts that are relevant to the framework will be reviewed. Following this, a conclusion summarising the literature review will be offered.

### **2.2 Previous studies on the use of technology for career counselling**

Over the years, the concept of career counselling has been substantially influenced, but the essential constituents of career counselling are preserving (Pordelan & Hosseinian 2022).The concept of career counselling was initially conceived so that youth can get guidance on the process of identifying work, as well as identifying the types of jobs that are suitable for them (Strauser et al. 2018).These were initially undertaken through face-to-face meetings. However, with the passage of time, there is a substantial transformation in the way career counselling is being undertaken. In modern times, the role of computer, as well as information and communication technologies has increased substantially in career counselling.

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and counselling technology, in general, has had a substantial impact on our lives, and substantially transformed our lifestyles, learning modes, and the future of the younger generation who are substantially different from baby boomers (Roberts 2012) . Irrespective of this, technology has emerged as an excellent tool that is an integral part of everyone's lives, and it is used as a medium for information gathering, communication, as well as entertainment (Detweiler 2013). Therefore, the growing reliance on technology, as well as the internet, has emerged as a new opportunity for practitioners, as well as counsellors for enhancing the lives of everyone (Zainudin et al. 2019). The use of technology, is therefore, assuming substantial importance in the case of career counselling.

The purpose of technology-enabled career counselling serves several purposes. For instance, career counselling is offered through various career sites, as well as online career assessments, and it is offered as a tool for gathering information, as well as undertaking job search (Osborn et al. 2014) . On the other hand, technology has also led to emergence of different career counselling methods such as video-based counselling that enables people looking for career counselling to experience counselling with ease (Osborn et al. 2014) . Numerous researchers have undertaken studies in career counselling from a technological perspective, with the aim of improving the existing career counselling services.

For instance, researchers such as Pordelan et al. (2018) investigated that using online technologies for career counselling purposes is effective and could be used as an alternative to traditional career counselling methods. . Their study revealed that online counselling sessions have a substantial impact on students' development in comparison to traditional counselling. Another study by Lent (2018) informed that career development professionals, as well as vocational psychologists must possess skills, knowledge, as well as information to cater to clients who face current working world, as well as must utilise technological to offer effective career guiding sessions. Researchers such as Glasheen et al. (2018) have informed that there is a substantial preference for online counselling when students are suffering from psychological distress. However, researchers Zeren (2015) have found that satisfaction levels, as well as problems faced during face-to-face counselling, as well as online counselling, are the same. But career

development remains a concern which is witnessed by clients going for any of the approaches face-to-face or online counselling. Researcher such as Bright (2015) reveals that using the internet for career counselling is an effective method but is not researched adequately. Bright (2015) further asserts that using the internet should not be considered as whether rather internet and technology must be used for career counselling purposes because their benefits are well accepted. Numerous other studies have been undertaken in this regard, such as Anthony (2015) ,Wong et al. (2014),among others, indicating the importance given to the role of technology and internet in career counselling. Previous studies in the areas of career counselling from a technological perspective have mostly paid attention to whether using technology for career counselling is an effective method, or it is not. The review indicates that majority of the researchers have confirmed that using technology and internet in case of career counselling, suggesting that technology is an efficient tool for career counselling.

When discussing about career counselling for students who are about to complete their course, it has been observed that placement of the students continues to remain a major problem (Sterling et al. 2020). Study by researchers such as Molinsky & Pisman (2019a)reveal that students face numerous challenges in finding jobs. Their study finds that students studying in different colleges have indicated that students face difficulties in getting a job and they attribute this failure to a lack of clarity and inconsistent feedback on their job applications. Therefore, it is difficult for students to understand about their personal performance, which makes it difficult for them to get an insight of their own strengths and weaknesses. Consequently, the recruitment process is difficult for graduates who are about to complete their courses and search for career opportunities (Molinsky & Pisman 2019a). Due to the absence of such a mechanism, students remain unaware of their strengths and weaknesses, and issues with their job applications. Due to this, the ability of the students to work on their skills is negatively impacted. Therefore, having an effective mechanism that helps students to get an insight of their job applications is vital for them to improve their career prospectus. Numerous studies have been undertaken by researchers regarding the prevailing placement issues (Kauffman & Lloyd 2019) (Tudor 2018) (Hossain et al. 2018).However, there is a lack of discussion on possible technical solutions that could be used

for addressing this problem. In this regard, it becomes vital to address this problem by undertaking this research. This research is an attempt to address the prevailing problem by developing a solution that helps students to increase their employability.

## 2.3 Software Development Life Cycle

The software industry uses the Software Development Life Cycle (SDLC) approach to plan, build, and test high-quality software. (Leau et al. 2012) . The purpose of SDLC is to develop high-quality software that has the potential meeting, or exceed customer expectations (Kashfi 2017), and ensuring timely completion within the decided cost and time (Rastogi et al. 2015) . SDLC is also referred as Software Development Process and it is a framework that defines tasks that must be performed at different steps during the process of software development (Leau et al. 2012). The ISO/IEC 12207 is an international standard for the software life-cycle processes and this standard aims to be standard that is used for defining the various tasks that will help in development and maintenance of software (Singh 1996).

According to the literature, a software project uses the SDLC methodology. A thorough strategy called the SDLC outlines how software must be built, maintained, replaced, upgraded, or improved utilizing particular software(Alshamrani & Bahattab 2015). SDLC defines methodology for improvement of the software quality, as well as the overall process of development. The various stages of SDLC are shown in Figure :2.1 .

A typical software development cycle comprises of six stages, as shown in Figure :2.1 . In the first stage, the planning and requirement analysis is undertaken. In the SDLC, requirement analysis is a crucial and foundational stage. This stage is performed with inputs collected from primary, or secondary research. This information is later used for planning project approaches, as well as conducting a product feasibility study in technical, operational, as well as economical areas. It is during this stage, that planning for quality assurance requirements, as well as risk identification, is undertaken during the planning stage. The technical feasibility study is used for defining the different technical approaches that could be followed for implementing a project in

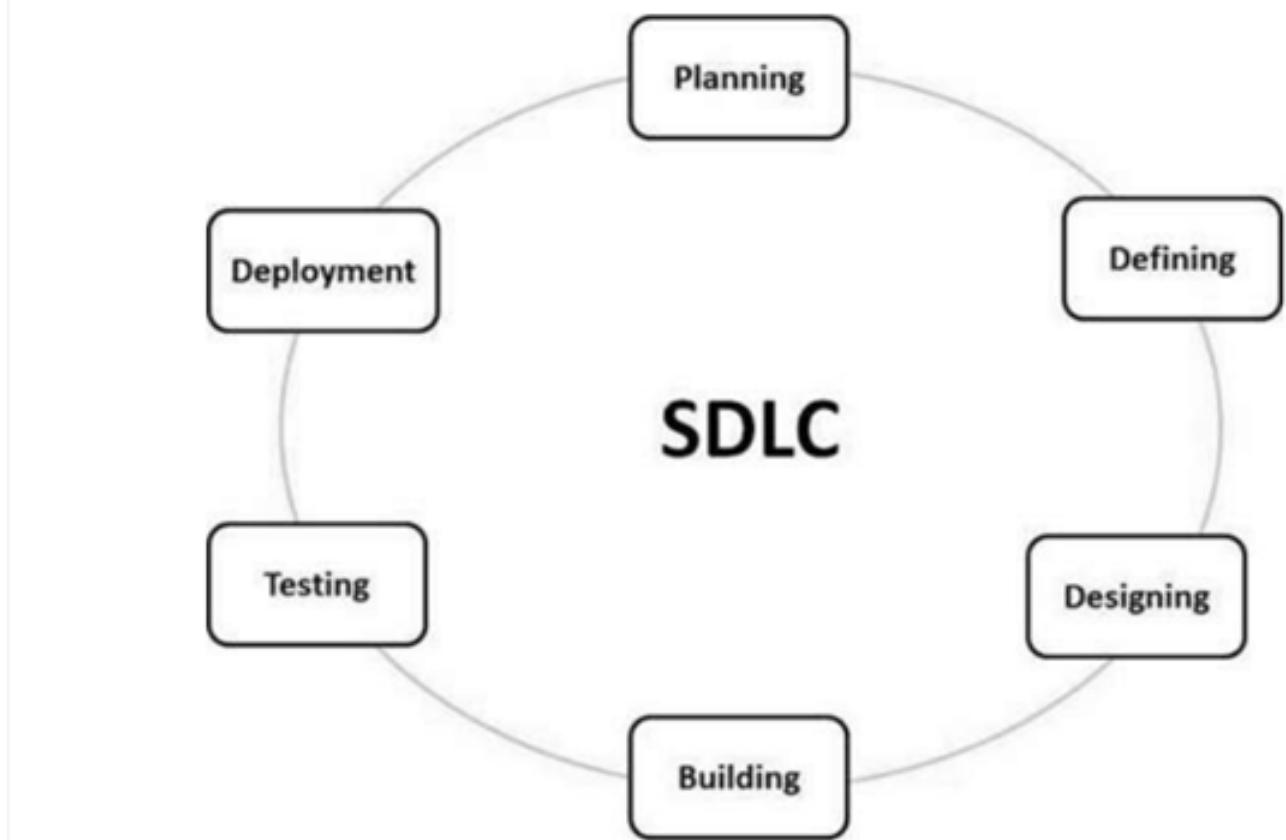


Figure 2.1: Stages of SDLC(Leau et al. 2012)

a successful manner with the least risks (Ragunath et al. 2010) .

In the second stage, requirement analysis is undertaken where the focus is on defining, as well as documenting the requirements of the product, and then getting the approval. Software Requirement Specification is used for doing this because software requirement specification comprises of the product requirements that must be designed and developed for the project life cycle (Ragunath et al. 2010) .

The best product architecture is developed at the third stage of the SDLC. Different design strategies are suggested and then specified in the design document specification in accordance with the specifications of the software requirement specification (DDS). After a review of design document specifications by different stakeholders, and based on the different parameters such as risk assessment, product robustness, budget and time constraints, and design modularity, the most suitable design is selected (Scroggins 2014). During the designing approaches, the different architectural modules of product, as well as the data flow representation are prepared. In addition, the internal design of the modules is clearly during the proposed architecture with all the minute details. In the fourth stage, the development begins. The programming code is developed at

this step as per the requirements in the design document. The code may be completed easily if the design is performed in a systematic and comprehensive manner. The developer follows the coding guidelines during this stage, and chooses the desired programming tools such as debuggers, interpreters, and compilers for generating the code. Depending on the requirements, different coding languages such as Java, PHP, python and NodeJS are used for coding purposes. The programming languages are chosen depending on the type of software that is developed (Sharma & Pandey 2013).

In the fifth stage, the product testing is undertaken. This stage is a subset of all stages in contemporary SDLC models; SDLC stages include testing activities. This stage, however, refers to product system testing, during which product flaws are reported, analyzed, modified, and retested until the required performance standards are achieved.

In the sixth stage, the product is tested and then deployed and then it is released in a formal fashion in the market. This stage depends on various aspects such as the business strategy of the organisation, and marketing plan, among other factors. However, once the product is introduced in the market, maintenance is done on a regular basis. These steps are the basis of SDLC Model.

There are numerous SDLC models, which included the waterfall, iterative, spiral, V, Big Bang, agile, RAD, rapid application development, and prototyping models. Different models are used by users, depending on their requirements. For instance, an iterative model is used when the purpose is to constantly rebuild something based on the feedback received. On the other hand, the waterfall model is used in organisations where substantial time is spent in requirement analysis and this approach does not employ an iterative approach, meaning that a linear approach is employed in this method (Sharma 2017). Thus, the literature informs that there are numerous types of SDLC models, and the choice of the models depends on the development context.

## 2.4 Relevant concepts for the development of a system

Firstly, a literature review on the Bootstrap framework is reviewed. Bootstrap is a popular framework that incorporates HTML, CSS, and JavaScript (Antunes et al. 2022). Bootstrap Framework enables developers to create websites that are responsive and user-friendly on mobile devices. It does not cost anything to download or use the tool. It is a front-end framework that makes the process of developing websites simpler and more efficient (Miró & Guerrieri 2021) . The bootstrap framework contains design templates predicated on HTML and CSS for typography, forms, buttons, tables, navigation, modals, picture carousels, and a variety of other elements. In addition to that, it supports plug-ins written in JavaScript. Bootstrap makes it easier for developers to develop designs that are highly responsive (Pajer 2021).

In their research, Jiang et al. (2014) reveals that bootstrap framework achieves the responsive web design on different screen sizes of the devices like mobile, monitors, iPad, and so on. Furthermore, they state that responsive design involves not only changing the page layout based on the size of the viewport but also reversing the current design's entire methods. Bootstrap is almost compatible with all the latest versions of web browsers. Additionally, Jiang et al. (2014) state that bootstrap not only increased efficiency, and saves time and money, but it also ensures that view pages are consistent between desktop output devices and mobile terminals.

Literature informs that there are various reasons for using Bootstrap. A mobile-first strategy is employed by the Bootstrap 3 framework, which incorporates Mobile first styles across the library rather than storing them in individual files (Jiang et al. 2014) . Additionally, the Bootstrap framework is compatible with all the major browsers, including Mozilla Firefox, Microsoft, Safari, and Opera (Gaikwad & Adkar 2019). Moreover, Bootstrap requires just a basic understanding of HTML and CSS for a user to get started, thus almost anybody can use it. Additionally, the official Bootstrap website contains detailed documentation (Pajer 2021). Besides, the responsive CSS in Bootstrap adapts itself to desktop computers, tablets, and mobile devices. Thus, simply

put, there are numerous advantages of a Bootstrap framework which makes this framework a suitable choice.

In their study, Wang & Zhang (n.d.) discusses about developing a university website in a responsive manner using the Bootstrap framework. They further assert that using the bootstrap framework helps designers with more accurate HTML and CSS standards while being simple and flexible, allowing for speedier site creation. Bootstrap framework increases the efficiency of front-end web development. It resolves several incompatibility issues and increases the utilization of the website and increased work efficiency. Bootstrap's essential idea is that the developed pages may determine the display size and display several page layouts without affecting the content. This gives consumers greater, more complete access to information and improves the site's overall usability. Simply put, Bootstrap framework is excellent for designing purposes.

There are different tools used for Bootstrap which include pingendo, Brix, jetstrap, Pinegrow, Bootstrap studio, Bootply, Bootmetro, Jsfiddle with Bootstrap, Codepen, among others (Hesterberg 2011). For instance, Pingendo is a Bootstrap 4 builder that is available in two flavours, and an online playground and a desktop version which is available for macOS, Windows, and Linux. On the other hand, Brix is a Bootstrap builder which is used to design, create, and edit responsive websites, as well as UI. Brix is a cloud-based service that is built on rapid prototyping. Likewise, there are various tools that are used for Bootstrap purposes. Bootstrap is an excellent framework for designing purposes.

Besides designing, security is another important aspect in web applications. The author Hassinen & Mussalo (2005) writes in the report on “Client controlled security for web applications” is that the encryption system for a web application. The client creates and stores an encryption key. The data is always in encryption format and cannot be decrypted by the server-side without being informed to the client. So malicious server-side software will not show confidential data. Data become more secure in the web application. This paper describes how to create a secure web application and generate an encryption key on the client-side. It does not require any added software and hardware for encrypting the data.

As the system is a web application, the issue of cookie hijacking assumes significant

importance in this respect. The concept of HTTP cookie hijacking has received substantial attention in recent years (Sivakorn et al. 2016a) (Sivakorn et al. 2016b). The attacker watches the data being sent and received over a public wireless network, such as the one found on a university campus or in a local coffee shop. The user navigates the web after successfully connecting to the wireless network (Maurya & Kulkarni 2021). The user's HTTP cookies are appended to the requests that are sent in cleartext over the connection that is not encrypted by the browser. The eavesdropper is monitoring the traffic and pulling the user's HTTP cookies out of the network trace so that they may connect to the susceptible services utilizing the hijacked cookies. The user's personally identifiable information and account features are accessible to the attacker since its services "identify" the user based on the cookies and provide a customized version of the website.(Maurya & Kulkarni 2021) .

Existing literature in this regard informs that use of SSL certificates, using security plugins, updating websites, and hardening website (Sivakorn et al. 2016a) . Besides, the researchers have revealed other ways to avoid cookie stealing includes installation of effective anti-virus, avoiding storage of sensitive data, avoiding clicking on suspicious links, and clearing of the cookies (Calzavara et al. 2019).

The research article "Web-based database security on the internet of things using fully homomorphic encryption and Discrete Bee Colony Optimization" Raj et al. (2020) defines the research study focuses on website page database security using optimization and encryption approaches for the Web of Things Environment Raj et al. (2020). This paper analysed the most effective SQL and DI attacks on website security and a combination of SQL and DI injection detection technologies aids in the development of a secure and reliable online application model. The chosen queries in the website application are initially injected using the Discrete Bee Colony Optimization (DBCO) methods. The injection prevention model is used after the Proxy filtering, and the injected data is used with various queries of different special characters. In the end, With the use of the query tree method, the attack is detected based on the user query. The suggested technique obtained a security level of 93.56 percent the prevented webpage implication-based databases Raj et al. (2020).

The author Johari & Sharma (2012) writes in the report “A Survey on Web Application Vulnerabilities (SQLIA, XSS) Exploitation and Security Engine for SQL Injection” mentioning that SQL Injection and Cross-site Scripting (XSS) attacks are the strongest and yet simple attack methods on the Web application Johari & Sharma (2012). This paper examines the current strategies for fighting against SQL injection and XSS and finds the weakness in the existing technique like Inherent limitations, Incomplete implementations, Complex frameworks, Runtime overheads, Intensive manual work requirements, and False positives, and false negatives Johari & Sharma (2012). This paper detail examination on the multiple types of Structured Query Language Injection attacks, Cross-Site Scripting attacks, vulnerabilities, and prevention techniques like AMNeSIA, ARDILLA, etc that develop promising strategies and secure the online data.

According to the articles published in journals about “Node.js: Using JavaScript to Build High-Performance Network Programs, released by IEEE, S. Tilkov” (Tilkov & Vinoski 2010) explores a brief overview of the NODEJS (Tilkov & Vinoski 2010). This article compares the other server-side technology with NODE JS such as PHP and python, to event-based asynchronous execution. Multiple instances of one Node JS application can listen to the same port using multi-node, presenting a load balancer effect. Node JS supplies better performance on the runtime web application, and it is 20 times faster than the other technology (Tilkov & Vinoski 2010). One of the most well-known frameworks and environments for server-side JavaScript programming is Node JS. The tool of NODE JS such as PostgreSQL play a significant role by supporting asynchronous interaction with relational data storage. The NPM package manager for Node allows you to install libraries and their dependencies. Finally, many libraries for client-side JavaScript that is compatible with the CommonJS module system also work with Node JS. The architecture of Node.js makes it easy to use a highly expressive, functional language for server programming without dropping speed or straying from mainstream programming.

## 2.5 Summary of Literature Review

The literature review informs about the previous studies that have been conducted on the use of technology in the area of career counselling. Further, the literature informs about the essential concepts that are vital for the development of a tool that could assist students in career counselling. These concepts will be used in the subsequent sections for the development of the system.

# Chapter 3

## Research Methodology

### 3.1 Introduction to Research Methodology

The research methodology employed for this dissertation will be discussed in this report. The research framework adopted for this dissertation is prepared in this report. In

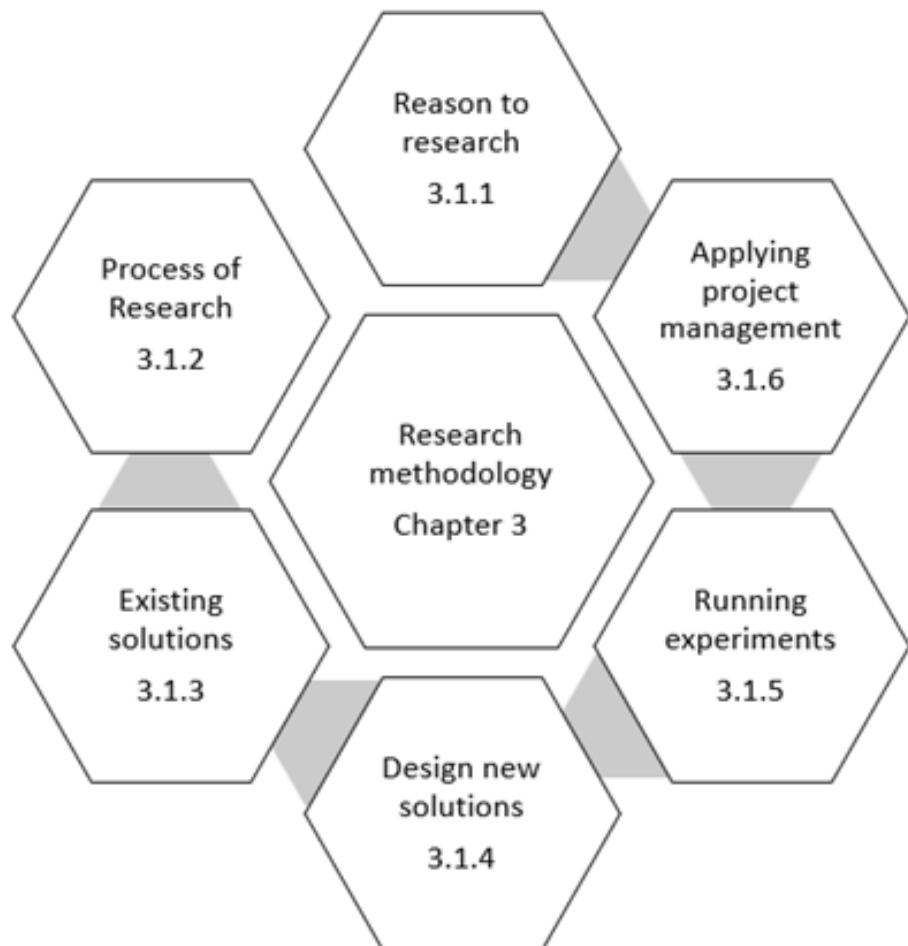


Figure 3.1: Research Framework Panneerselvam (2014)

this chapter, there will be six sub sections. In the first subsection, the reason for

undertaking this research will be offered. Further, the research process employed for this dissertation will be discussed. Further, different solution related with the subject will be discussed. Following this, the experimentation aspect will be determined and then application will be discussed. This chapter is based on the framework developed by Panneerselvam (2014) (Figure: 3.1).

## 3.2 Reason for undertaking the research

As discussed in the introduction, the issue of career is a major concern for students who on the verge of completing their graduation (Sterling et al. 2020). Molinsky & Pisman (2019a) also argues that students face numerous challenges in finding jobs which is attributed to the lack the difficulty in getting a clear and consistent feedback on their job applications. Therefore, students face challenges in identifying the problems with themselves, affecting their career in the long-term. Therefore, it becomes vital to have a mechanism in place that enables students to get feedback on their job applications which will enable them to work on their weakness.

Existing research has revealed that numerous studies have been undertaken by researchers regarding the prevailing placement issues (Kauffman & Lloyd 2019) (Tudor 2018) (Hossain et al. 2018). However, there is limited interest in developing possible technical solutions that could be used for addressing this problem. Therefore, it becomes vital to address this problem by undertaking this research. This research is an attempt to address the prevailing problem by developing a solution that helps students to increase their employability. This is the primary reason why this research is being undertaken.

## 3.3 Research Process

Firstly, I was supposed to select a suitable topic for this research. There was a list of topics available to choose from. Initially, I was confused as to what topic to select from. I researched the different topics and found the current topic to be interesting. I discussed about the topic with my supervisor Dr. Jason lines. After discussion and guidance from my supervisor, I started to work on the topic.

The purpose of the research is to develop a job tracking system that addressing the prevailing problem by enabling students to inform about their job applications progress to instructors and professors, resulting in feedback from professors which will help students to acquire skills and make amendments to their resume to increase likelihood of getting a job.

An important aspect to complete the work successfully was gathering the data for development of the web application. In this regard, data was gathered from different literature sources, speaking with students about their job requirements and issues, and then preparing use cases for the scenario.

### **3.4 Existing Solutions**

To develop a portal where students can update their job progress multiple times. Students will add information regarding their job progress like which company they have applied for job, and if they were appointed for the job or not. Furthermore, if they are rejected, they will mention why they were rejected like failed in an interview, resume not accepted, and so on. Students can update all things by their login account. There will be a professor portal as well where the professor can log in and check how many students get jobs and how many students got rejected for their job, and in accordance with reasons they can give feedback and support to the students regarding their needs like needing help in making a resume, needing the help for the interview, and so on. Moreover, the professor/teacher can search the trends of placement of the students for example why students are getting rejected for the job, and according to the report of the trends, they will make the report that can give suggestion to the academic department regarding which subject can be added to the curriculum. So new students will get help in the next job placement.

### **3.5 Designing New Solutions**

For this research, a suitable software development life cycle was first selected to build the application. The first key point that was considered here is identifying an appropriate software development life cycle. There are many different software development

life cycles, including agile, lean, waterfall, iterative, spiral, as well as DevOps, among others, as had been noted in the literature review (Alshamrani & Bahattab 2015) .

After evaluation of the different software development life cycle, it was observed that waterfall was the best option. The first SDLC model used for software engineering to ensure a project's success was the "water approach." The whole software development process is divided into phases that used the "Waterfall technique." The outcome of one phase will serve as the sequential input for the process stage in the waterfall model. The waterfall model's numerous phases are depicted in the graph below (Bassil 2012)

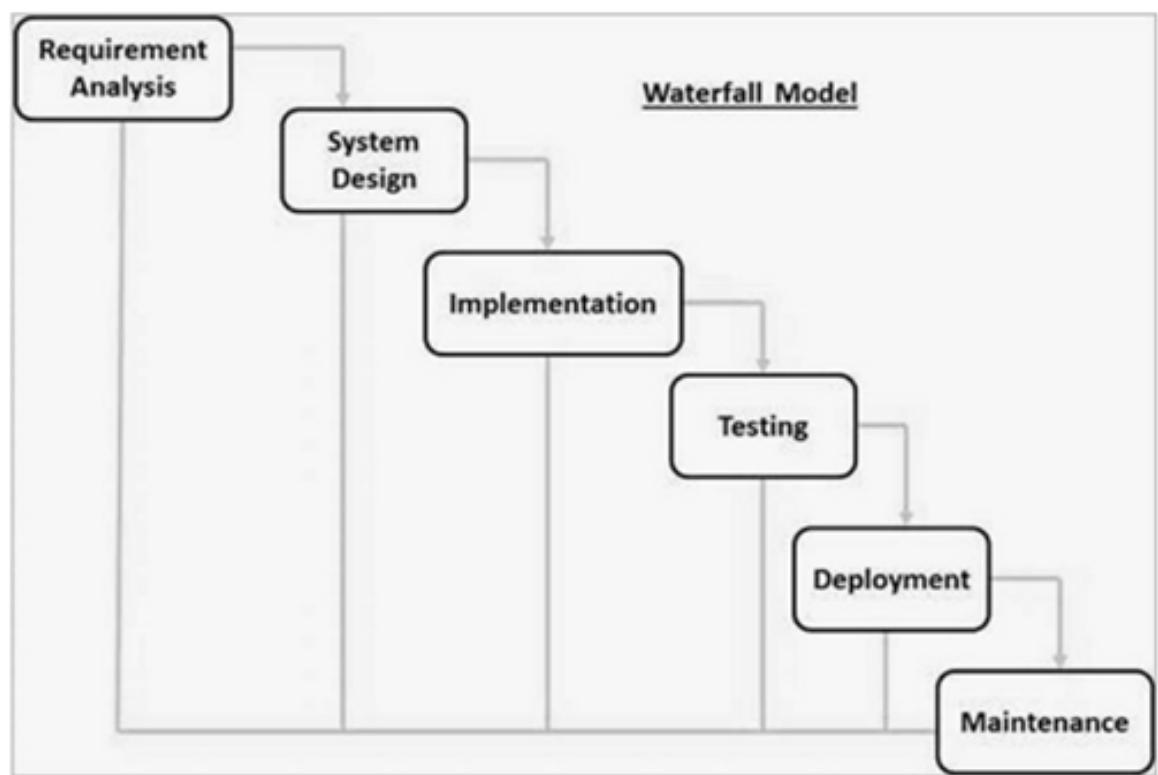


Figure 3.2: Waterfall Model (Bassil 2012)

As shown in the figure :3.2, The waterfall model has six stages: collecting requirements, system design, implementation, integration and testing, system deployment, and maintenance. The following method was used to implement these phases.

Firstly, requirement gathering, and analysis was conducted. During this stage, analysis of the students' requirements was given importance. In addition, the role of tutor's requirement and administrator was also analysed and accordingly their requirements were analysed. After the requirement analysis was completed, the system designing

was conducted.

With regards to Front end of the application, there were several reasons for choosing HTML5. HTML5 is a wise choice for this task for a number of significant reasons, including accessibility, video and audio support, doctype, better and clean code, smarter storage, better interactions, and compatibility for legacy and cross-browser browsers (Hickson & Hyatt 2011) . On exploring these advantages in detail, it is noted that HTML5 helps to create accessible sites due to ARIA and semantics. The new heading in HTML allows the screen readers to access the content easily. I will be using HTML5 because HTML5 support the traditional HTML and XHTML style syntax and it has more feature like New APIs, XHTML, and error handling. HTML5 has one common interface to make loading elements easier. This means we do not need to install any flash player or similar elements as everything can run by itself. HTML5 supports multimedia on mobile devices like video, audio, and canvas tags. But html4 and lower versions of HTML do not have advanced features which are not beneficial for my project. Due to these aspects, the decisions to work with HTML was taken. Furthermore, CSS3 was the chosen style sheet because CSS3 has many advanced features which do not have in CSS2and CSS1 like enhancing the look of the HTML5 page with rounded corners, shadows, gradients, transitions, or animations, as well as useful layouts like multicolumn, flexible boxes, or grid layouts.

Furthermore, Bootstrap framework is also used. Bootstrap is a popular HTML, JavaScript, and CSS framework which is used for creating responsive and mobile-friendly websites. It is a frontend framework and is used for easier and fast web development. It provides design templates for typography, buttons, tables, modals, forms, picture carousels, navigation, and more, all created with HTML and CSS. Bootstrap is supported by all the browsers like internet. explorer, firefox, google chrome, and so on. The responsive CSS in Bootstrap is compatible with Desktops, Tablets, and Mobiles. With the knowledge of CSS and HTML, anyone can easily use the bootstrap and make a website in simple ways by using bootstrap library, and the best part is that it is free and open source. Furthermore, JavaScript is used for making dynamic modifications on web pages and updating the data promptly on the page. The scope of JavaScript is vast, which helps in making a website like validating input from a web page, loading new data or content

onto the web page without reloading the web page, animation, and so on.

Further, with regards to the server-side, Node Js is used. The reason for choosing Node.Js is that Node.js is an excellent framework for developing website applications that can run JavaScript both on the client as well as on the server-side. The best example of NodeJS-powered websites are LinkedIn, eBay, PayPal, Trello, and Netflix. Node.js is a single-threaded, open-source, cross-platform runtime environment for developing server-side and networking applications that are fast and scalable whereas Python is better for back-end applications, numerical computations, and machine learning. Nodejs utilizes a JavaScript interpreter but the interpreter for Python is CPython. ExpressJS is an immensely powerful framework that builds a powerful application. There are various advantages associated with Node.Js which make Node.js an appropriate tool. Some of the key features that have made Node.js an appropriate tool in this project are as follows:

**A. Asynchronous and event-driven:** Nodejs libraries do not block any API of the node JS. After calling one API server shift to the next API without waiting for any response (Chakravarty 2017). When the request is completed, the server receives a promise, which is a call-back mechanism that informs the server of the outcome or error. Hence, NODE JS can perform actions quickly.

**B. Highly Scalable :** NodeJS is designed to build highly scalable apps, and which is clear from event looping, Nodejs uses a single-threaded technique (Chakravarty 2017). The promise/ call-back technologies allow the server to respond in an asynchronous way, which makes it highly scalable. Node.js is an outstanding technology for real-time collaboration tools, streaming and networking apps, and data-intensive apps.

**C. No Buffering :** Nodejs applications do not buffer any data, because NodeJS applications simply output the data in chunks (Chakravarty 2017). Node.JS has Buffer classes and libraries like stream buffers, to stream and make data access easy and fast. Node.JS is a great choice for this project due to a number of additional factors, as well as the ability to execute JavaScript code outside of a web browser and an open-source, cross-platform, back-end JavaScript runtime environment that runs JavaScript Engine. In this project, I have used the node js for server-side functionalities, and for the front end, I will use NodeJS's EJS template engine. One of the main advantages to choose

it is that EJS code looks like pure HTML format, hence it keeps the HTML syntax while allowing for datacasting. While EJS is a basic templating language that uses JavaScript to build HTML markup. Whereas other template engines like react use different syntax with indentation and spaces and because of the speedy rate of growth, ReactJS developers must need to learn new developing techniques. It is difficult for every developer to keep up to date with the latest techniques and frameworks. Node.Js was used for development purposes in Visual Studio Code.

Further, with regards to the choice of compiler, visual studio code was chosen. The visual studio code editor was chosen since it is suitable for everyday use. The source code editor in Visual Studio Code is startlingly quick, which makes it suitable for consistent use. Moreover, visual studio code helps in instantly increasing the productive by using syntax lightning, as well as bracket-matching, auto-indentation, box-selection, snippets, among others (Microsoft 2022). Due to all these features, the decision of using Visual Studio Code was used.

In addition, decision was made to upload the code on Github in private mode. Therefore, the code is also uploaded on Github because uploading the code has also ensured that there is a backup available for the code in case of any mis-happening with the system.

Further, with regards to the Backend, PostgreSQL has been used. The back end will be using PostgreSQL Workbench as the database tool it is connected to the frontend or user interface with the help of NodeJS. PostgreSQL has some advanced features which will be beneficial for the current project. They are as follows:

**I:** PostgreSQL can handle several advanced data types which MySQL does not such as Numeric Types, Pseudo-Types, Boolean Types, Object Identifier Types, and even Geometric Types like Points, Line Segments, Network addresses, Bit String Types, Arrays, Composite Types, Boxes, Paths, Polygons, and Circles (Chen 2021). Another important aspect is that it also supports the JSON, hstore, XML (Chen 2021) , and user the created data types that is created by the CREATE TYPE command.

**II:** Postgres is an object-relational database. Whereas MySQL is a completely relational-based database (Baukes 2021) . Hence, PostgreSQL has some advanced features like table inheritance and function overloading that has particularly important for making

web applications and it also makes the web application appealing to the users.

**III:** Postgres was the first database management system to have multi-version concurrency control (MVCC) (Baukes 2021) . That ensures transaction isolation for each database session.

After deciding the front end, Server Side and Back-end factors, the designing was conducted. Following this, testing of the code was conducted. For testing, system testing, as well as acceptance testing has been employed. Here, the system testing is conducted to test the application overall. Because this is the first level where the entire program is analyzed, this technique was chosen. The purpose of using this testing approach was that this testing method helps in evaluating whether the system has complied with the outlined requirements, as well as to see whether the system meets the quality standards. Besides, this testing method was also selected because this testing approach also verifies that the application is successful in meeting the technical, business and functional requirements that were set initially Jamil et al. (2016).

Besides the system testing, acceptance testing was also used. The acceptance testing was used to determine whether the system is ready for release or not. While undertaking this testing, the focus was on ensuring that the application is successful in meeting the business requirements. Once the process was completed, the program was later deemed fit for launch. Finally, the system was introduced.

### 3.6 Running of the experiments

During this stage, the web application was tested multiple times. Here, application was constantly tested by filling random entries to see whether there is a bug in the system and whether the system hangs during the process. The process helped in identifying the software bugs which were later removed through appropriate coding practices.

### 3.7 Application of Project Management

To undertake the project successfully, it was vital to ensure that there is guidance from someone who can assist in completion of the project. Therefore, I asked my supervisor Dr. Jason lines to guide me in the project. I discussed the idea with my supervisor

and then once it was approved, I started working on the task.

As mentioned previously, software development life cycle was employed to complete the application in a successful manner. Although various problems were faced during the development of the task, I managed to complete the web application under the given deadline. Further, the supporting report was also prepared simultaneously.

The code was successfully completed but the challenges in meeting the deadline was a major project management challenge. However, with increased work during the later stages, the deadline was achieved.

### **3.8 Summary**

The chapter has informed about the process that has been employed to undertake the research. Research framework proposed by Panneerselvam, Panneerselvam (2014) has been used to describe the research work. Using the research framework, the chapter has informed about the cycle adopted for software development and the tools used for development of the system. In the next section, an explanation of the system and the implementation process will be discussed.

### **3.9 Design/Development and Implementation**

#### **3.10 Functionality of The Project**

As per the Figure :3.3 , There are three main users of this application Admin, professors, and students. University can provide the link to this application to all students. So that they can get relevant guidance according to their career needs and those who are already qualified in the jobs. So that university can keep a track record of the student's job progress. The function application used by these three are given below:

**Student:-** Students can log in and register in this application through their university Email ID. After login, they are able to reach the student dashboard and add their job status, whether they qualified or not. by filling the various columns such as company name, job title, qualified, failed by, add resume and guidance. After the created job, the student can wait for the feedback of the professor. Then chatting feature is open and

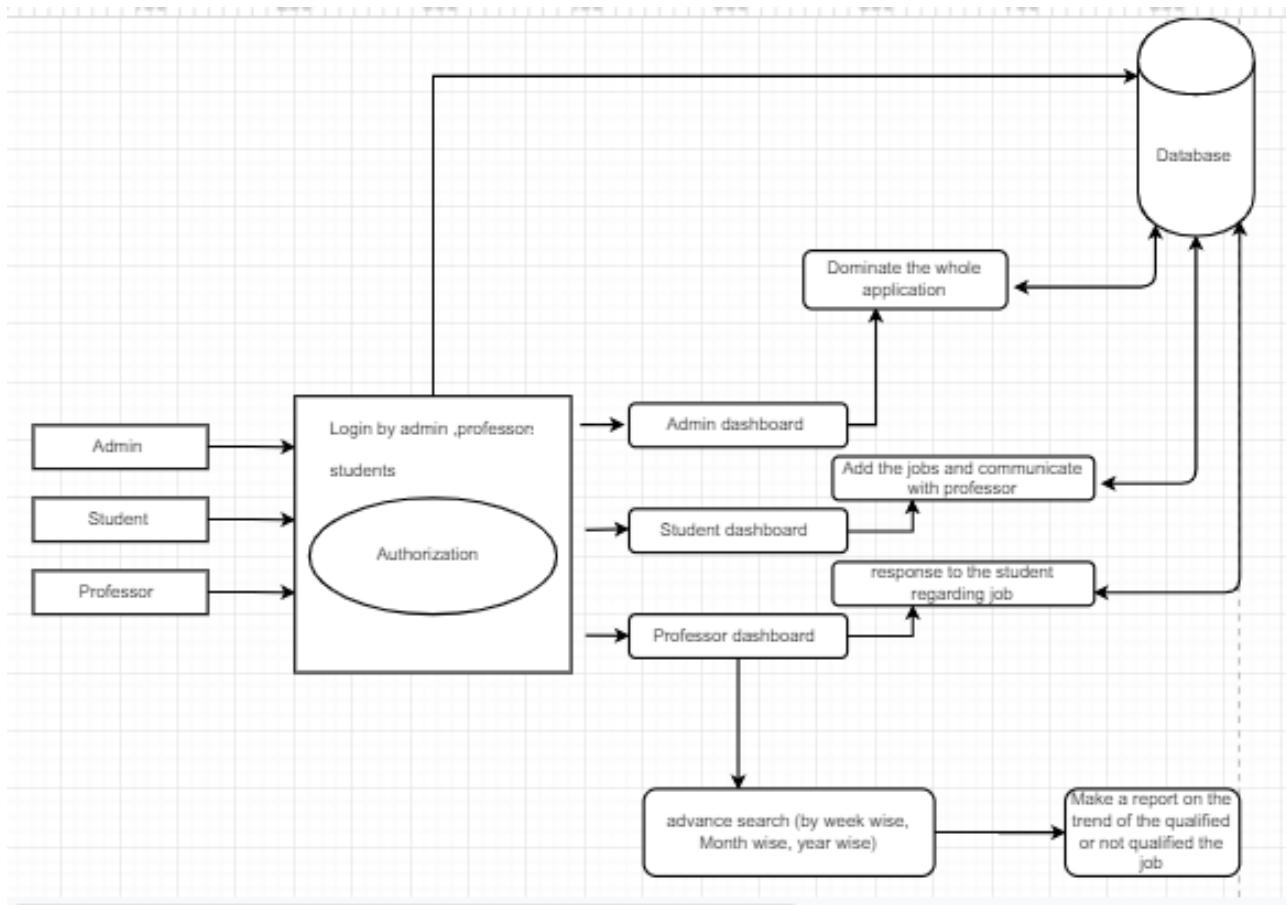


Figure 3.3: Functionality of the project

students can chat with a professor regarding particular jobs they applied for. When the professor will give the response to the student, then the message will be shown on the notification and start the communication between the student and professor. Despite of this, The student dashboard has a search feature that helps students to find the job by company name, and title of the job.

**Admin:-** Admin is dominate the whole application. Admin can give permission to the professor who can log in or not login in to the system. when a professor wants to register in the system. then first time needs permission from the admin to access this system after the given the permission then the professor allows accessing this system and can help the students.

Admin has permission to add and delete departments and courses in this application and it will automatically add to the system. Admin has full authority to block and unblock the students.

**Professor:-** Professors play the main role in the application. They can provide a relevant solution to the students through the chatting system in this web application.

Professors have an advanced search option in which professors can search the record data of jobs added by students, weekly, monthly, and yearly. So that they can track students who applied among them how many qualified and how many did not. The professors have access to the feature in this application, which they can check the trend of jobs in which students qualify or are unqualified by visual graphs, which appear monthly.

Professor will have the feature of an advanced search option with the help of the search, the professor can find the detailed trend of the job placement like how many students are selected for jobs, how many students are not selected for the job, and so on. The main point in the application, the professor can find the trend of job rejection by reason of the rejection like resume not selected, interview rejection, rejection by the student, and so on. According to the search by professors, they will get a detailed report of the student's job placement.

As we can see in the proposed framework of this project. I discuss the tools, technology, and database that will use in this project. which is shown in figure :3.4.

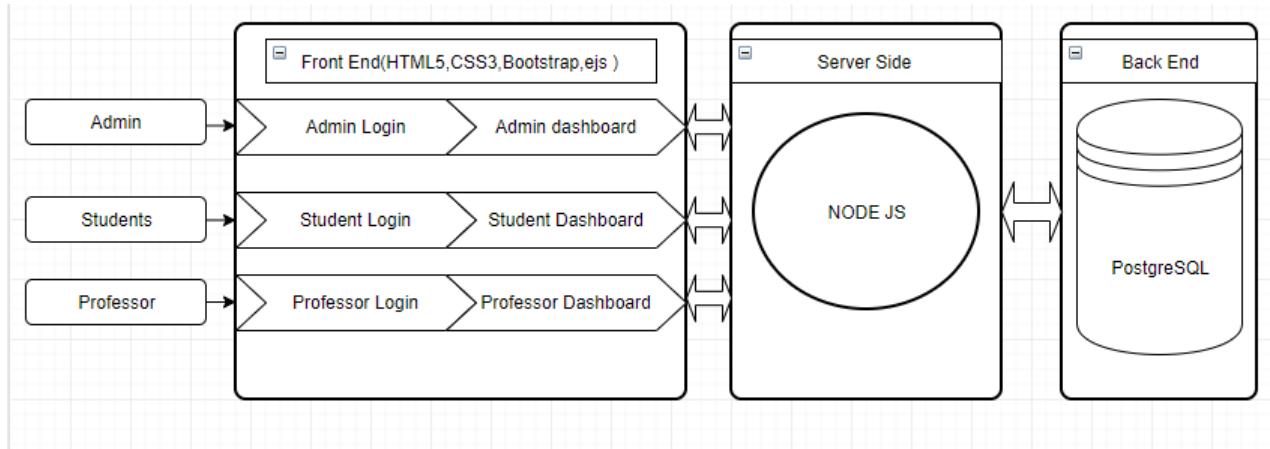


Figure 3.4: The methodology design shows the tools and techniques used

### 3.11 Implementation

**Coding Part :** In this part, I am going to explain which type of technology, technique and tools, I have used in my web application.

As mentioned earlier, HTML5 and CSS3 has been used for creating the web pages and bootstrap for making the responsive and effective designing of the web pages . Also

web pages are functioned by ejs templated in nodejs. As the student dashboard is shown in the Figure : 3.5 .

Figure 3.5: Student dashboard HTML file using ejs template

Likewise, professor dashboard HTML file using ejs template is shown in the Figure :3.6. Which used the Bootstrap table,CSS and font style.

The screenshot shows the Visual Studio Code interface with the following details:

- File Explorer:** Shows a tree view of files and folders, including 'OPEN EDITORS' (index.js, style.css, Admin-dashboards.js, Professor-dashboards.js, view-job-profiles.js), 'JOBS TRAJECTORY' (professor-search.js, edit-job.js, fetch.js, graph.js, header.js, header.js.map, index.js, login\_admin.js, login\_professors.js, login.js, login.js.map, notification-professors.js, notification-students.js, professor-side\_bar\_dashboard.js, Professor-dashboards.js), and 'ADMIN DASHBOARDS' (Admin-dashboards.js).
- Editor:** The main editor area displays the 'view-job-profiles.js' file content. The code is a template-based component (using Mustache syntax) for displaying job profiles. It includes sections for student and company information, and a table for course details.
- Bottom Bar:** Shows tabs for 'ROLLING', 'OUTPUT', 'DEBUG CONSOLE', 'TERMINAL' (selected), 'GRAMES', 'AUTOMATE', and 'NET INTERACTIVE'. The terminal tab shows the command 'node .js' being run and the message 'Body parser deprecated unhandled extended; provide extended option app.js:40:17'.
- Right Panel:** Shows a 'PROBLEMS' panel with one error: 'SyntaxError: Unexpected identifier' at line 1, column 1 of 'view-job-profiles.js'.

Figure 3.6: professor dashboard HTML file using ejs template.

The admin dashboard HTML file using ejs template is shown in in the Figure :3.7.

```

File Edit Selection View Go Run Terminal Help
Admin-dashboard.ejs - job-tracking - Visual Studio Code
views > Admin-dashboard.ejs > body > div#studentDashboard.bg-light > div.container-fluid > div.row > div.col-md-12.table_main.p-0 > div.col-md-12.table_main.p-3
  1 <div class="studentDashboard bg-light">
  2   <div class="container-fluid">
  3     <div class="row">
  4       <!-- include('admin_side_bar_dashboard') -->
  5       <div class="col-md-12 table_main p-3" style="overflow-x: auto;">
  6         <!-- include('admin_search') -->
  7         <div class="table-responsive">
  8           <tbl_struct version="1.1" max_colspan="1" max_colwidth="100%" max_crowspan="1" max_rwidth="100%" total_cols="5">
  9             <tbl_header cols="5">
 10               <tr>
 11                 <td>Database</td>
 12                 <td>Email</td>
 13                 <td>Type</td>
 14                 <td>Date</td>
 15                 <td>Action</td>
 16               </tr>
 17             </tbl_header>
 18             <tbl_info cols="5" index="1" usedcols="5">
 19               <tbl_r cells="5" ix="1" maxcspan="1" maxrspan="1" usedcols="5">
 20                 <tbl_c index="1" ix="1" maxcspan="1" maxrspan="1" usedcols="1"><td>Database</td></tbl_c>
 21                 <tbl_c index="2" ix="1" maxcspan="1" maxrspan="1" usedcols="1"><td>Email</td></tbl_c>
 22                 <tbl_c index="3" ix="1" maxcspan="1" maxrspan="1" usedcols="1"><td>Type</td></tbl_c>
 23                 <tbl_c index="4" ix="1" maxcspan="1" maxrspan="1" usedcols="1"><td>Date</td></tbl_c>
 24                 <tbl_c index="5" ix="1" maxcspan="1" maxrspan="1" usedcols="1"><td>Action</td></tbl_c>
 25               </tbl_r>
 26             </tbl_info>
 27             <tbl_r cells="5" ix="2" maxcspan="1" maxrspan="1" usedcols="5">
 28               <tbl_c index="1" ix="2" maxcspan="1" maxrspan="1" usedcols="1"><td>record.Fname</td></tbl_c>
 29               <tbl_c index="2" ix="2" maxcspan="1" maxrspan="1" usedcols="1"><td>record.Lname</td></tbl_c>
 30               <tbl_c index="3" ix="2" maxcspan="1" maxrspan="1" usedcols="1"><td>record.Type</td></tbl_c>
 31               <tbl_c index="4" ix="2" maxcspan="1" maxrspan="1" usedcols="1"><td>record.Date</td></tbl_c>
 32               <tbl_c index="5" ix="2" maxcspan="1" maxrspan="1" usedcols="1"><td>record.Delete</td></tbl_c>
 33             </tbl_r>
 34           </tbl_struct>
 35           <script>
 36             records.forEach(record => {
 37               const tr = document.createElement('tr');
 38               const td1 = document.createElement('td');
 39               const td2 = document.createElement('td');
 40               const td3 = document.createElement('td');
 41               const td4 = document.createElement('td');
 42               const td5 = document.createElement('td');
 43
 44               td1.textContent = record.Fname;
 45               td2.textContent = record.Lname;
 46               td3.textContent = record.Type;
 47               td4.textContent = record.Date;
 48               td5.innerHTML = `<a href="#" onclick="deleteRecord(${record._id})>Delete</a>`;
 49
 50               tr.appendChild(td1);
 51               tr.appendChild(td2);
 52               tr.appendChild(td3);
 53               tr.appendChild(td4);
 54               tr.appendChild(td5);
 55
 56               table.appendChild(tr);
 57             });
 58           </script>
 59         </div>
 60       </div>
 61     </div>
 62   </div>
 63 </body>
 64 </html>

```

Figure 3.7: admin dashboard HTML file using ejs template

The images are also important components of the designing process. For instance, Figure 3.8 shows the Notification HTML. which uses the bootstrap table and CSS class. and show the notification with the click of the notification icon. Otherwise, the notification is hidden.

```

File Edit Selection View Go Run Terminal Help
notification.html - job-tracking - Visual Studio Code
views > notification.html > Admin-dashboards.ejs > notification.html > view-job-profiles
  1 <div class="modal" id="exampleModalToggle" aria-hidden="true" aria-labelledby="exampleModalToggleLabel" tabindex="-1">
  2   <div class="modal-dialog modal-dialog-centered">
  3     <div class="modal-content">
  4       <div class="modal-header">
  5         <h5 class="modal-title" id="exampleModalToggleLabel" style="color: #007bff;">New MESSAGE

```

Figure 3.8: Notification HTML

As per the figure:3.9 shows the coding of the css . which is help to making attractive web pages.

```

public > css > style.css > access
599
600 .media-chat {
601   padding-right: 64px;
602   margin-bottom: 0;
603 }
604 Shorthand property combines four of the transition properties into a single
605 property.
606 (Chrome, Opera 12, Safari 5)
607 -webkit-transition: background-color .2s linear;
608 transition: background-color .2s linear;
609
610
611 .media-chat-reverse {
612   float: right;
613   clear: right;
614   background-color: #e6f2ff;
615   color: #007bff;
616 }
617
618 .media-chat .media-body p {
619   /* position: relative;
620   padding: 0px 8px;
621

```

Figure 3.9: Style.css coding

Further, figure 3.10 shows the Ajax query which is used for fetching the data from the database without page refresh and uses in fetching data in the front-end webpage. In this coding department and courses are made dynamically. admin can add department and course manually and department and course are automatically updated. By This feature, This project could be expanded.

```

public > js > main.js > (ready) callback > (done) callback
You > 6 days ago | 1 author | You
1 // Department dynamically
Complexity is 13 You must be kidding
2 $(document).ready(function() {
3   // $("#Department").on('click', function() {
4     $.ajax({
5       type: "POST",
6       url: "/dept",
7       // data: data,
8       // contentType: "application/json",
9       dataType: "json"
10     }).done(function(data) {
11
12       // x.removeChild();
13       // x.innerHTML = "";
14       var x = document.getElementById("Department");
15       x.innerHTML = "";
16
17       $.each(data, function(i, d) {
18         // $("#Department_course").append(<option value="" + d.id + "" id="dept" onclick="course(" + c
19         // var opt = <option value="" + d.id + "" id="dept" onclick="course(" + d.id + ")">" + d.dept_
20         var opt = document.createElement("option");
21         opt.value = d.dept_full_name;

```

Figure 3.10: AJAX Query coding

The figure:3.11 show the coding of the app.js file. App.js file is the most important

file in this project. Almost all coding have in this file. In this file set up all types of environments which are needed in a web application like ejs, express-session, cookie-parser, myTotallySecretKey, cryptr, download, and so on. In this file create the manual functions which are needed in web application for functionality.

```

File Edit Selection View Go Run Terminal Help
app.js style.css Admin-dashboard.ejs notification-professor.ejs view-job-profs.ejs
app.js > @ app.get('/login') callback > @ then() callback > @ then() callback > error
3 const app = express();
4 const ejs = require('ejs');
5 const PORT = 5000;
6 const path = require('path');
7 const config = require('../config.js')[env];
8 const Pool = require('pg').Pool;
9 var bodyParser = require('body-parser');
10 const { count } = require('console');
11 //const bodyParser = require('body-parser');
12 const { createHash, scryptSync, randomBytes } = require('crypto');
13 const { clearScreenDown } = require('readline');
14 const session = require('express-session');
15 const cookieParser = require('cookie-parser');
16 const helmet = require('helmet');
17 require('dotenv').config();
18 const nodemailer = require('nodemailer');
19 const Crypt = require('crypt');
20 const bcrypt = new Crypt('myTotallySecretKey');
21 //const formidable = require('formidable');
22 //const fs = require('fs');
23 const fileUpload = require('express-fileupload');
24 const download = require('download');
25 //const app = express();

[nodemon] to restart at any time, enter 'rs'
[nodemon] watching path(s): *
[nodemon] watching extensions: js,ejs,json
[nodemon] starting "node app.js"
body-parser deprecated undefined extended; provide extended option app.js:40:17
Server running on port: http://localhost:5000

```

Figure 3.11: App js coding

To establish the Connection of the database written in config.js, the code is shown in Figure:3.12.

```

File Edit Selection View Go Run Terminal Help
config.js Admin-dashboard.ejs view-job-profs.ejs
config.js > config
You, 5 days ago | 1 author (You)
1 var config = {
2   development: {
3     user: "postgres",
4     database: "job-tracking",
5     password: "12345",
6     host: "localhost",
7     port: 5432,
8     max_connections: 100,
9   }
10 };
11 You, 5 days ago + 100 ...
12 };
13 module.exports = config;

[nodemon] to restart at any time, enter 'rs'
[nodemon] watching path(s): *
[nodemon] watching extensions: js,ejs,json
[nodemon] starting "node app.js"
body-parser deprecated undefined extended; provide extended option app.js:40:17
Server running on port: http://localhost:5000

```

Figure 3.12: Connection of Database Coding

**Back-End** This project uses the PostgreSQL database management system. Because it is a free and open source relational database system. it has high standing for dependability, feature robustness, and performance.

In this project need to create the five tables like login, department, course, add job, and reply-response.

As shown in Figure :3.13, In the login table enter the detail of the three different types of users when they will register in the application. In the department and course table add the information about the department and courses. That is used for making dynamically adding and deleting the department and courses in this project.

The add-Job table is the main table in this project and students can add the job detail in this table which uses in the project according to the need of the different types of users.

The last table is the reply-response table which stores the information about chats between professors and students.

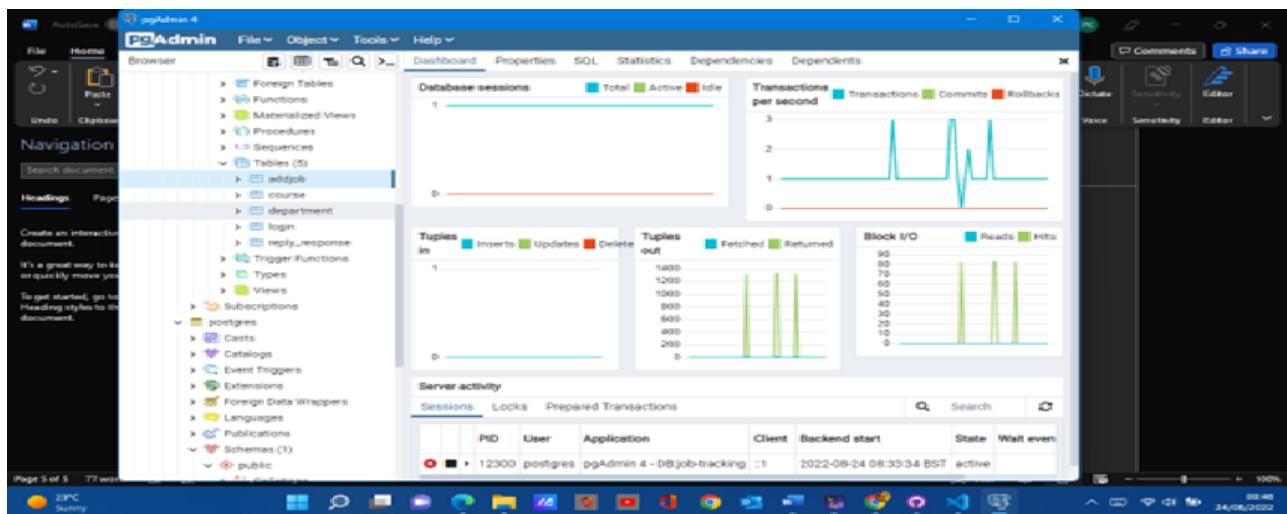


Figure 3.13: Execution of PostgreSQL

## 3.12 UI of Web Application

In this application, I have used a very easy-to-understand UI system. Users can easily understand the functionality of the system. it is very users friendly web application. I have created very attractive and simple web pages that mention the purpose of the website and write information about my project and the University of the UEA. As per figure:3.14, show the first page of the website.

The figure consists of three vertically stacked screenshots of a web application interface, likely a development environment running on a local host.

**Screenshot 1: Home Page**

The title bar shows "Job Tracking System of UEA". The main content area features a large image of a smiling young woman. Overlaid on the image is a box containing the text:

**Job Tracking Web Application**

This application is used for tracking the jobs of the students. This application is helpful to the students in getting jobs. Professors will give feedback on the student's weak points and will help the students. When students will apply for the next jobs.

**Screenshot 2: About Us Page**

The title bar shows "ABOUT US". The main content area contains the following text:

The time for inaction is now. New innovations, rivals, difficulties, and expectations are continuously altering our world. To build the university of the future, we must take risks, think creatively, and alter the way we think. We are investing in the future to expand on our solid foundations because we are passionate about attaining student, research, staff, and worldwide success. We'll expand our campus and offer the greatest resources and most cutting-edge instruction. To equip everyone with the skills they need for the future, we'll offer unmatched assistance and a top-notch learning experience. We'll continue to expand our local, national, and international alliances and networks.

Below this text are three sections with icons and links:

- Education**: Our UEA values, which were developed by the staff, serve as a foundational set of guidelines for how we conduct ourselves as an employer, encourage excellence in teaching, learning, and research, and cooperate as a key institution in our region.
- Campus Life**: It offers terrific shopping, a fun nightlife, and a thriving music scene—everything you would want from a university town. Norwich is not only surrounded by stunning English countryside, but is also close to the North Norfolk shore. It is a thriving cultural hub, with some of its best attractions being its renowned literary heritage (Norwich was the first English UNESCO city of literature), museums, and galleries (such as the...
- Student Hub**: Students' Union at UEA. The season is almost here... <https://buff.ly/2Zlx2Ov>. Why not volunteer during welcome week to aid UEA's new students in setting in? We need existing UEA students to assist newly admitted students. Benefits of the position include:
  - Access to special welcome week activities and club social events

**Screenshot 3: Another Page**

The title bar shows "localhost:5000". The main content area contains two columns of text:

University is courageous in our judgments and forward-thinking in our approach. We foster innovation and creativity, grab possibilities that are ethical and long-lasting, and strive to improve education.

and its adored football team, the Canaries, also known as Norwich City Football Club), as well as too many festivals to list.

opportunity's project coordinator  
 • Union benefits plus more Significant skills will also be acquired during the programme, further information is available here: <https://buff.ly/2Zx2h1>

At the bottom of the page is a footer with the UEA logo and navigation links:

- UEA University of East Anglia**
- About us**: Financial Aid, Accessibility, Library, Academic
- Services**: Facility Services, Time Schedule, Pay My Tuition, Human Resources
- Contact us**: Email: Admin@gmail.com, Phone number: 000-000-0000, Follow us on: Facebook, Twitter, LinkedIn

Figure 3.14: Index Web Page of Job Tracking System

**Explain UI of Student :** There will be three users for the developed system – student, professors and admin. The students' login page will be as shown in the figure :3.15 .

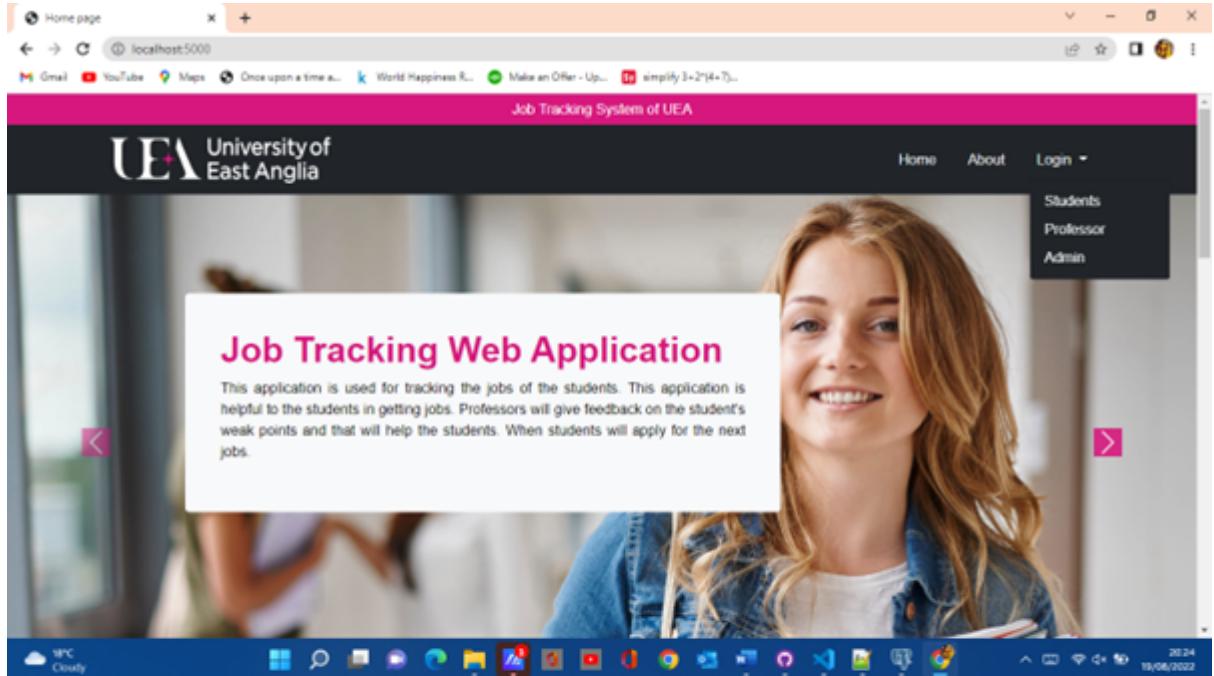


Figure 3.15: UI of Three Different Types of Users

**Student Login:** Account enumeration has been used to prevent hackers from getting unauthorized access to the system. The feature will prevent the hacker from knowing whether there is an issue with the email or the password, creating confusion for the hacker. The student Login page is shown in figure:3.16.

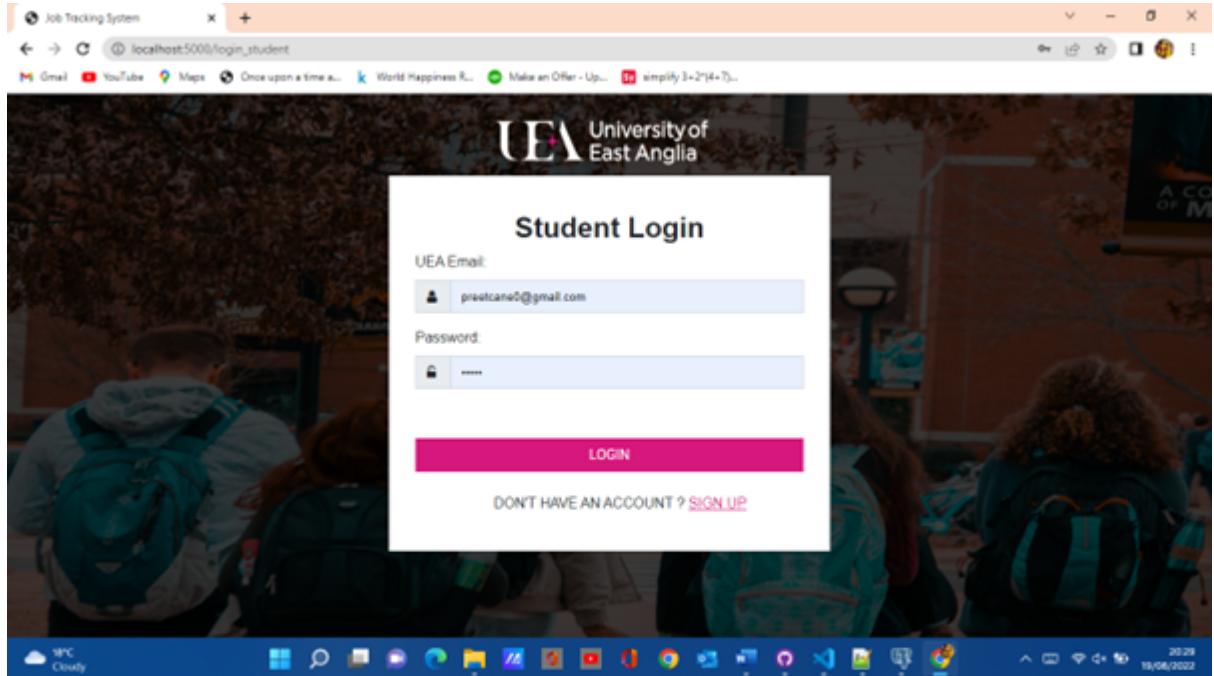


Figure 3.16: Student Login Web page

**Student Registration :** Once the Student will click on the student signup page, the following page will appear as shown in the figure:3.17. During the development, HTML 5 validation use has been taken.

The department and course will be dynamically added, meaning that it will be possible for the admin to add a new department and course. Therefore, there will be automatic addition of the department in dropdown, as well as course. This has been facilitated by AJAX.

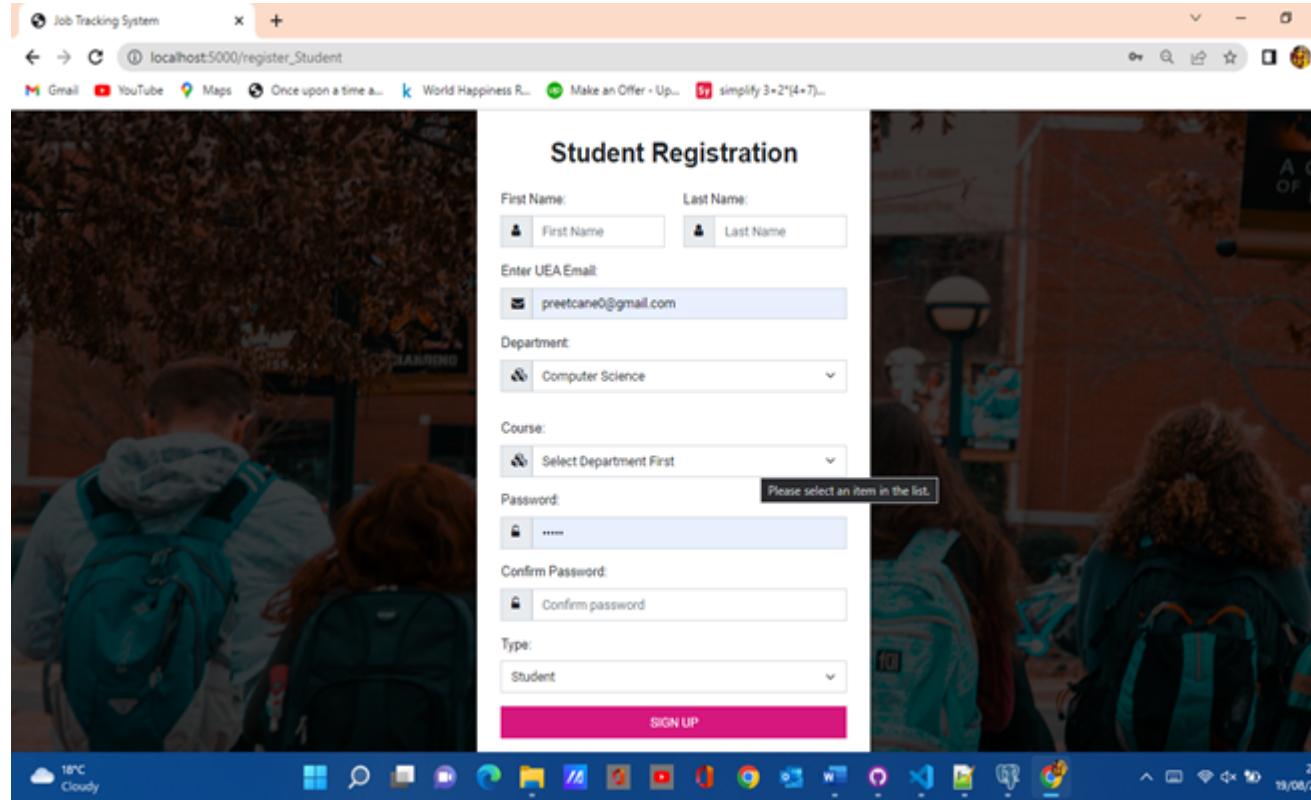


Figure 3.17: Student Registration Web Page

To increase security, validation features have been incorporated. For instance, when there is an issue with the password during the registration process, a message will be displayed that the password does not match as shown in Figure: 3.18.

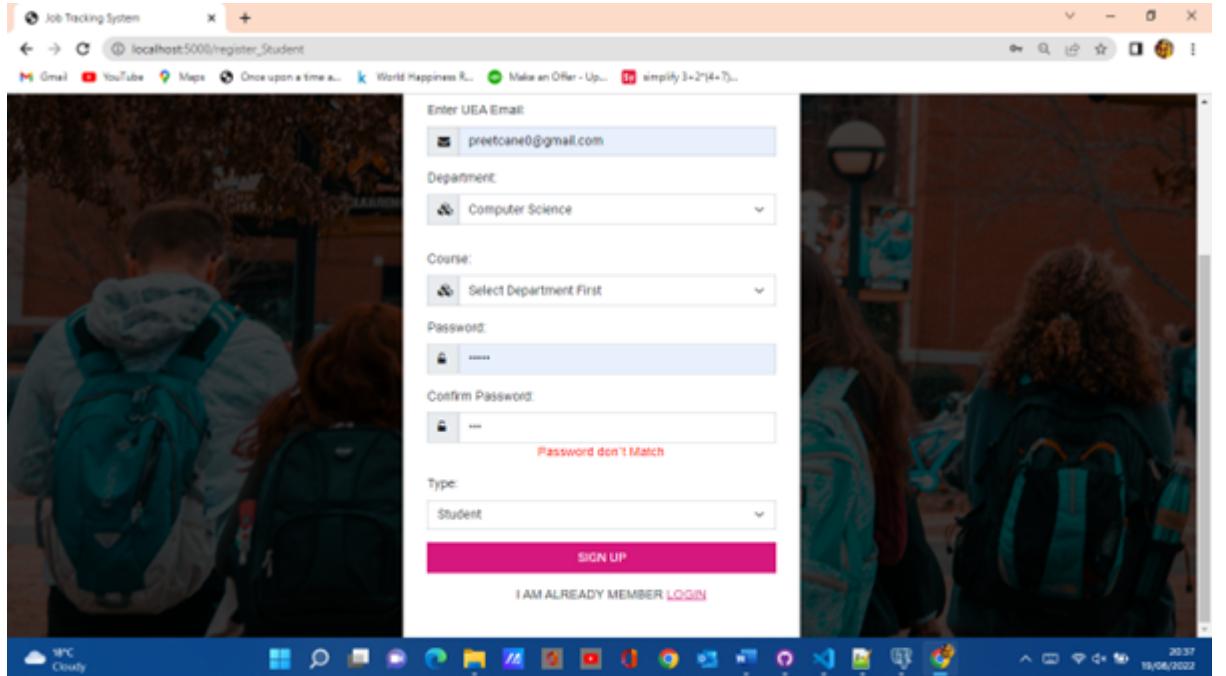


Figure 3.18: Show Message of Password Does Not Match In Student Sign-Up Web Page

As Per Figure:3.19, show an increase in security on the server side, the message will be shown on the registration page when the password doesn't match.

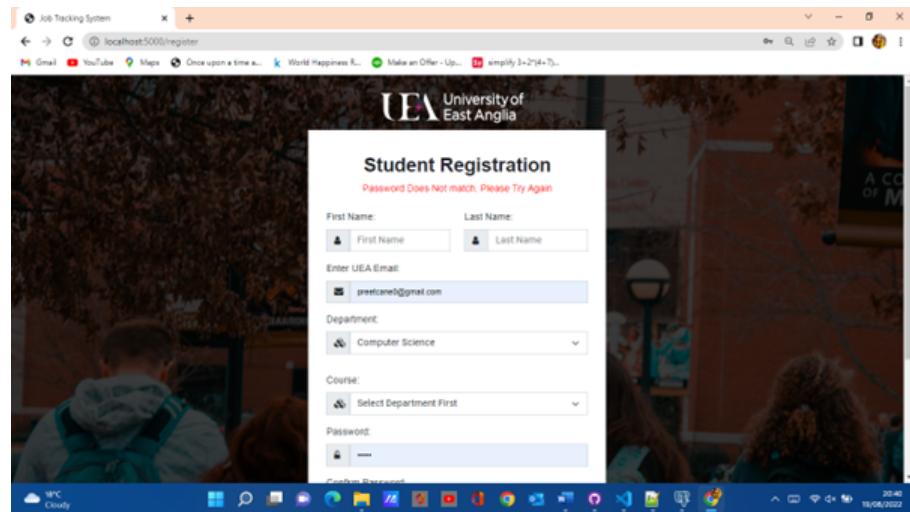
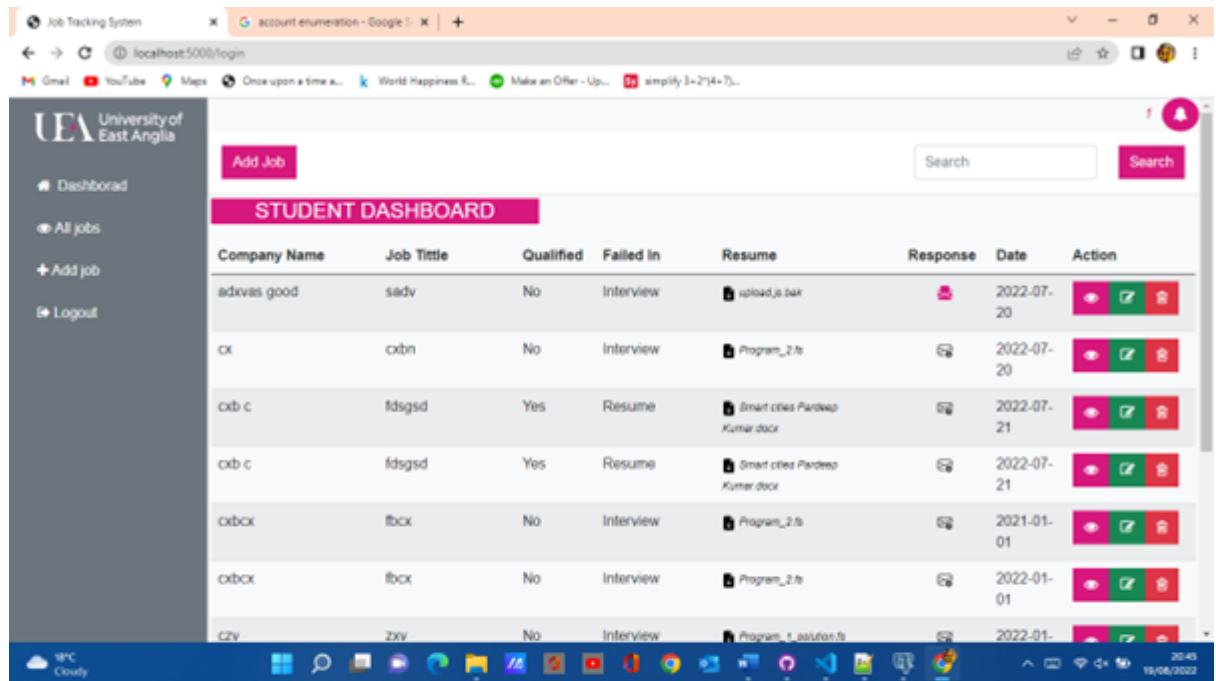


Figure 3.19: Server-side Message of Password Does Not Match In Student Sign-Up Web Page

**Student Dashboard :**When the student will login in their dashboard, they will

be able to see the different jobs they have applied for by using the add-job feature. Further, the dashboard will also give students the option to create, edit, delete and view jobs. Moreover, the system will also enable the students to search jobs in the search box. Student can see the new message notification and click on the notification icon check the new message and start chat with professor. Further, different features such as view, edit delete have been added in order to make it easier for the student to view the details of the job they have applied for or edit and delete.

In the student dashboard, there is an option chat system that can only be activated by the professor. Whenever students apply for guidance the professor replies. It starts the chatting feature with the student, which can be seen on the screen when the icon changes of the message in the response column. By seeing this, the students came to know they can start conversations with professors. This communication is confidential, only students and professors can see it on their chat system. which show in the figure :3.20.



The screenshot shows a web browser window titled 'Job Tracking System' with the URL 'localhost:5000/login'. The main content is the 'STUDENT DASHBOARD' page. On the left, there is a sidebar with the University of East Anglia logo and navigation links: 'Dashboard', 'All jobs', '+ Add job', and 'Logout'. The main area has a header with 'Add Job' and a search bar. Below is a table titled 'STUDENT DASHBOARD' with columns: Company Name, Job Title, Qualified, Failed In, Resume, Response, Date, and Action. The table contains seven rows of data. Each row includes a small preview of the resume file and three action buttons (edit, delete, and another). The bottom of the screen shows a taskbar with various icons and the date/time '18/06/2022 20:49'.

Company Name	Job Title	Qualified	Failed In	Resume	Response	Date	Action
adxvas good	sadv	No	Interview			2022-07-20	
cx	cxbn	No	Interview			2022-07-20	
cx b c	fdsgsd	Yes	Resume			2022-07-21	
cx b c	fdsgsd	Yes	Resume			2022-07-21	
cxbox	fbcx	No	Interview			2021-01-01	
cxbox	fbcx	No	Interview			2022-01-01	
CZV	ZXV	No	Interview			2022-01-	

Figure 3.20: Student Dashboard

**add job :** On the add job page, the students will be able to enter the details such as the company details, qualifications, and job title, and upload their resume. In this

page use HTML5 validation. Students need to fill in all detail of the job and then add the job otherwise shows the message to students, when students doesn't fill the all detail in add-job web page. When new job is added then show the message "Job Added successfully" other wise shows the message "Job doesn't added". Which show in figure : 3.21.

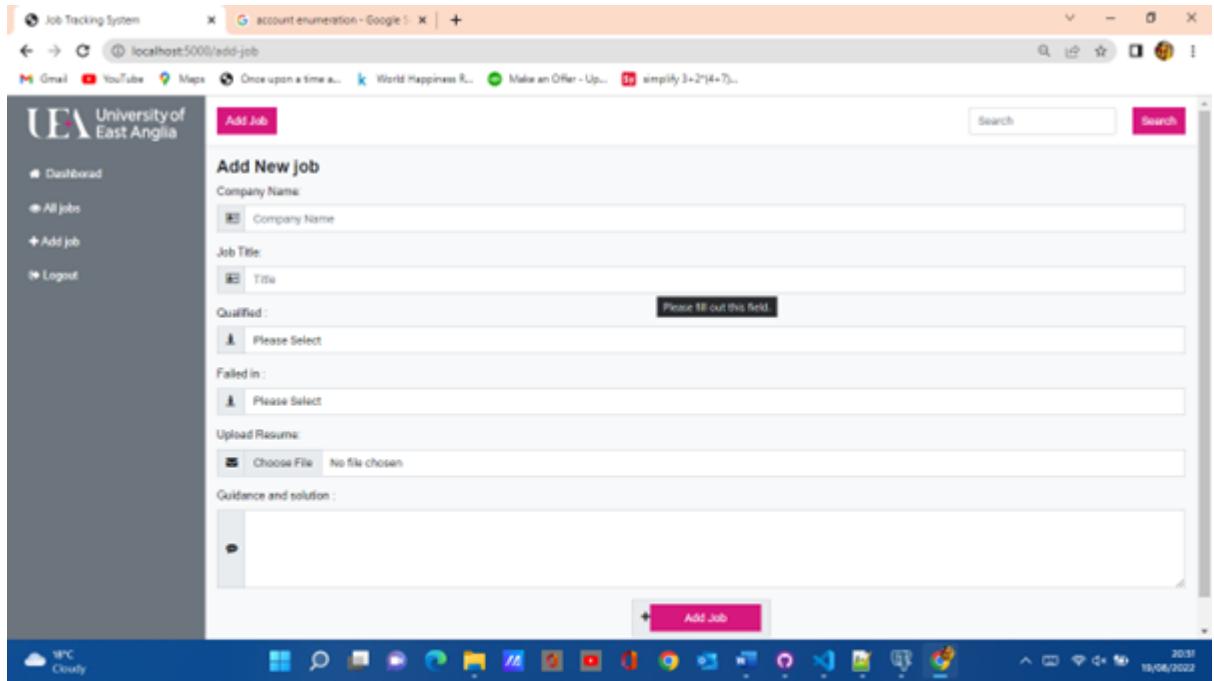


Figure 3.21: Add Job Web Page

**Edit job :** The figure: 3.22 shows the options available to the student when it comes to editing of the file. Some of the key points that needs to be considered from the dashboard are that there are different features available in the dashboard. For instance, there is feature which informs the student of the job posts which is getting a response from the professors, the student can have a conversation in the message box with professor regarding the job. Furthermore, jobs that are not getting any responses will also be visible.

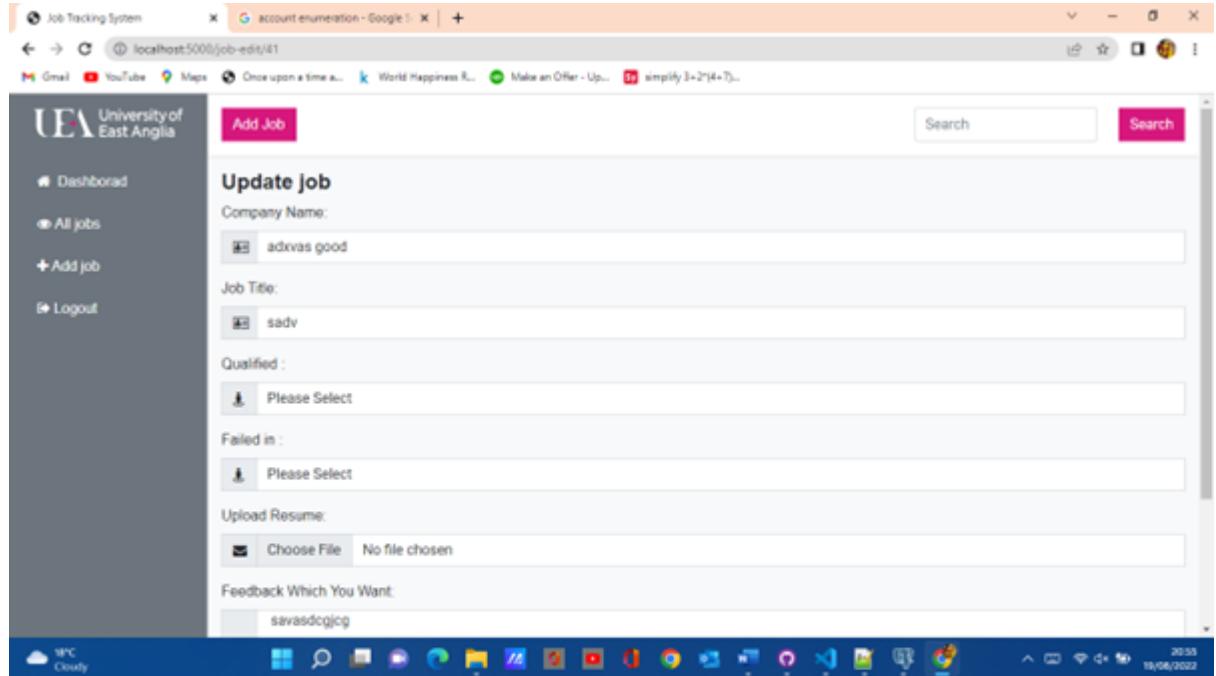


Figure 3.22: Job Edit Page

**Chatting Web Page :** The system has also incorporated a feature where a chatting system is available to the student. The system facilitates a chat between the instructor and the professor regarding the jobs. which is show in figure:3.23 .

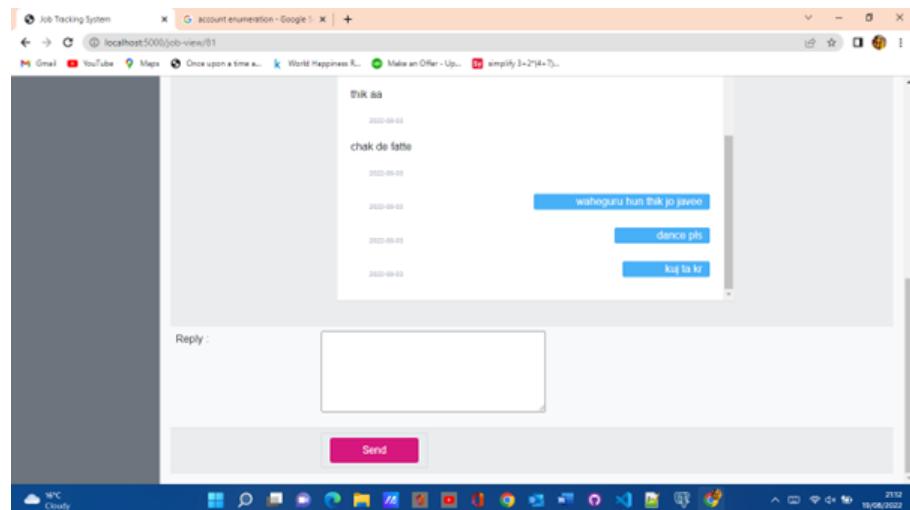
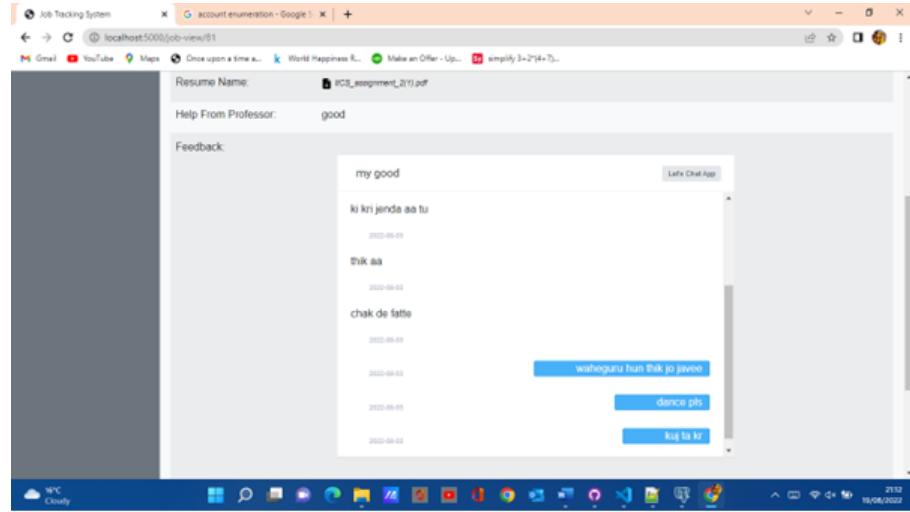


Figure 3.23: Chatting System

The above aspects have been taken into consideration for the student portal.

**UI of Professor Portal :** The professor dashboard is shown in figure: 3.24. This dashboard is very important because this dashboard comprises of critical features such as advanced search, response to students, and chatting with others students. Professor can deal with multiple students at a time. The best feature of the professor portal, the professor can see the trend of the jobs which are qualified by the students or not qualified by students on the graph last 3 months, last 6 months, last 9 months, and last 1 year. The professor uses their analytical mind skills to solve students' problems and improve their limitations of students.

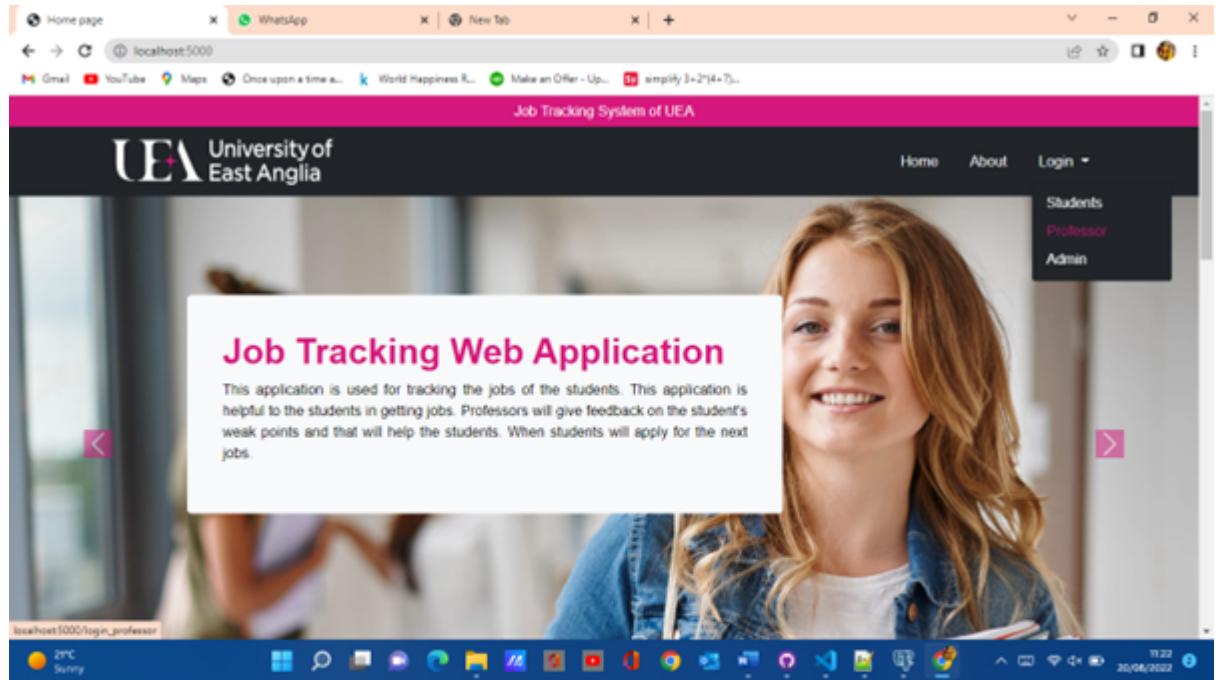


Figure 3.24: UI Of Professor Portal

**Professor Login :** An important feature that has been incorporated in the system is that when professors register in the professor dashboard if the admin allows then professors can access the professor dashboard. Otherwise, if the admin doesn't give access to the professor. it will see a message on the professor login page. which shows in figure: 3.25.

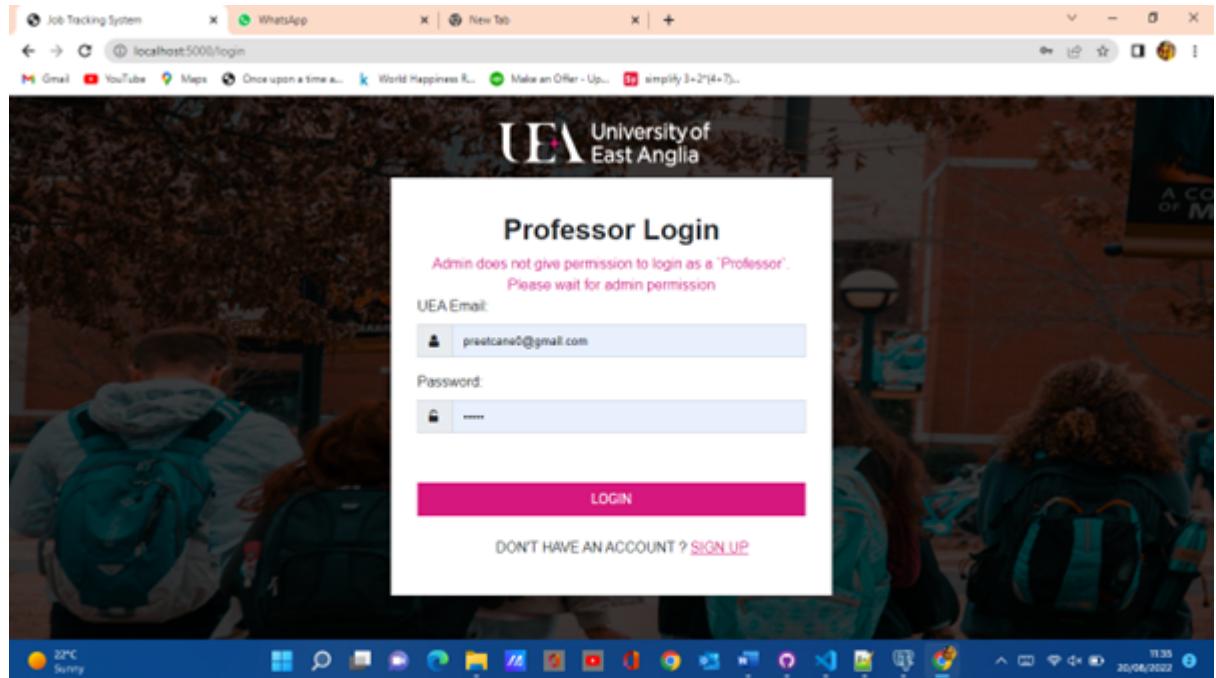


Figure 3.25: Professor Login

**Professor Dashboard :** Professor can reply to created jobs. Furthermore, in the professor dashboard, there is a change in symbol when the feedback is given by the professor. Furthermore, when the professor started giving the feedback on a specific job, there will be an option to initiate conversation with the student. which show in figure : 3.26.

The screenshot shows a browser window titled 'Job Tracking System' with the URL 'localhost:5000/login'. The main content is the 'PROFESSOR DASHBOARD' showing a list of student applications. The table has columns: Student Name, UEA Email, Course, Company Name, Job Title, Qualified, Failed In, Resume, Response, Date, and Action. There are six rows of data. The dashboard also includes a sidebar with links for Dashboard, All jobs, and Logout, and a top navigation bar with search and filter options.

Student Name	UEA Email	Course	Company Name	Job Title	Qualified	Failed In	Resume	Response	Date	Action
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	Infosys	software developer	No	Resume	<a href="#">Program.ftr</a>	<a href="#">Download</a>	2022-08-10	<a href="#">View</a>
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	viva	software eng	No	Interview	<a href="#">100574418_curriculum.cv.pdf</a>	<a href="#">Download</a>	2022-08-10	<a href="#">View</a>
Akashdeep kaur	ype21pcu@uea.ac.uk	Msc Business Management	Rostercare private limited	health care assistant	Yes		<a href="#">Gantt Chart.pdf</a>	<a href="#">Download</a>	2022-07-27	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru g	reader	Yes	None	<a href="#">NCS_assignment_211.pdf</a>	<a href="#">Download</a>	2022-08-18	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru	writing	Yes	None	<a href="#">NCS_assignment_211.pdf</a>	<a href="#">Download</a>	2022-08-18	<a href="#">View</a>
Pardeep	preetkane0@gmail.com	MSC Advance	mycompany	software	No	Interview	<a href="#">Program.ftr</a>	<a href="#">Download</a>	2022-	<a href="#">View</a>

Figure 3.26: Professor Dashboard UI

**Professor Notification :** As per in figure :3.27, In the student, and the professor dashboard there is a feature of notification message. The dashboard has a feature where students, as well as professors could give replies by clicking on upcoming notification. Furthermore, the feature is available for both the professors and students. The professor also has the feature of clicking on the resume, and automatically downloading resume. However, similar feature is not available in students' portal.

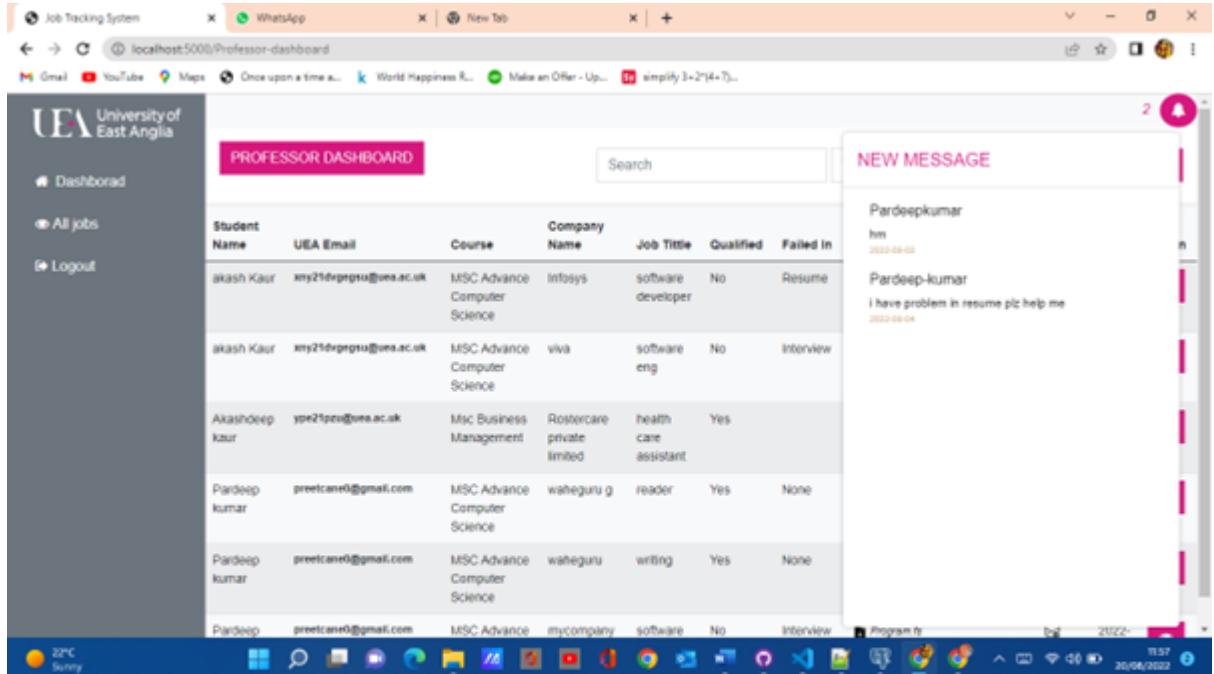


Figure 3.27: Professor Notification Image

In the figure:3.28 and Figure:3.29 shows the UI of previous and new messages between students and professor.

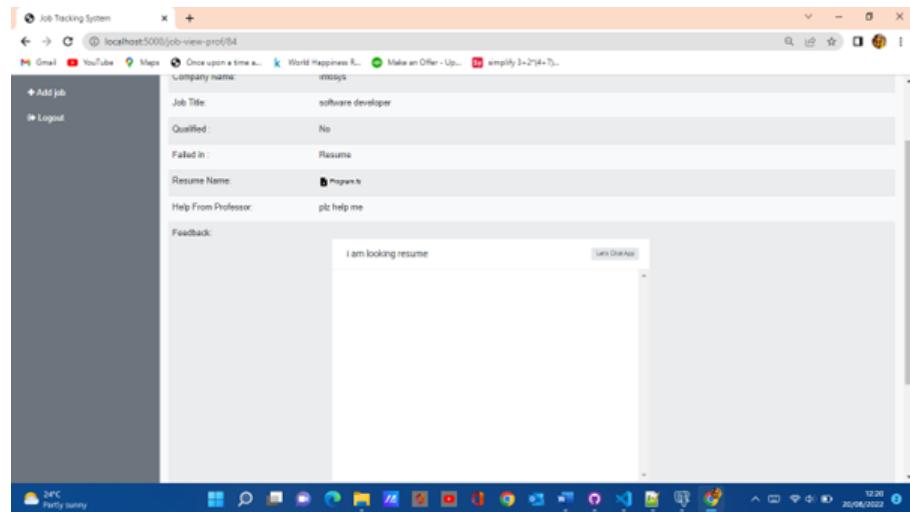


Figure 3.28: The feedback message appears as shown in image

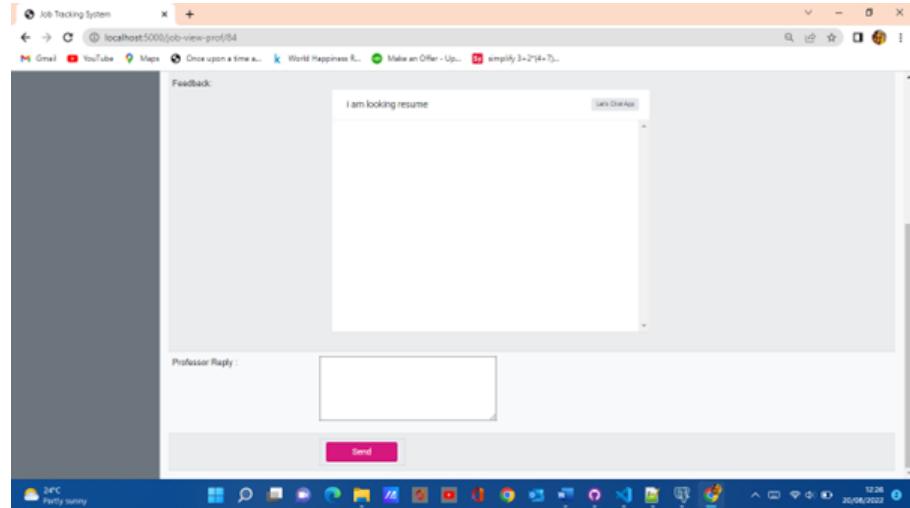


Figure 3.29: Text Area Message

**Advance Search :** As per figure 3.30 shows that A key feature in the professor's dashboard is the advanced research feature which is being created through job search by the students' name, job, as well as email id. Furthermore, the search options are also available by weekly and monthly. The option to search whether the individual is qualified for job or unqualified is also available.

The screenshot shows the Professor Dashboard with the 'Weekly Wise' dropdown menu open. The table lists six job applications with details like student name, UEA email, course, company name, job title, qualification status, failure reason, resume file, and application date.

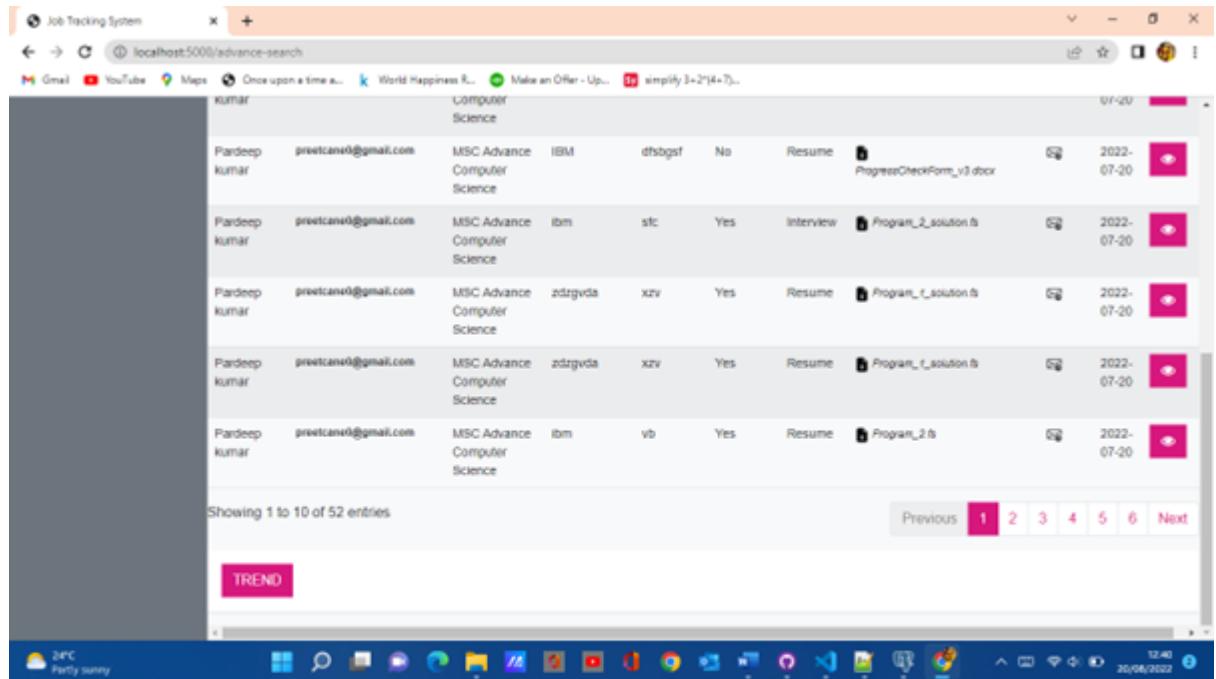
Student Name	UEA Email	Course	Company Name	Job Title	Qualified	Failed In	Resume	Date	Action
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	Infosys	software developer	No	Resume	<a href="#">Program.fw</a>	2022-08-10	<a href="#">View</a>
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	viva	software eng	No	Interview	<a href="#">100574418_curriculum.cv.pdf</a>	2022-08-10	<a href="#">View</a>
Akashdeep kaur	ype21psu@uea.ac.uk	Msc Business Management	Rostercare private limited	health care assistant	Yes		<a href="#">Gantt Chart.pdf</a>	2022-07-27	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru g	reader	Yes	None	<a href="#">RCS_assignment_2(1).pdf</a>	2022-08-18	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru	writing	Yes	None	<a href="#">RCS_assignment_2(1).pdf</a>	2022-08-18	<a href="#">View</a>
Pardeep	preetkane0@gmail.com	MSC Advance	mycompany	software	No	Interview	<a href="#">Program.fw</a>	2022-	<a href="#">View</a>

The screenshot shows the Professor Dashboard with the 'Monthly Wise' dropdown menu open. The table lists the same six job applications as the previous screenshot, but the data is presented in a monthly-wise format.

Student Name	UEA Email	Course	Company Name	Job Title	Qualified	Failed In	Resume	Date	Action
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	Infosys	software developer	No	Resume	<a href="#">Program.fw</a>	2022-08-10	<a href="#">View</a>
akash Kaur	amy21dvgpegu@uea.ac.uk	MSC Advance Computer Science	viva	software eng	No	Interview	<a href="#">100574418_curriculum.cv.pdf</a>	2022-08-10	<a href="#">View</a>
Akashdeep kaur	ype21psu@uea.ac.uk	Msc Business Management	Rostercare private limited	health care assistant	Yes		<a href="#">Gantt Chart.pdf</a>	2022-07-27	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru g	reader	Yes	None	<a href="#">RCS_assignment_2(1).pdf</a>	2022-08-18	<a href="#">View</a>
Pardeep kumar	preetkane0@gmail.com	MSC Advance Computer Science	waheguru	writing	Yes	None	<a href="#">RCS_assignment_2(1).pdf</a>	2022-08-18	<a href="#">View</a>
Pardeep	preetkane0@gmail.com	MSC Advance	mycompany	software	No	Interview	<a href="#">Program.fw</a>	2022-	<a href="#">View</a>

Figure 3.30: Advance Research

The professor have the option to see the job trends over a period, depending on the search results. As it is shown in the Figure : 3.31.



A screenshot of a web-based Job Tracking System. The main content area displays a table of search results. The columns include Name, Email, Degree, Company, Status, Interview, Resume, and Date. There are five entries listed, all belonging to 'Pardeep kumar' with various details like 'MSC Advance Computer Science' and 'IBM'. Below the table, a message says 'Showing 1 to 10 of 52 entries'. At the bottom right, there is a navigation bar with buttons for 'Previous' and 'Next', and a page number '1'. A prominent pink button labeled 'TREND' is located at the bottom left of the main content area. The browser's address bar shows 'localhost:5000/advance-search'. The taskbar at the bottom of the screen includes icons for various applications like Gmail, YouTube, Maps, and File Explorer, along with the system clock showing '20/06/2022 12:40'.

Name	Email	Degree	Company	Status	Interview	Resume	Date
Pardeep kumar	preetcan0@gmail.com	MSC Advance Computer Science	IBM	dfsbgf	No	Resume	2022-07-20
Pardeep kumar	preetcan0@gmail.com	MSC Advance Computer Science	ibm	stc	Yes	Interview	2022-07-20
Pardeep kumar	preetcan0@gmail.com	MSC Advance Computer Science	zdrgvda	xzv	Yes	Resume	2022-07-20
Pardeep kumar	preetcan0@gmail.com	MSC Advance Computer Science	zdrgvda	xzv	Yes	Resume	2022-07-20
Pardeep kumar	preetcan0@gmail.com	MSC Advance Computer Science	ibm	vb	Yes	Resume	2022-07-20

Showing 1 to 10 of 52 entries

Previous **1** 2 3 4 5 6 Next

TREND

Figure 3.31: Show Trend According The Search

The search shows the trend button, then clicking the trend button show the Graph according to the search like a 3-month graph,6 months graph, 9 months graph, and last one-year graph. Which shows in the figure 3.32,figure 3.33,figure 3.34, and figure 3.35.

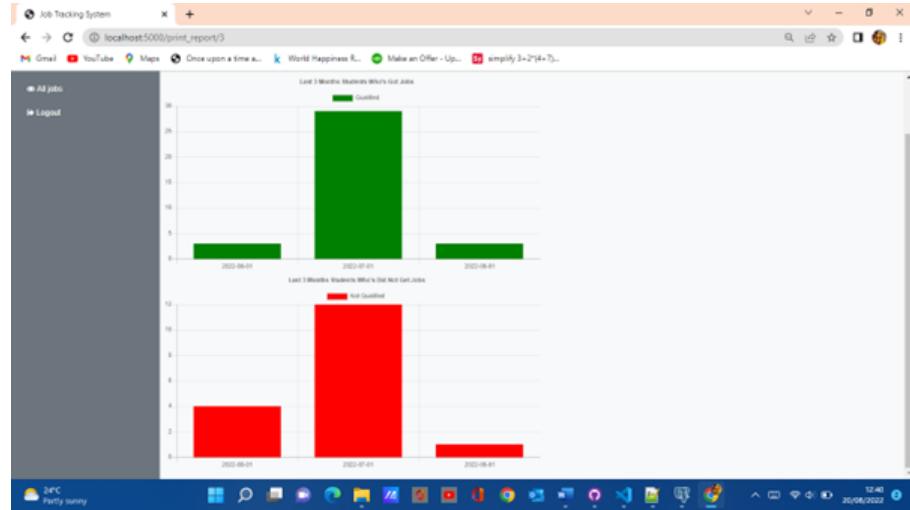


Figure 3.32: Show Graph of 3 months

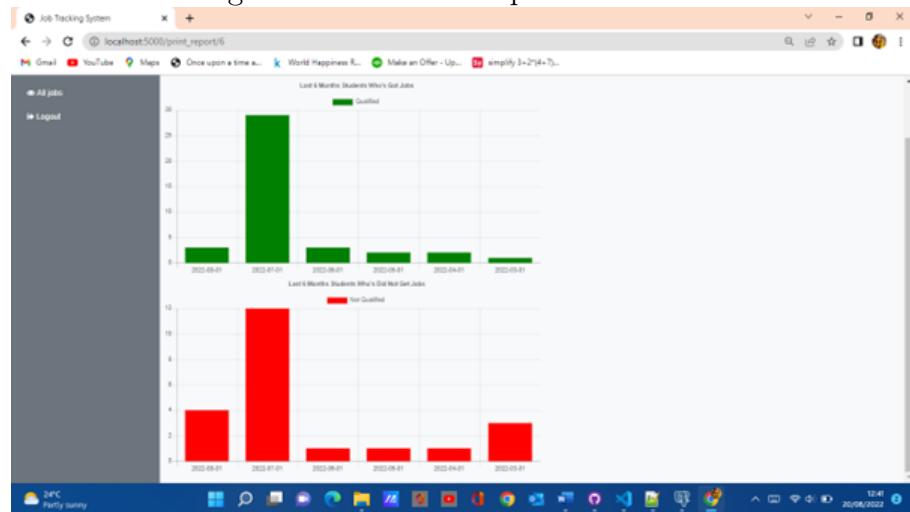


Figure 3.33: Show Graph of 6 months

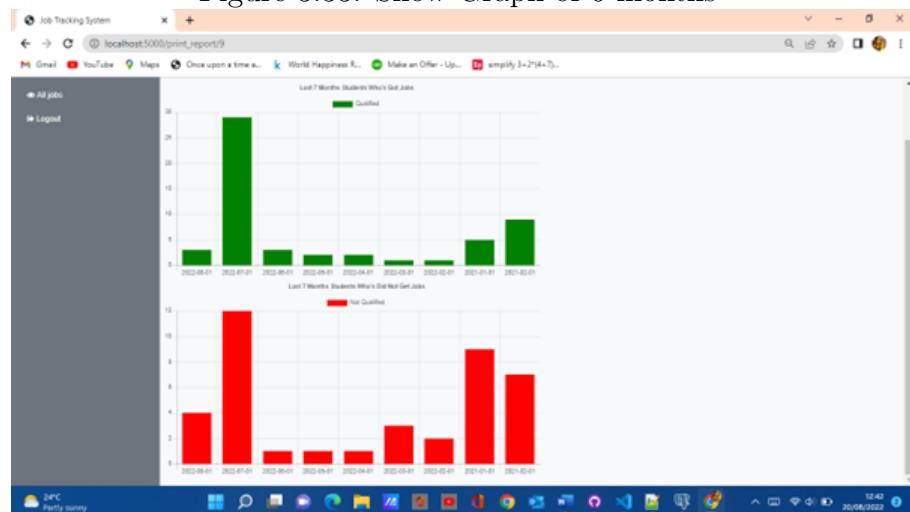


Figure 3.34: Show Graph of 9 months

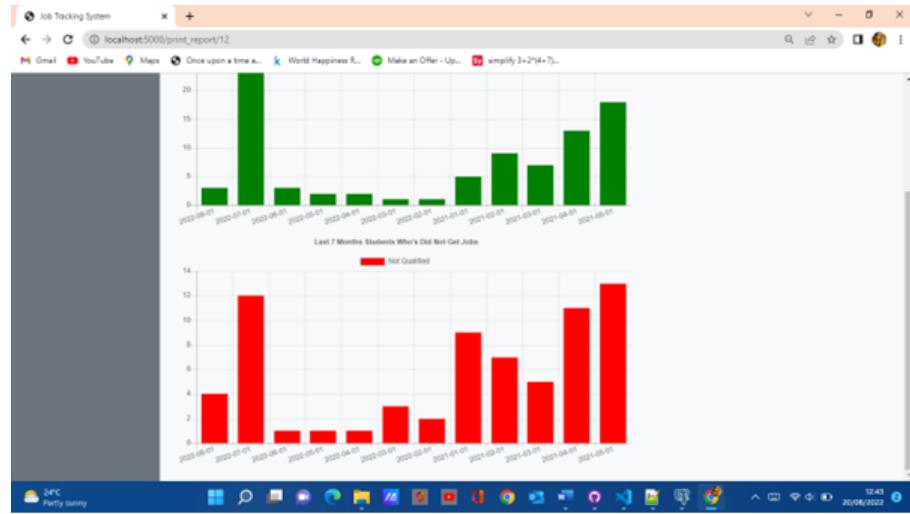


Figure 3.35: Show Graph of last 1 Year

**Admin Panel :** Admin Panel Plays a major role in this application. We have created one super-admin who will have the option to allow the quest, as well as the professor, to access the application. Furthermore, Super Admin can block students, professors, and guest admin at any time if they work in an informal way or create any unusual issue in an application.

**Admin Login Page :** Super Admin and Guest Admin (Professor) use the same Admin Login Page Whenever a new admin or a professor will get registered, they will require file permission for accessing the system. Once they will register, but still are not able to access the time, the message that will be displayed include Admin does not give permission to login. Then The professor can use the admin dashboard. Which shows in Figure 3.36.

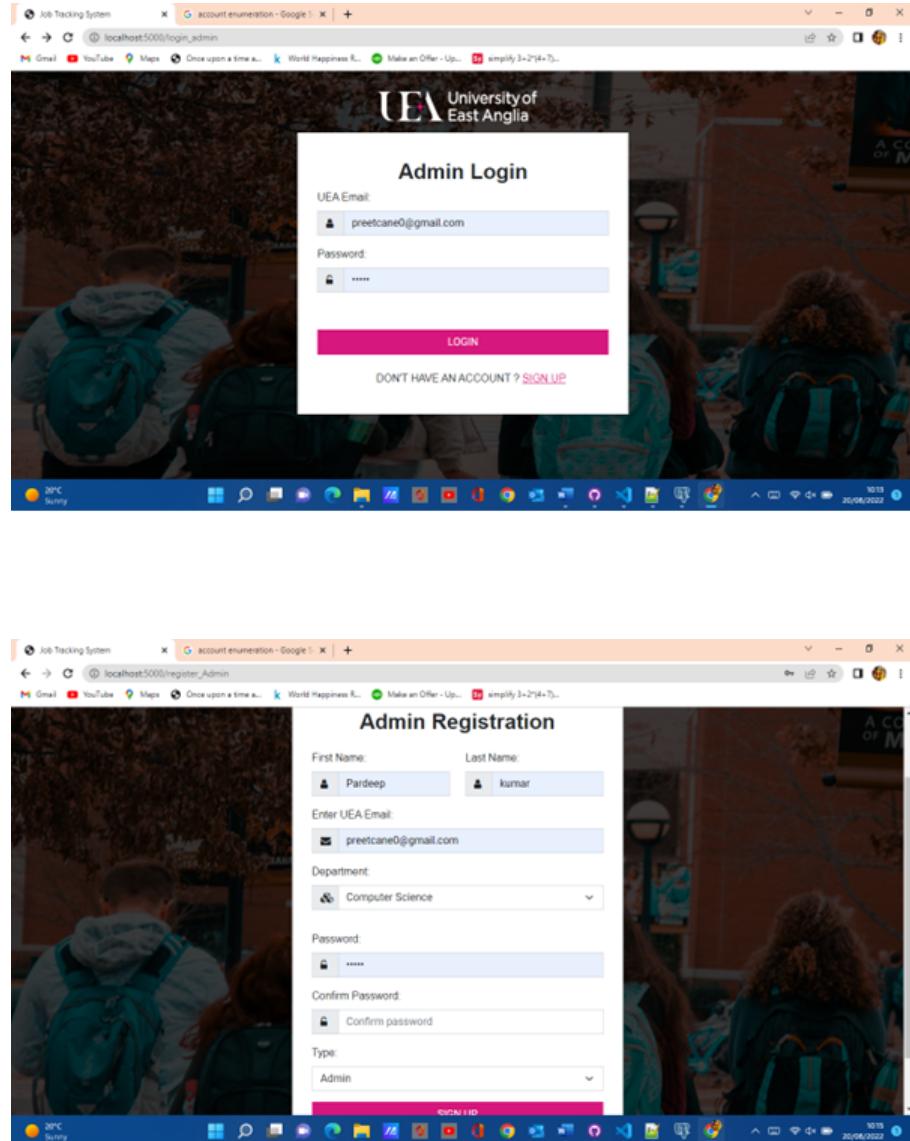


Figure 3.36: Admin Login and Registration Pages

**Admin Dashboard :** Furthermore, there is admin dashboard. The Admin dashboard has several features. In the admin dashboard, there are three types of users - Student, professor and admin. The super-Admin will have the power of blocking/unblocking student, as well as have the power of controlling professor and guest admin. The complete control of the system will lie with the super-admin, while guest-admin will have some rights. which is shows in Figure:3.37.

The screenshot shows a web-based admin dashboard for a job tracking system. The main title is "ADMIN DASHBOARD". On the left, there's a sidebar with links: "Dashboard", "+ Add Department", "+ Add Courses", and "Logout". The main content area is titled "ALL USERS" and displays a table with the following data:

Name	Email	Type	Date	Action
akash Kaur	xny21vgje@uea.ac.uk	Student	2022-08-10	<input type="radio"/> Block <input checked="" type="radio"/> Unblock
Akashdeep kaur	ype21pcu@uea.ac.uk	Student	2022-07-27	<input type="radio"/> Block <input checked="" type="radio"/> Unblock
Deep Pawar	xny21dsu@uea.ac.uk	Professor	2022-08-10	<input type="radio"/> Disallow <input checked="" type="radio"/> Allow
Jason Lines	J.lines@uea.ac.uk	Professor	2022-08-10	<input type="radio"/> Disallow <input checked="" type="radio"/> Allow
Pardeep kumar	preetcane0@gmail.com	Student	2022-07-17	<input type="radio"/> Block <input checked="" type="radio"/> Unblock
Pardeep kumar	preetcane0@gmail.com	Professor	2022-07-17	<input type="radio"/> Disallow <input checked="" type="radio"/> Allow
rohit sharma	rohit@uea.ac.uk	Admin	2022-08-18	<input type="radio"/> Disallow <input checked="" type="radio"/> Allow
rohit sharma	rohit123@uea.ac.uk	Student	2022-08-18	<input type="radio"/> Block <input checked="" type="radio"/> Unblock

At the bottom, it says "Showing 1 to 8 of 8 entries" and has "Previous" and "Next" buttons.

Figure 3.37: Admin Dashboard

**Add Department:** The admin will have the functionality of adding new departments such as science and art, which will automatically be shown during the registration page. The admin will also have the option of deleting the department, as well as adding of the new department which shows in figure:3.38.

The screenshot shows the "Add Department" page. The main title is "ADMIN DASHBOARD". On the left, there's a sidebar with links: "Dashboard", "+ Add Department", "+ Add Courses", and "Logout". The main content area is titled "Add Department" and contains the following form fields:

- Enter Full Name Of Department:
- Short Name of Dept:
- A large red "+" button followed by "Add Department" in a pink box.

Below the form is a table showing existing departments:

Department Full Name	Department Short Name	Action
biology	bio	
Health Science	H Sci	
Business	MBA	

Figure 3.38: Add Department

**Add Course:** Furthermore, the admin will also have the option of adding courses, as shown in Figure: 3.39.

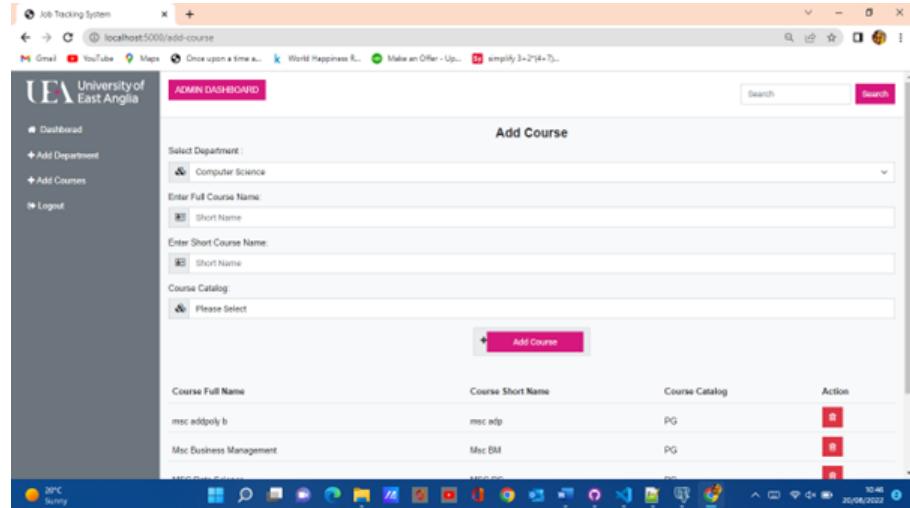


Figure 3.39: Add Course

# **Chapter 4**

## **Conclusion**

### **4.1 Conclusion and Future Research Constraints**

The purpose of the research was to develop a job tracking system that addresses the prevailing problem by enabling students to inform about their job applications progress to instructors and professors, resulting in feedback from professors which will help students to acquire skills and make amendments to their resume to increase likelihood of getting a job.

To design the system, software development cycle has been employed. Using HTML5, Visual Studio Code, Node.JS, the web application has been developed. The system is built using Node.Js for the middleware, and the front end of the system is built by using HTML5 and CSS3. The back end of the system is developed using PostGreSQL server.

The web application gives students and professors a portal where students can update their job progress multiple times. Furthermore, students also have the option of adding their information regarding their job progress like which company they have applied for job, and if they were appointed for the job or not.

In addition, there is also a professor portal where the professor can easily log in and check how students can get jobs, and how different students get rejected. Moreover, there is a functionality that enables the professor to search placement trends such as why students are getting rejected for the job and offer guidance to students based on these trends. There are certain shortcomings in the project that we intend to discuss here and discuss the future areas where work could be done.

## 4.2 Limitations of the project

There are certain limitations in the project which are as follows:

**A :** Firstly, the existing messaging system used is the web application is not dynamic, meaning that a user will need to continuously refresh the page to see the messages being received. Therefore, the user will need to continuously refresh the web page to receive messages. Additionally, current system only support text messaging and does not have face to face meeting feature.

**B :** Second limitation associated with the project is that in the current model allows only 25 users to access the web application simultaneously. If more numbers of users access the application, the system will crash.

**C :** Third limitation associated with the project is that the existing mechanism is case sensitive. Due to this, the user will need to type the terms correctly so that the search results are accurate. This limitation will have a negative impact on users' search experience.

**D :** The fourth limitation with the project is that it is vulnerable to cross site forgery. The reason for this vulnerability is that adequate coding measures to prevent cookie session hijacking has not been taken.

**E :** Fifth limitation of the current project is a web application. As majority of the universities across United Kingdom are employing a mobile application-based model, developing a mobile based application would be more useful. Therefore, the current project has limitations because it is not a mobile based application. In this regard, it is vital to develop an extended version of the system which is a mobile application so that it is more accessible and easier to use for students, as well as tutors.

## 4.3 Suggestion for Further Work

Based on the limitation, it is noted that there is substantial scope of improvement in the current web application. Firstly, the existing messaging system could be made dynamic so that user messaging experience is improved as they can receive messages dynamically. Additionally, a feature of face-to-face meeting could also be incorporated

in this regard. Further, the limitation associated with number of users could be improved further. Thirdly, the future system must be improved so that a greater number of users could access the systems simultaneously. Further, the vulnerability associated cookie hijacking must be addressed in the future research work by incorporating codes to prevent cookie session hijacking. Lastly, a mobile application for the web application should be built to make the system more accessible to students.

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