ASHESI UNIVERSITY

ELEV8.COM: AN INFORTMATION TECHNOLOGY BASED FREELANCING AND SKILL LEARNING PLATFORM FOR THE GHANAIAN SOCIETY.

APPLIED PROJECT

B.Sc. Management Information Systems

Jason Apaw Nkansah

2021

ASHESI UNIVERSITY

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APPLIED PROJECT

Applied Project submitted to the Department of Computer Science and Information Systems, Ashesi University in partial fulfilment of the requirements for the award of Bachelor of Science degree in Management Information Systems.

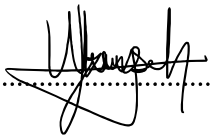
Jason Apaw Nkansah

2021

DECLARATION

I hereby declare that this Applied Project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:



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Candidate's Name:

Jason Apaw Nkansah

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Date:

May 14, 2021

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I hereby declare that preparation and presentation of this Applied Project were supervised in accordance with the guidelines on supervision of Applied Project laid down by Ashesi University.

Supervisor's Signature:

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Supervisor's Name:

Akua O. Ahenkorah

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Date:

14/5/2021

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Acknowledgements

I would like to dedicate this in five parts: firstly to my family, for providing the amazing support and encouragement; my inspirational friends, with special thanks to Nana Obeng Marnu for helping me collate this report; my incredible supervisor, Akua Ahenkorah, for providing valuable insight and advice throughout the journey; Almighty Jehovah God, as without Him none of this would be possible and all thanks and glory goes to Him and finally to myself, because it has been a long and unfathomable journey of growth, but in the end I rose to the occasion and gave it my all.

Abstract

Society today preaches that the world has become so interconnected that life has become seamless without the need for in person interaction and transactions, however, how are we using this seemingly connected society to our advantage, especially when some of our biggest challenges today are the high unemployment rate and access to a higher form of education than the book oriented one we are used to, especially in the Ghanaian context?

In this paper, a proposed solution is discussed and the Architecture, Implementation and testing are expounded on to see how best the problem of unemployment and book oriented education in Ghana, taking the Information Technology sector; Elev8, a web application designed for students to learn, workers to find freelance work and employers to hire and outsource, is suggested as a potential fit to the problem society faces today. A key feature it has is its ability to link freelancers or employees to potential employers and vice versa; a feature which will ultimately serve as the panacea for the problem identified.

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Chapter 1: Introduction

In recent times the need for making the best use of what we have to solve everyday problems is on the rise. This chapter introduces the problem from both research and an intrinsic analysis perspective, compares and contrasts existing solutions progress to this problem and lists the aims and objectives of the proposed solution.

1.1 Background

According to Davide Morselli, when we think of the future, one thing often comes to mind – uncertainty [16]. Even if as an individual you have your life mapped out to the letter, or you live one day at a time, uncertainty is unavoidable. Many people combat this uncertainty through education; we learn as much as we can to avoid not knowing and prepare ourselves for the future, be it in school or on our own. However, the issue that arises here is how what we know is useful to our future. A survey conducted took samples from 43 randomly selected four-year tertiary institutions globally, and out of 32,500 students, about 34 per cent of those students indicated they were confident that they would graduate with the know-how to succeed [5].

Even after we do transition to the corporate world, the issue of what it is we will do is a big question; given the plethora of careers in the world, we tend to pursue one based on ambition, pressure from externalities or even our degrees. But in a world with a little over eight billion people [27], the corporate world is very competitive. Taking Africa, a survey conducted from data collated from 41 countries over the years 2000 to 2010 showed that unemployment, especially youth unemployment, was on a rise and from the looks of it, no redresses were being made to resolve this [19].

In 1984, the late Marshall McLuhan, a media and communication theorist, coined the term "global village" to describe the notion of how the different world cultures have become interconnected, allowing for easy sharing of culture and information [8]. However, after a global pandemic struck in early 2020, and forced many businesses to move online, economies were seemingly brought to their knees because there were no or few contingency plans for remote working.

Looking at Ghana, information technology is a new yet fast-growing trend; due to its diverse nature as well, it is very easy for one to find a niche in this field, as there is a wide array of options ranging from cybersecurity specialists, web developers, software engineers, database administrators and IT technicians. All these options are well suited for online learning experiences [9]. But at a glance, it is very easy to see the gap in most existing businesses when it comes to e-commerce and other internet-oriented business models. The issue is simple: people have the skills but cannot find jobs and others have the knowledge but based on the book-oriented nature of education in the country, most can define and explain technical terms, but cannot do the actual work, as they lack the skills needed for this.

1.2 Motivation

As an avid for self-improvement and personal growth, as well as a soon to be graduate, these issues were of great importance to me. My motivation for this applied project comes in two spheres: the first is the book-oriented form of the education system in Africa. Students study to pass, and very little emphasis is placed on actual learning of skills, and Ghana is no different [10]. As a society, we seek constant development, and one way we can do that is through our human resource. This is even more evident, as, in the Sustainable Development Goals (SDG), Goal 4 advocates the motion to ensure inclusive and equitable

quality education and promote lifelong learning opportunities for all, and one way to restructure our educational system, from book-oriented to a more hands-on/technical approach.

The second motivation is the unemployment issue Ghanaian society faces today. In this period, when seemingly everyone, mostly young adults, has this get rich fast mindset where everyone is trying to find a way to balance their lives and simultaneously improve their standards of living, it is not absurd to notice the pains people are willing to endure for this.

As such, they turn to illicit schemes like Betway lotteries, an online sports gambling system; Loom hierarchies, in which people engage in what can be described as a pyramid scheme, but focused on getting money to the person at the top of the 'loom', after which the next in line succeeds; 'Sakawa' or Internet Fraud, which a case study focused on Ghana describes as one of the most common money-making schemes [5] and OnlyFans subscriptions, which is the latest trend where you can choose to post content of yourself and have people pay, in an attempt to limit the trade-offs they could face in their endeavour much as possible.

To narrow the scope of this problem and better understand how much of a challenge it poses, I focused on the Ashanti and Greater Accra Regions of Ghana, as they both have some of the country's biggest tertiary institutions and are the top two most populated in the country [27]. I focused my research centred on the students of Information Technology and its related programmes in the University of Ghana – Legon, Ashesi University and Lancaster University Ghana and The Kwame Nkrumah University of Science and Technology.

1.3 Problem Statement and Description

After conducting research and benchmarking other available software and web applications, I found that according to the Universities and Colleges Admissions Service (UCAS), 8 out of 10 people aged between 21 and 65 say they regret rushing their career choices going on to say they wish they had more knowledge about what they want to do [3].

Aside from that, many people are unemployed because companies and employers lack the resources and capacity to take on additional full-time employees. Students, who after graduating would move into the job sphere, often find it difficult choosing a career path or even connecting the knowledge they have to applications in work areas.

As such, the problems I have identified is in two phases; the first is that ***there is a huge gap between the things we learn as students and the things we apply in our work life.*** The second is that ***there is a lack of an avenue to link skilled human labour to remote and in-person work opportunities from ready employers.***

1.4 Related work/Existing solutions

Although as of now, no current platform exists in Ghana to work on the problem I have identified, there are a handful of websites, local and international, that are tackling certain aspects of the problem. These include:

a. **Fiverr -** Freelancers can showcase finished projects to the public so potential clients can easily pick someone whose creation sparks their interest. Fiverr offers you free learning courses to develop your skills and teaches you how to pitch to clients [17].

b. **Aquent -** This website is well-established and known to deliver high-quality workers for creative, digital, and marketing purposes. Aquent states that they mainly accept someone who has 2+ years of working experience (which can be a challenge to new entrants), fresh

graduates are still welcome to explore their available jobs. It also provides a salary guide to help you set your price, based on your skills and what you can offer [22].

c. **GeeksforGeeks -** An online site that allows you to learn to program, try projects and then get a certificate after passing an examination. It offers online support in a wide array of programming languages and explains programming concepts using text and videos [22].

d. **LinkedIn –** Perhaps the most effective approach, as they merge both online learning and giving users a corporate profile. It works as a social media for the corporate world, linking users to a wide range of potential jobs and giving them chances to collaborate [13].

e. **Glassdoor –** A recruitment software that makes job recommendations based on the specified skills of the user. Also, when the need job openings in line with a user's skills, a notification is sent to the user, so they can apply. Glassdoor also provides the option to compare salary options of companies to making better-informed decision [18].

f. **Freelancer –** A freelance platform that connects people who need to get some tasks completed to people who are willing to get such task completed at a fee. A job is posted, freelancers bid for the project providing invoices and proof of work/portfolios and then the hirers select a candidate from the pool [17].

1.5 Proposed Solution and Objectives

As a remedy to this problem, my project is to develop a web application that is tailored to the Ghanaian society. I deduce that the Ghanaian society will be better equipped to handle many issues it faces today if this system, or one similar to it, is established. *There is a need for a system/platform that would allow individuals to access remote job and freelancing opportunities and learn practical skills online in Ghana.*

This system should:

a. Allow students and interested parties to create profiles and learn skills and concepts in IT, be it software development, IT hardware and software, database management or web development.

b. Allow companies to host freelancing gigs/opportunities for interested parties to make quick income on the go, be it as a side hustle from their work or school.

c. Allow users to show their skill level via an online portfolio or repository.

d. Provide real-time industry-based activities as projects, as this gives a fair idea of what specific career paths entail.

1.6 Assumptions

In the development of this website, users are taken to have a basic knowledge of information and communication technologies and may (optional) be familiar with a programming language of their choice. Users are also considered to have a basic level of the English language and have access to an internet connection.

Chapter 2: Requirements

In this chapter, the user and system requirements for the web application are stated and explained; the mode of the research as well as analysis of findings, with graphs to show data obtained from research are expounded on. The functional and non-functional requirements of this application are then gleaned from findings and documented in this section. Based on the identified problem, the user groups identified were students and employed individuals in IT who would like to make an extra source of income and find freelancing opportunities.

2.1 User Segments

The first group of users identified in the problem discovery is the "Student" group. These individuals are typically final year high school students or freshly graduated tertiary institution students. In the course of the research, I probed to find out how they were affected by the book-oriented nature of education and drew insights from my research.

The second group of users is the "Employee" group. This is the portion of people who are targeted in the National Youth Unemployment Scheme, as well as people who have lived in the period beyond the information age – the age of IT. These are individuals who are open to finding extra income opportunities regardless of whether or not they are employed or not.

The third group plays more of a support role; the “Companies” group represents the portion of users who have work available or will want to outsource certain aspects of work they have in their institutions. These companies are not limited to IT companies but can range from companies that require simple website creation and management to companies seeking regression models in data analytics.

2.2 Requirement Gathering

My research occurred in a two-fold manner, as it was mixed-method research: the first part, the quantitative worked as follows:

- Development of questions from identified themes (Unemployment, Book Oriented approach to learning).
- Selecting sample using the simple random sampling technique open to tertiary institutions in Ghana and young adults employed in the Information Technology industry. A sample size of 100 was chosen.
- Surveys were conducted to get a general idea of Ghanaian views on the subject matter. These digital surveys were created and tracked using Google Forms and aimed at students who major or majored in the fields of Information Technology, Computer Science or anything related to it.
- Responses were then collected and analysed afterwards to find emerging trends and specify numerical values to the study.

The quantitative study commenced in early November. This was made possible by creating the survey and sharing the link with liaisons, who are students in the tertiary institutions and workplaces the research intends to cover.

The second phase of the research, the qualitative phase, occurred in mid-November 2020, and it involved a smaller sample which was selected from the initial sample used for the quantitative study. A convenience sample of fifteen people was picked, and digital interviews were conducted. In light of the global pandemic currently, the research was conducted using Zoom and Google Forms, to respect the social distancing and global combative measures.

The outline for the qualitative research was as follows:

- A quota sample of six Ashesi representatives, four University of Ghana representatives, three Lancaster University representatives, two Kwame Nkrumah University of Science and Technology representatives was selected. All of these were picked from an Information Technology based background. These representatives were either students or graduates. Five representatives from companies were also contacted and a separate interview was conducted.
- Digital Interviews were conducted on this sample individually. This allowed for the collection of opinions and thoughts easily. Individual information remained anonymous for this.
- Data recorded from these interviews were then collated and analysed.

2.3 Analysis of Findings

As mentioned earlier, this research is a mixed method approach. As such it occurred in two phases: the quantitative aspect, which was used to find out how much of the people related to the problem I discovered. This was done to validate the problem as being an issue that the Ghanaian society today could relate to. The second aspect, the qualitative study, was a more detailed approach used to understand the minds of the population and how the problem affects them. Here, a smaller section of the initial sample was selected, and interviews were conducted with them. All participants were volunteers, and their responses remain anonymous.

The quantitative research took place from the first of November to the seventh of November, with it encompassing the views of 100 respondents, ranging from students to workers all in the Information Technology (I.T.) sector. Although before the research, the focus was placed on the University of Ghana – Legon, Lancaster University Ghana, Kwame

Nkrumah University of Science and Technology and Ashesi University, there were outliers, that is, students who found the survey and proceeded to answer but did not come from the schools mentioned. As some of these responses were still in the geographic regions stated, they were included. Based on findings:

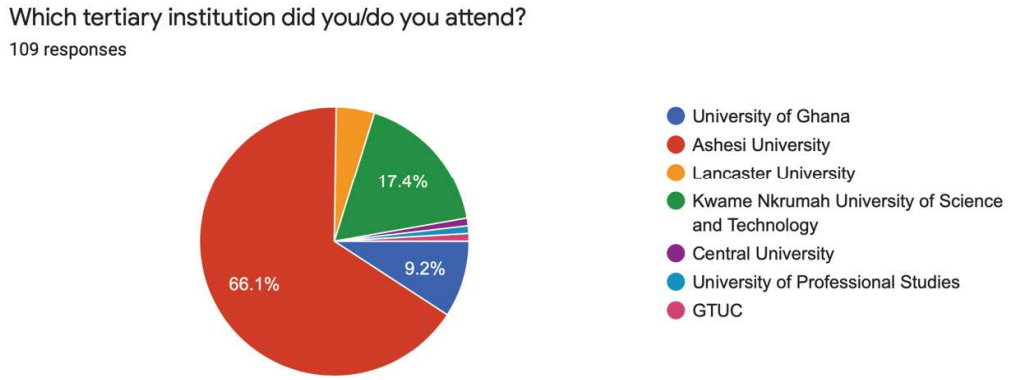

figure 2.1: Pie chart showing the distribution of respondents by school.

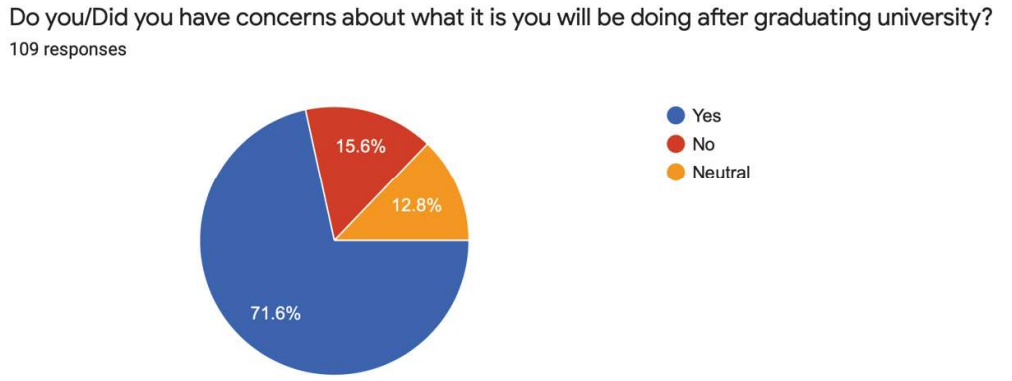

fig 2.2: Pie chart showing the proportion of users who faced or are facing challenges moving from school life to work life

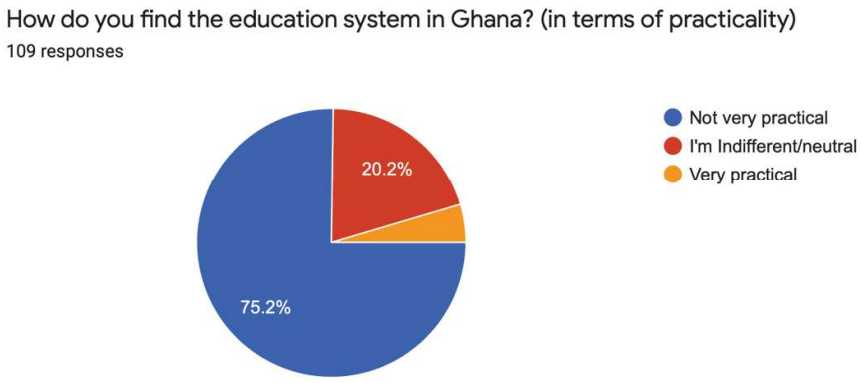

fig 2.3: Pie chart showing the practicality of the education system in Ghana

71% of the respondents of this survey showed that they were worried about the transition from school life to work life as seen in *figure 2.3.2.* About 75% of the people identified the need for educational reform, as they consider it not very practical from the subsequent pie chart *figure 2.3.2*. This finding ties in with my initial research and proves that the current educational system in Ghana, especially concerning Information Technology, is lacking.

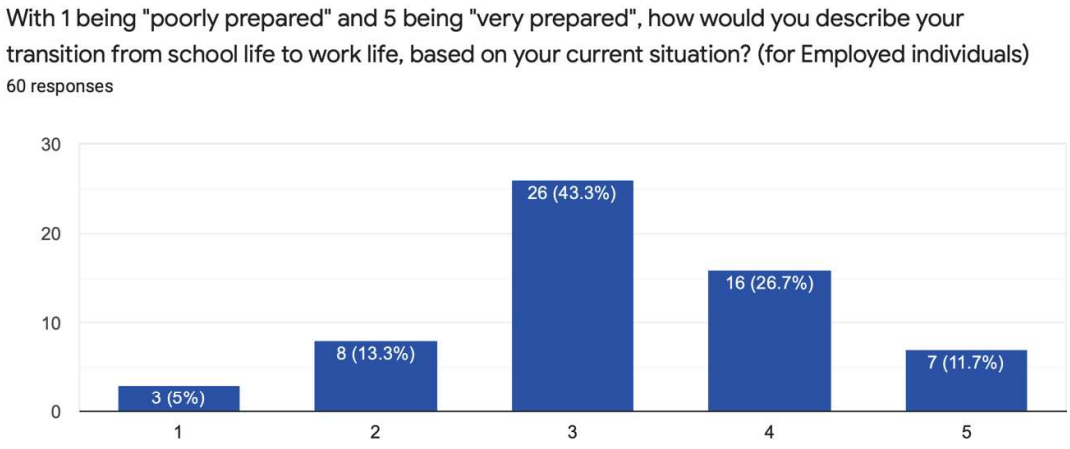

fig 2.4: Bar chart from quantitative study

Out of responses collected for how prepared individuals were for life after graduation where respondents had previous experience with the corporate world or were already working. A little over 30% confess that they were not ready for the life that would come after.

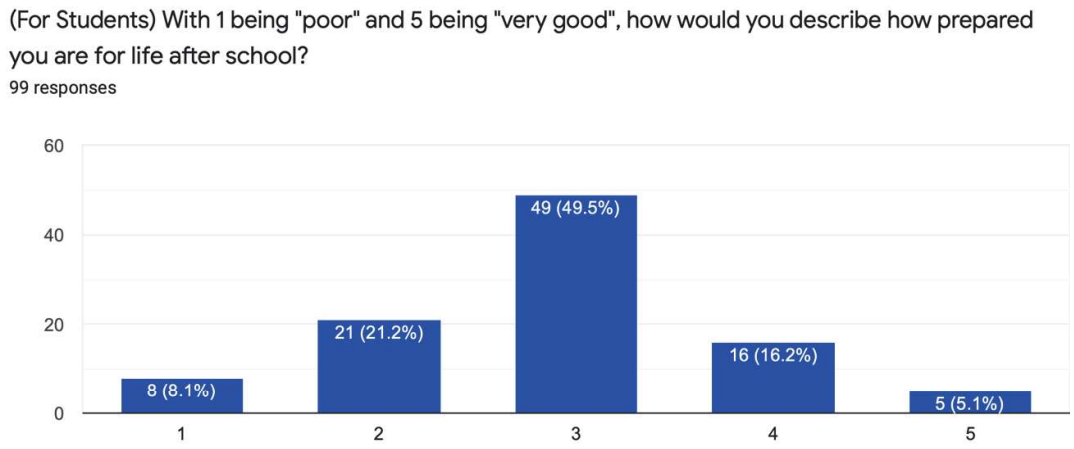

fig 2.5: Bar chart from quantitative study

From previous research (which has been incorporated into findings from this research), students prepared for life after graduation (taking 60% and above as a pass rate) were significantly less than those who were.

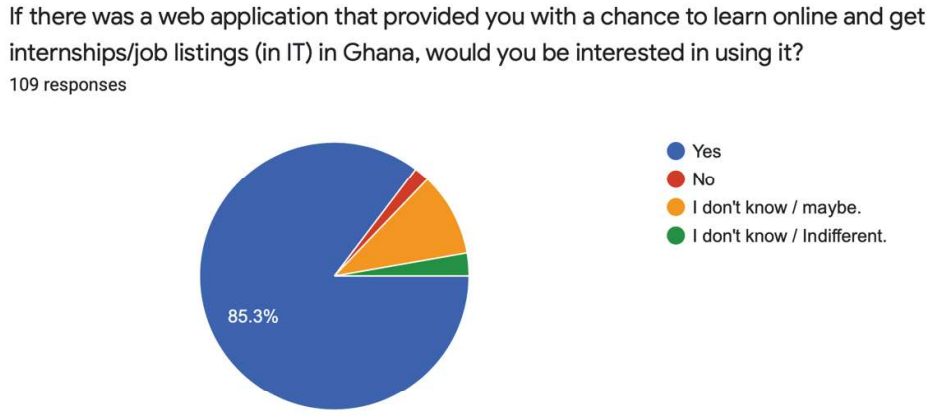

fig 2.6: Pie chart showing the need for a web application.

The last two questions were set to assess the receptivity of the proposed solution. Are students keen on using it to study? Are people open to finding jobs, freelancing gigs and internships online? Out of all the respondents, a little over 85% expressed that they would be willing to accept the aid that came with helping them with their educational challenges and migrating into employment or finding available jobs in the country.

A further 12% were open to the idea and had an open mind about it. This question was asked to test how receptive user groups would be to the proposed solution and the acceptance rate exceeded expectations. This turnout was very critical and favourable to the progression of this project.

The qualitative research was executed primarily through virtual meetings and forms for those who were unable to meet because of their schedules; some of the questions and responses include:

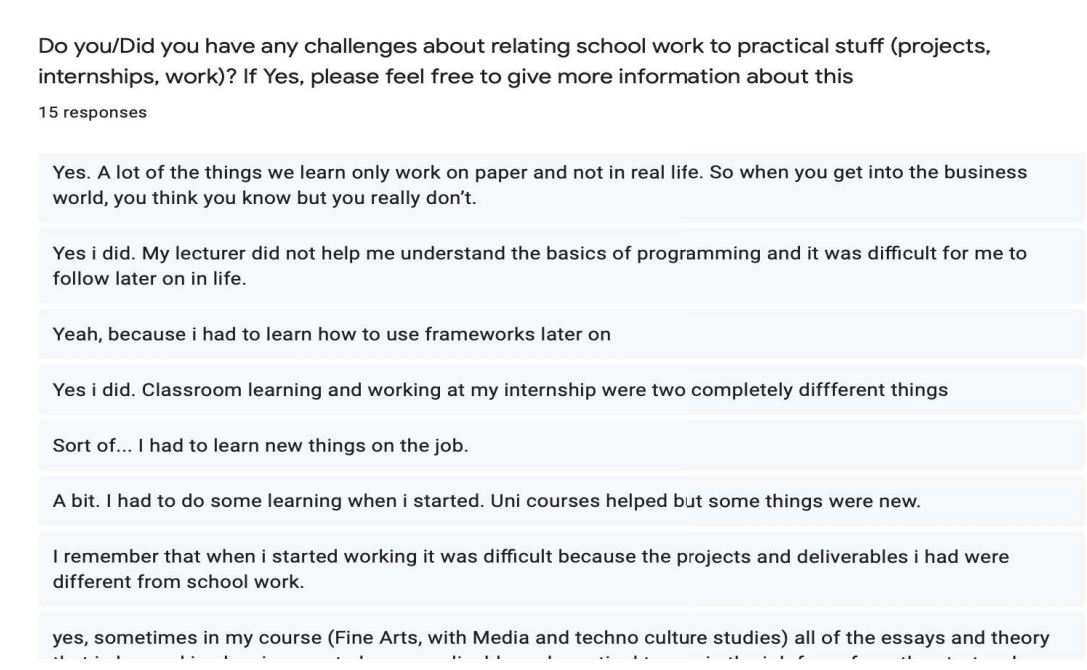

fig 2.7: Responses from asking respondents about relating material to work and internships.

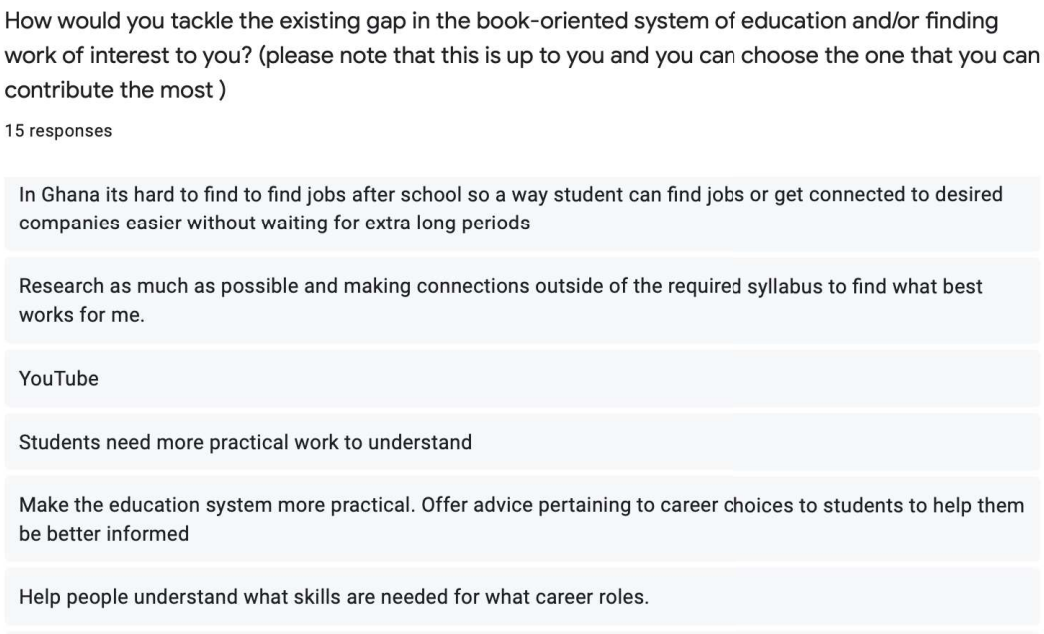

fig 2.8: Responses from asking respondents about what they think will work

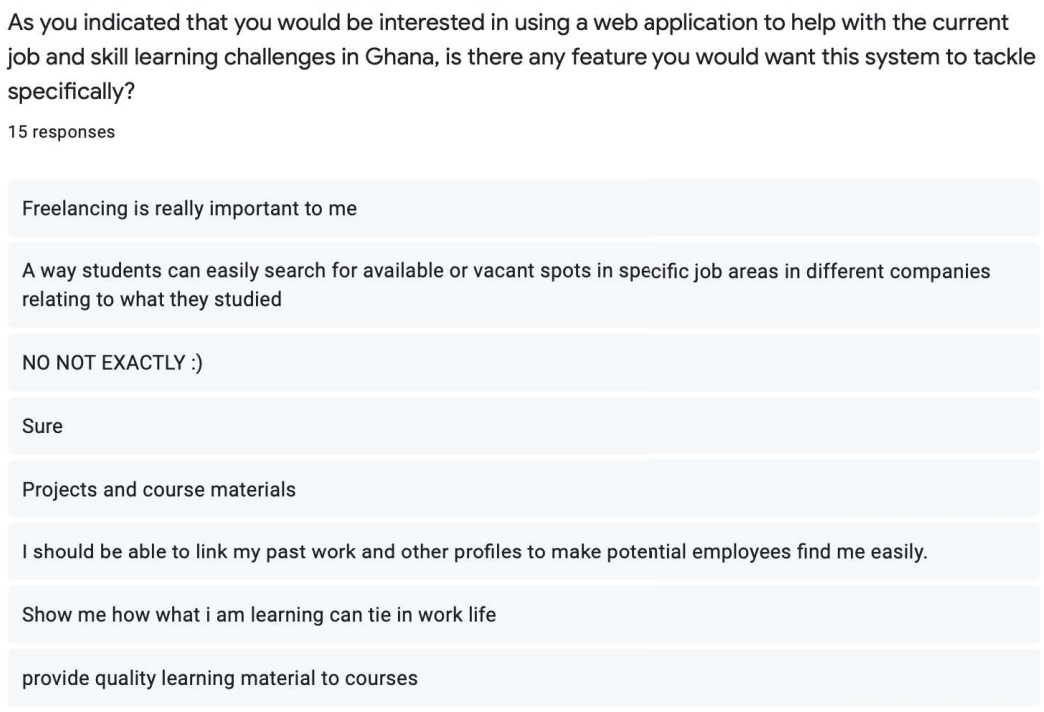

fig 2.9: Responses from asking respondents about the features they would want from the proposed solution.

These questions used in the research gave a deeper perspective on the issue, as well as the needs of my target population. The responses, both digital from the survey and recorded minutes from the interviews influenced the requirements of the system.

2.4 Core Functional and Non-Functional Requirements

From the research, the three user groups gave indication that there was a consensus that a web application could be a great avenue to tackle the issue of education and employment in Ghana. They also specified certain thing they would want this proposed system to do and from benchmark tests conducted on how effective other websites had tackled certain aspects of the problem, the following base requirements were found:

Table 2.1: List of functional requirements for the system and their codes.

Requirement Code	**Description**
FR01	Create a profile (career path). Users will be required to create profiles to use this application. The profile will have an ID that will allow tracking of user activity, their full name for identification, educational or work institution major or course of study and a link to their GitHub or any other online repository. This information can be modified anytime the user feels the need to update something; the exception to this case is the ID, which the system, monitored by the administrator, assigns to each user Creating this will require a valid email and password combination. Career paths will groom users into being a valuable asset to whatever company they find themselves, by focusing mostly on the essentials in that field.
FR02	Login/Logout. Users will be able to log in and logout of the profiles they have created. Users who are not logged in will not be able to access the core features of the web application. User activity will be tracked using sessions and user data will be validated and encrypted before storage.
FR03	Find relevant topics for study. Users who wish to learn concepts under a particular topic will be able to search based on keywords; this will display a list of available media, either

	text or video, available on the user's query. Users can find a course from our list of available ones. Videos and text explaining concepts will be outsourced to educational institutions and reviewed to assess how useful the material is.
FR04	Provide simple question and answer tests to assess understanding. Users are at liberty to take standardized tests that they have studied to test understanding. These are not graded, as the main goal is to test understanding, not use it as a metric for success.
FR05	Tackle past industry projects Users can take on previously completed projects, published by companies that have tackled these. This gives an idea of what to expect when the user follows a career path.
FR06	Apply for a job available in listing. Users can opt to apply for job listing available to certain career paths. These will mostly be in the form of freelancing gigs, which once performed, gives the user a rating/review.
FR07	Create an online profile. Users of the system should be allowed to create an online profile that they can link to their other relevant accounts like LinkedIn, GitHub and even other social media accounts to help people find them. They should be able to attach their CV as well, if they wish to do so.

In addition to these functional requirements, a set of non-functional requirements, a guide to how the system is supposed to operate, were derives from the interviews and benchmark tests. These requirements are:

Table 2.2: List of non-functional requirements for the system and their codes.

Requirement Code	**Description**
NFR01	Performance: The application should handle an increasing number of users sending queries at the same time without crashing.
NFR02	Availability: Since the web app is designed to facilitate user interaction, it has to be highly available and guarantee a good server uptime. The server should allow only 1-hour downtime per year.

NFR03	Privacy and Security: The application should ensure the privacy of the users and also be robust where only authorized users can post and edit their information. Private user information, except what has been agreed on, should not be displayed publicly
NFR04	Usability: The app should be very user friendly and should consider usage by people with disabilities

2.5 Use Cases and User Roles

As this system is designed for various user groups, each user has certain privileges and access to some data that others do not.

Use Case 1: Student:

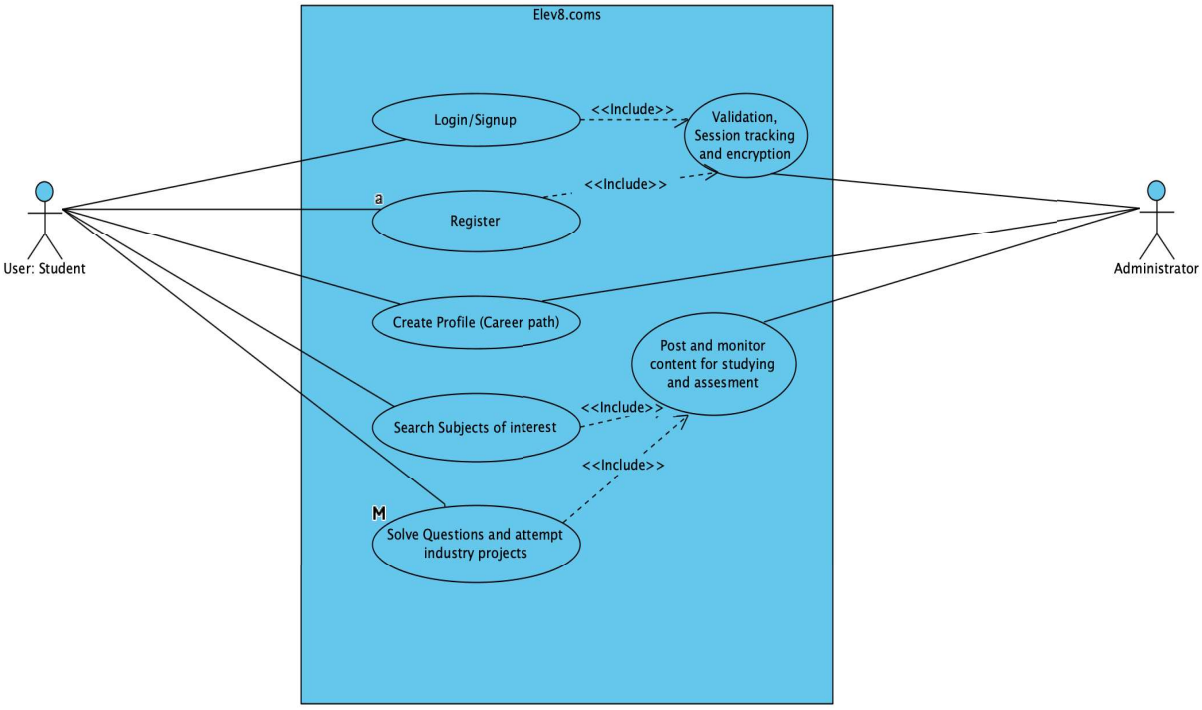

fig 2.10: Use case diagram for Elev8.com 'Student' role

Registration will allow users the chance to create a profile with their details, which will then be encrypted and stored in the database. This serves as proof of membership and

grants access to certain services.

Login will be required to enter the website and start studying or previewing and applying for task listings. Also tracks user activity to show content based on interest.

Create a profile (called Career Path) that will guide students to make the right choices they need for their future. Profile will display user details like name, institution, expected year of graduation and then major. Other user information will be kept confidential and encrypted, only accessible to the user via admin side control.

Solve questions to test simple level understanding of the basics, then move on to test how they can use this knowledge in real-world situations by assigning them to tasks based on industry projects tackled in the past. Admin will be required to assess understand after, and mentors will be assigned, if the student wishes, to aid in the process. No emphasis is placed on grades, only understanding and creativity.

Use Case 2: Employee

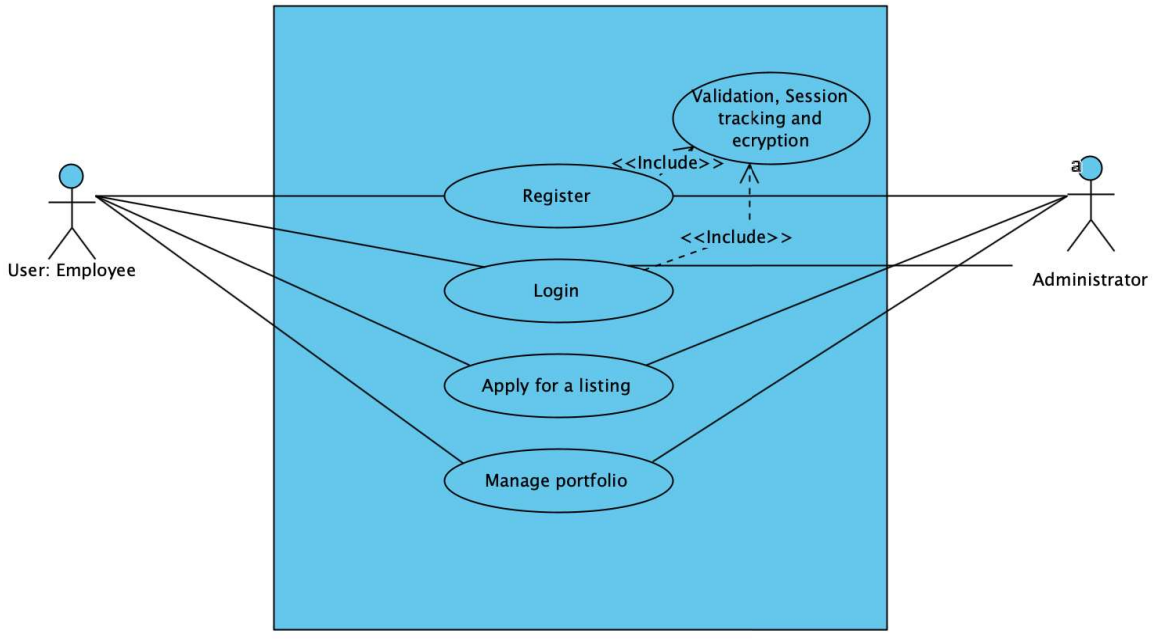

fig 2.11: Use case diagram for Elev8.com Employee role

Registration will allow users the chance to create a profile with their details, which will then be encrypted and stored in the database. This serves as proof of membership and grants access to certain services.

Login will be required to enter the website and start studying or previewing and applying for task listings. Also tracks user activity to show content based on interest.

Apply for listing posted by a company that is in the field or industry that they find themselves. From here, communication becomes direct between the two parties.

Manage a portfolio to record and display all past tasks performed via the website. Users can opt to attach a link which will redirect to a page that has published work.

Use case 3: Employer/Company:

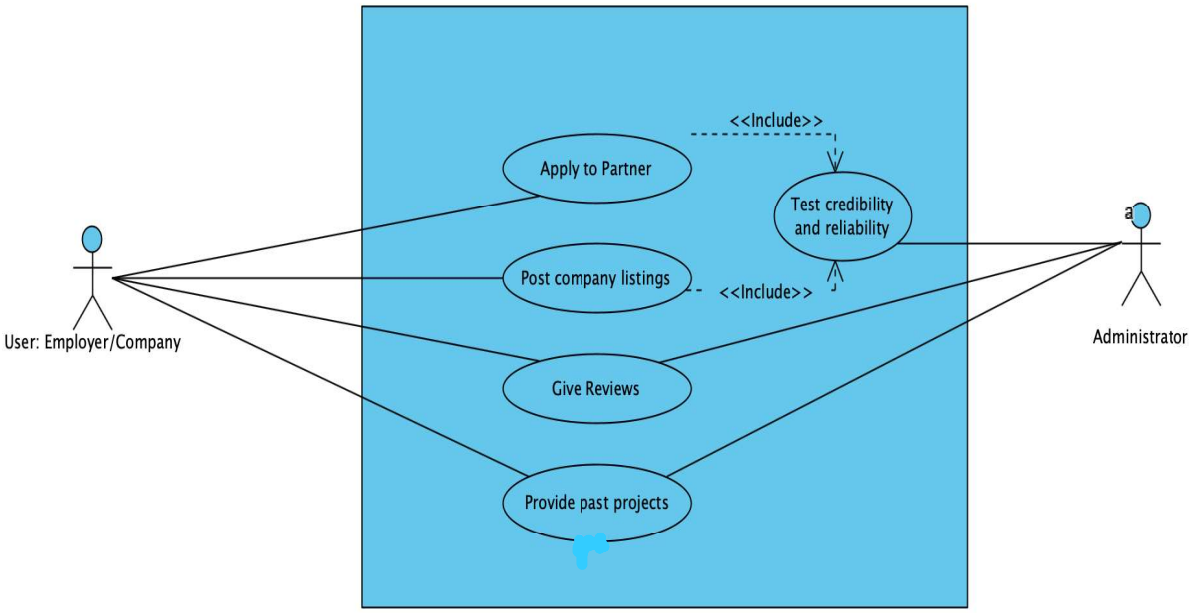

fig 2.12: Use case diagram for Elev8.com 'Employer/Company' role

Apply to partner with the website to enable them to find workers as well as post listings. This will be done directly with the admin team

Post company listings to show the users what they have available in their company/organization. This makes companies set out what they expect with each role as well as with list the activities each role requires.

Give reviews based on employees who have worked with them in the past, via the website. Check professionality, efficiency, and also serves as validation or reference for employees in future work.

Provide projects to employees to allow them to assess whether or not the company is the right fit for them. These projects are also mini freelance gigs of sorts and can generate income. Also serves as a practical 'work' experience feature.

Chapter 3: Architecture and Design

After finding out what the user groups needed and confirming that Elev8.com was a valid fit, modelling the system comes next. In this chapter, a detailed view of the various subsystems that form the freelancing and skill learning platform, as well as the system in its entirety would be expounded on. It also considers how users interact with the system, how the system would work, how the database will be modelled (including how data will be stored), the technologies involved (including the Integrated Development Environment and the programming languages used in the scope of this project) and then the various diagrams to give a graphic depiction of how this project functions.

3.1 Architecture.

The website application is a Three-tier application. Data corruption through client actions can be minimized as the data passed in the middle tier for database updates ensures its validity. Also, the placement of the business logic on a centralized server makes the data more secure. Due to the distributed deployment of application servers, scalability of the system is enhanced since a separate connection from each client is not required whereas connections from a few application servers are sufficient.

The diagram fig 3.1.1 illustrates how information and requests would be handled in the system and also illustrated how secure it is as the Client tier is separated from the Data tier by the logic tier, showing that it offers some protection to the system data from users who may have malicious intent.

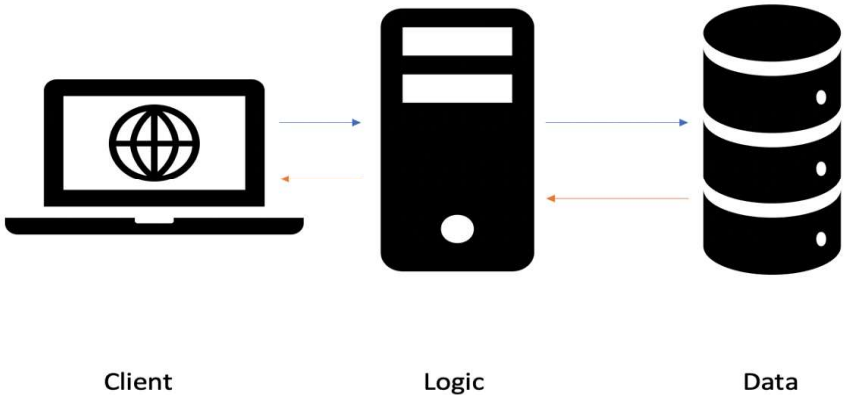

fig 3.1: Three-tiered architecture.

3.2 Model View Controller

This project would be developed using the Model View Controller (MVC) architecture. The MVC is an architectural pattern that separates an application into three main logical components: the model, the view, and the controller. It is the most primarily used architectural patterns in web applications because it makes building complex web applications easy [13]. It achieves this by allowing each component to handle specific development aspects of an application.

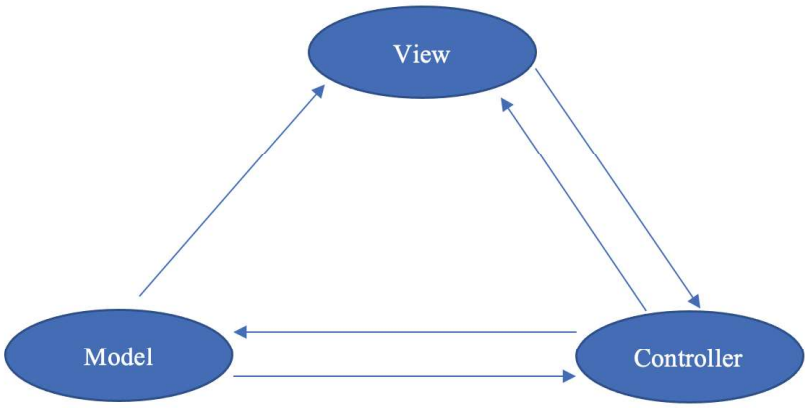

fig 3.2: MVC architecture

Front-End: The graphical interface that users will see and interact with. This was made to ensure that users can use it and it is relevant and aesthetically pleasing. With this, Schneiderman's eight golden rules of an ideal user interface were taken into great consideration. This corresponds to the View in the MVC. Each user of the system will have an interface limiting them to what they can do. The view consists of various UI components the user interacts with.

Database: The users' data was stored into a database modelled to support the various functions and controls of this application. The tables of this database were normalised primarily to the Boyce-Codd normal form. The database, represented by the Model component, corresponds to all the data-related logic; as such, the model of this project will be built using MySQL. The diagram below shows the various tables in the project and their relationships with each other.

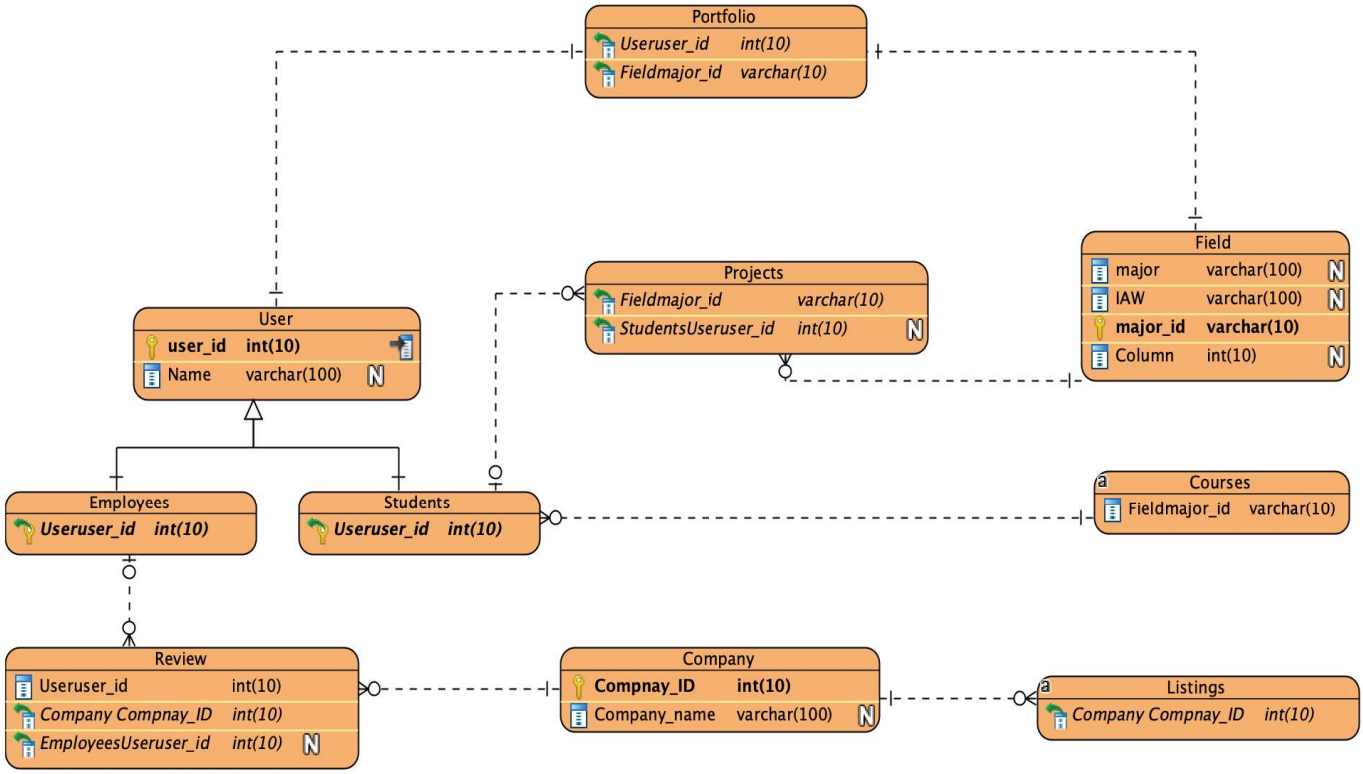

fig 3.3: ERD showing database tables and relationships

Each table collects a specific type of information from the users, and these tables were normalised to Boyce-Codd normalisation form to ensure that they agree with standards.

Table 3.1: Database Table and the Data Stored

Table Name	**Information**
User	Represents the main table where user information is collected after signup. Houses the user role which shows whether users are either employees or students.
Students	Collects information about the student user, stores addition information like interests, expected date of graduation, major, etc
Employees	Collects information about the employee user, stores details like the employee's current role in the institution they find themselves in, interests and industry.
Company	Stores information about the companies that partner with Elev8. This information includes who they are, what they do, where they are located and what they expect from employees. It also links these to the company websites
Listings	Stores job and freelancing opportunities posted by the companies, their details, date issues and deadlines and estimated pay for the given task.
Review	Stores and track the progress of users who have worked with partner companies and shows how they performed the task at hand. Gives a rating and serves as a testimonial for the user.
Courses	Stores links to relevant learning material grouped into intro and advanced courses for the users to be able to learn from.

Projects	Stores and tracks projects posted by companies and administrator to better understand what kind of work companies do.
Field	Stores the kind of technical field the material being learnt falls under and what users can move on to pursue given what they are learning.
Portfolio	Stores links to GitHub repositories and past work the user has done, to provide an overview of the user's skillset to employees.

Backend: The backend, which serves as the control for how the web application works. It refers to the server-side of development where the primary focus is on how the site works and how it interacts with the front on and database. Making updates and changes in addition to monitoring the functionality of the site all fall here. The controller is the backend, and it acts as an interface between the view and the model components. The Controller processes incoming requests and manipulate data using the Model component and interact with the view to render the final output.

3.3 Data Security

Users who have permission to only view data and not modify would retrieve data from views, a group of stored queries that when invoked produce a result, instead of the physical tables. Views are made up of tables in the database. Therefore, it allows one to access the information one needs without making modifications to these tables.

The web server is separate from the database server to make it more secure and reduce the risk of attackers gaining access to the database and the data. By separating the servers, resources are allocated based on the needs of the server, therefore allowing

resources to be utilized and reduce wastage. It promotes the effective maximization of front-end connections.

All files put on the web server, and database server that is of value will be encrypted to ensure no unauthorized users gain access. Users and accounts will be limited in terms of the data they have access to. This will ensure that the data stored is less likely to become compromised. Each user has an encrypted password that is required to log in to the system and gains access to the data.

3.4 Disaster Recovery Plan

Since the website is not immune to attacks and disasters, a backup of the system's data will be made and stored to ensure continuity even after the occurrence of an unfavourable event. The backup would be done periodically and incrementally. It will rely on local storage to store the relevant data.

Chapter 4: Implementation

This chapter covers the implementation process for Elev8.com. It documents the functionalities of the project and their importance, as well as the tools used, APIs, libraries and frameworks used in this website application.

4.1 Technologies Used

The development of this project was done using the XAMPP package, which is a web service composed of an APACHE HTTP server, PHP interpreter and MySQL database. This was ideal because XAMPP creates a local server to run PHP files from a desktop machine. It is also compatible with MySQL, a relational database management system based on SQL – Structured Query Language [20].

At every level, various tools and languages were selected to create the best web application in a context suited for the current technological era, i.e., as of 2020-2021. The research was done extensively to understand why and what each of these was chosen. The languages used in the creation of the front end, as well as a brief description from GeeksForGeeks were:

1) *Hypertext Markup Language (HTML)* was chosen because it is the ideal language for building a framework for web applications and websites. HTML is often regarded as the "backbone" of front-end development, so it is essential in this project [15].
2) *Cascading Style Sheets (CSS)* was chosen because it allows the aesthetic of the project to be improved. Although this project was mostly cantered on Bootstrap for design, CSS was used to improve, add or edit some things. It mostly deals with how the content that is displayed would be presented. Colours, sizes of objects, borders among others are all done with CSS [15].

3) *JavaScript (JS)* was chosen to make the web application more interactive. This was done to enable the platform to be s event-driven, functional, and imperative. To allow the web application to have asynchronous communication with the other tiers, AJAX was adopted for easier development. How a button would respond, and many other responses and alerts are some examples of how JavaScript plays in this system [15].

These three languages serve as the only implemented languages for this project's front-end.

The database of this project was created using the relational database query language *SQL,* as this is one of the many alternatives for database modelling. SQL is the acronym of Structured Query Language and it is the language used to manipulate the database. This is the language that creates, reads, updates and deletes input and output in the database [20].

The backend was planned for development using python initially but later transitioned to *Hypertext Pre-processor (PHP)*. PHP is a server-side scripting language. This language is responsible for inputting and retrieving information from the database [20].

4.2 Integrated Development Environment (IDE)

The development of this web application was done using Visual Studio Code, Workbench and Atom. The HTML, CSS, JavaScript and PHP parts were written using Atom for structure, and then later a transition to Visual Studio to enable effective unit testing and debugging. Also, the use of two text editors served as a precautionary measure to prevent any possible glitches that could come.

4.3 Frameworks, Libraries and APIs

For this project, certain features were implemented via the use of an API and others were achieved through the use of frameworks and libraries. Although a majority of the

project is raw code, frameworks, libraries and APIs were used together to reduce the amount of code to be written for any given instance. These include:

1. Bootstrap – An open-source Cascading Stylesheets (CSS) used in designing webpages. It allows developers to access predesigned materials like forms, buttons, Navigation bars and even web page templates[15].

2. AJAX – Asynchronous JavaScript and XML (AJAX) is a language that supports processing in the background during loading and after a page has been loaded [15].

3. PHPMailer – A Backend functionality that will allow the users to receive emails once their accounts have been created to ensure that the right email was used [15].

4. jQuery – jQuery [30] is a lightweight JavaScript library that enhances and simplifies the use of JavaScript through reduced semantics. In this project, jQuery is used to call multiple JavaScript lines of code in one method singly [15].

4.4 User Roles and App Interaction

As stated earlier, there are three user roles in this project. These user roles were developed from literature reviews on other existing solutions as well as a problem-solving technique called Disney's Three Rooms. In this system, the best fit solution was taken based on feasibility, desirability and viability. The best and current solution was to have a system that would allow one user group to learn online and tackle industry-based projects; this user group would be known as Student. The second would allow another user group to apply for job listings posted by companies and other organizations; this would be the Employee group. The final group, the Employer group will post work listings as and when they have an opening.

Since the Employer user group is more of a support and does not do much, they will be redirected through a web portal to sign in and track their activities. The other two groups,

Student and Employee share a more complex relationship, in the sense that a Student should be able to see only learning material and projects, but an Employee should be able to see company listings and company profiles, as well as learning material, that is, what the student sees.

This was achieved by the use of PHP sessions, where users were given a certain value based on the user role they signed up with: Students have a value of 2 and Employees have a value of 1. These values and the sessions created will allow the user to see specific parts of the screen and prevent other users from seeing what they do not have access to, as seen in the two navigation bar images. Pages were also given if statements to ensure that if the user role did not fit what was required the user was not allowed to access the page.

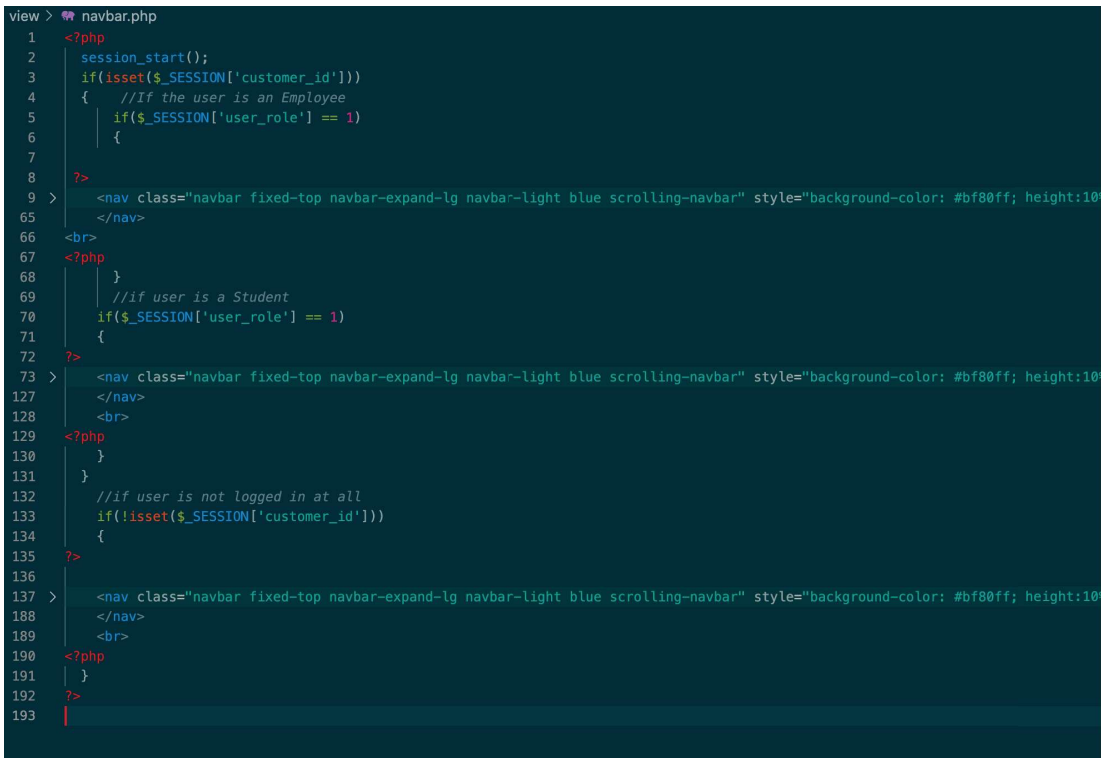

fig 4.1: A code snippet showing the navigation privileges each user role has.

This was done to create a learning space for the Student users and can be changed

based on the user's request to upgrade from Student to Employee. This request will be approved by the administrator and after the user can tackle actual projects to earn money.

Given that the system will be handling sensitive and vital user information, the password is encrypted before it is stored in the database. This ensures that for any user, the only person who can access his or her account is himself or herself and users on the app are advised to not share login details.

```
21    // encrypt password to be stored.
22    $regpassword = $_POST['userPassword'];
23    $regpwordsecure = md5($regpassword);
24    // echo $regpwordsecure;
```

fig 4.2 The md5() encryption method used to secure passwords stored in the database

4.5 Folder Structure

Given that the system is developed in a modular design, as per the MVC standards. The folder structure is as follows:

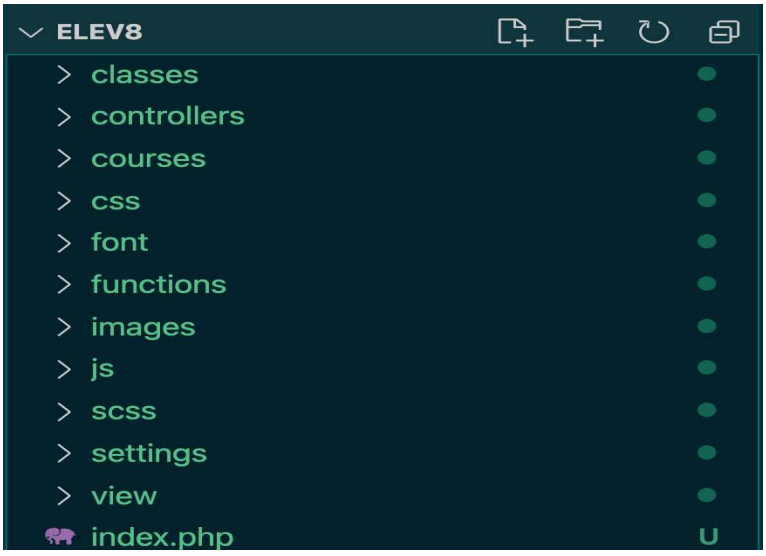

fig 4.3: The folder structure of the web application

The index.php file represents the homepage of the application. It is the landing page a user is sent to when he or she is directed to the platform. Although it is done traditionally in HTML, it was saved as a PHP file because PHP methods and functions do not work in HTML, as such the file had to be saved as a PHP file for the various aspects to work.

All other files exist in the different folders which do different things; the view shows the user interfaces, that is, the pages the user interacts with. The classes folder houses the SQL queries for the system to call from, written in an object-oriented model form. The controller folder requires the classes folder to run these methods in the functions. The settings folder contains the various database connections which enable the reading and storing, as well as creating, updating and deleting of the various data in the database

4.6 Database

The database contains ten well-normalised tables in which user information is stored. Each table contains vital information which is collected during sign up. Other data is stored when the user chooses to update his or her information and inserted into the database as this would be used in search and display functionalities. The database is hosted on the PhpMyAdmin server.

Data from the user is inputted using forms, in which a user can type details and have them sent to the PHP server using form actions. Once this is complete, the prespecified database connection with credentials, classes and methods work to send the user details into the database.

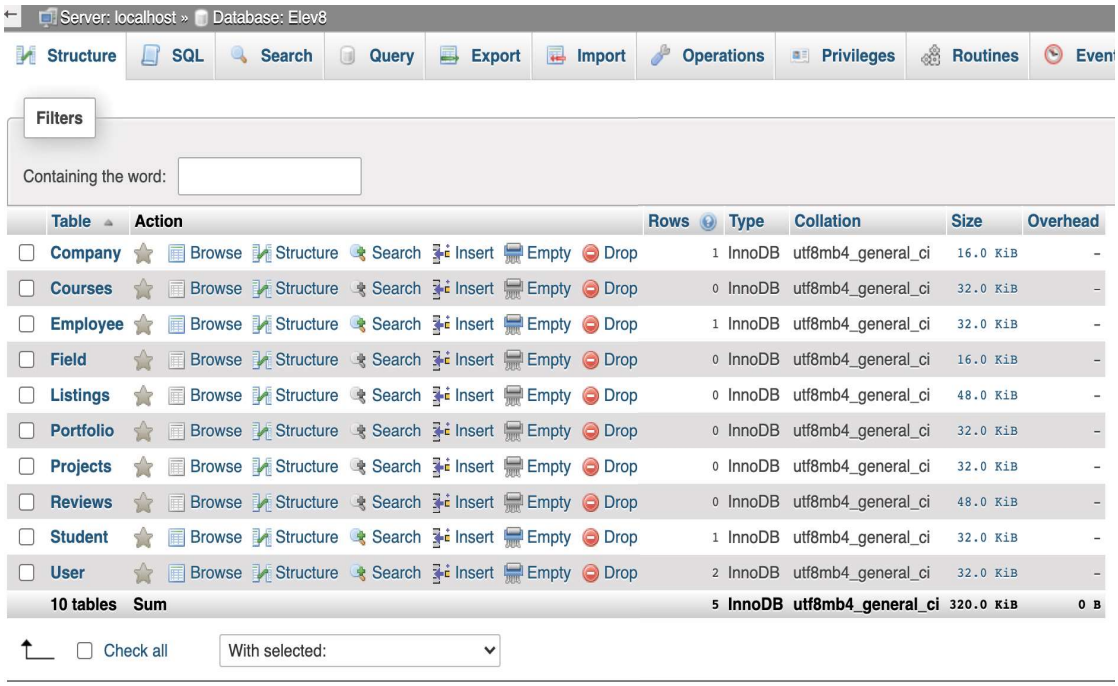

fig 4.4: The Database as hosted on PhpMyAdmin.

4.7 Core Functionalities

These functionalities are the ones that cut across all three user groups.

Sign Up and Log in: Given the importance of security, users are required to sign in when they want to use the system. Alternatively, new users (users without accounts) are required to sign up. Their information is checked and validated by the form which then processes it and stores it in the database.

```
class AppUser extends db_connection
{
// method to add new user

  public function createUser($name, $dob, $mail, $password, $phone, $gender, $location, $userrole)
  {
  //Write the sql
    $sql = "INSERT INTO `User` (`userName`, `userDOB`, `userMail`, `userPassword`, `userPhone`, `userGender`, `userLocation`, `userRole`)
      VALUES ('$name', '$dob', '$mail', '$password', '$phone', '$gender','$location', '$userrole')";

    //return the executed query
      //echo $sql;
    echo "<script>console.log('the createuser is working.')</script>";
    return $this->db_query($sql);

  }
```

fig 4.5: The class method that holds the query to create a new user

When the user clicks the log in button, it calls the JavaScript function to check the form input (validation) after which the form action sends the form information and starts the PHP function to process login. This function queries the database to select the user details based on the email provided. If a user is found, it verifies whether the password matches. If so, the user is routed to the appropriate page, based on their role. Else they are shown an appropriate error message.

When the user clicks the sign-up button, the form details are checked by the JavaScript function which compares the form inputs to the given regular expressions and validates them. After this, the user password is hashed and the inputs, including the hashed password, are sent to the database to be stored. For each user, a specific key will be generated by the database and this is what will be used as the ID for him or her.

The PHP session was used to a great extent for this part because PHP sessions as the webserver store information about the user by default because the HTTP address doesn't maintain state. PHP sessions old information about one single user and are available to all pages in one application.

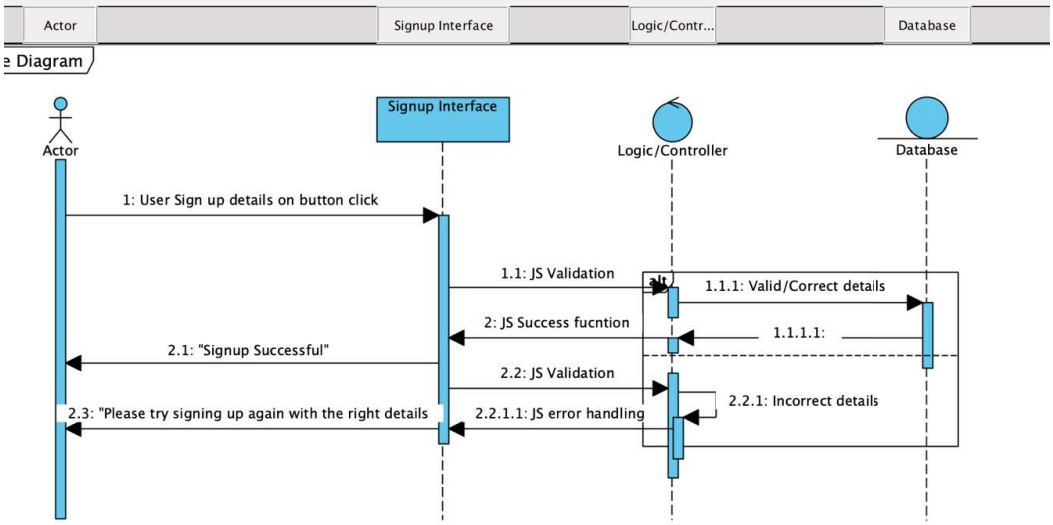

fig 4.6: Sequence diagram showing how the signup process would work.

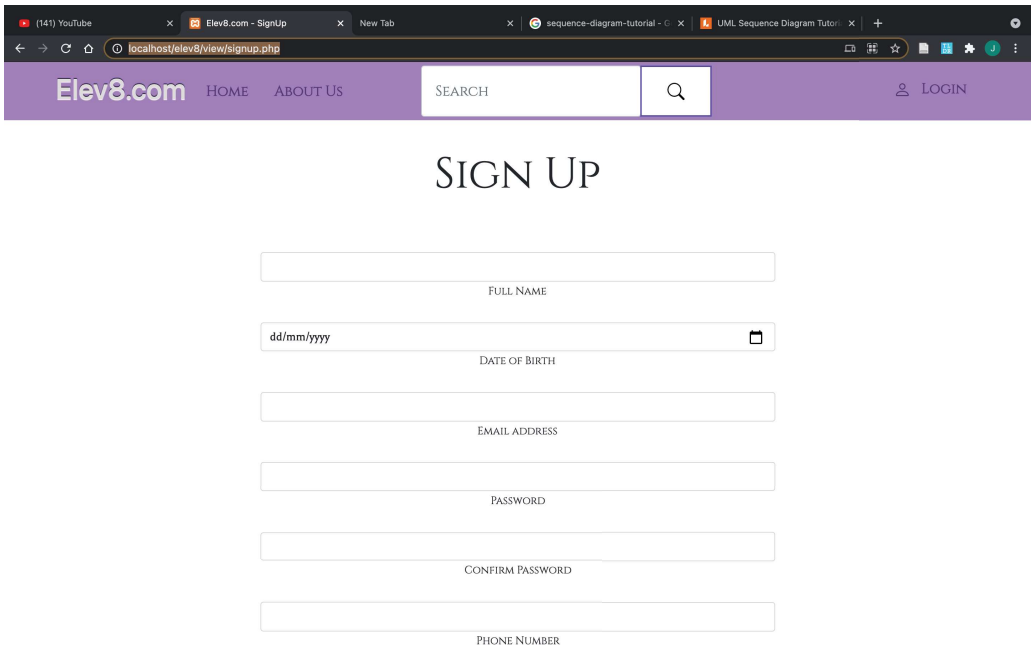

fig 4.7: The User interface for registration

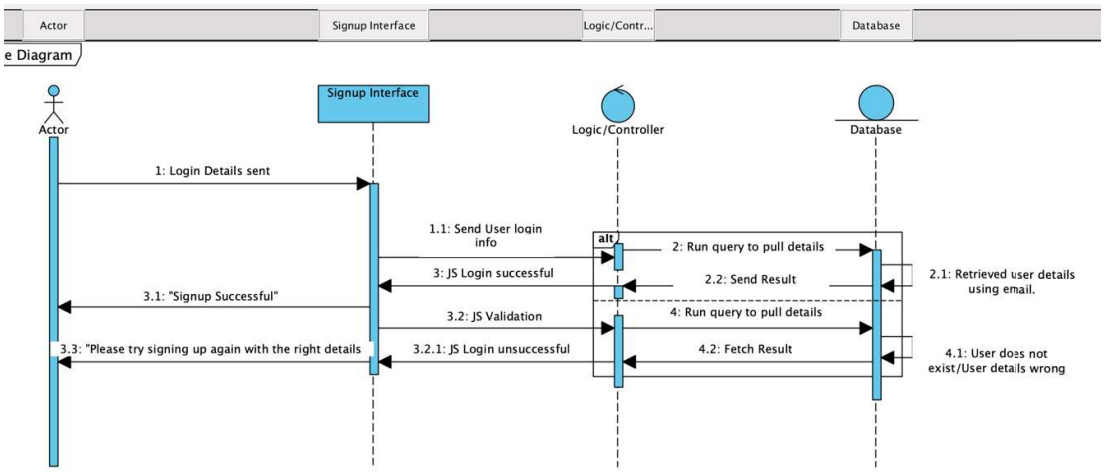

fig 4.8: Sequence diagram for the login page

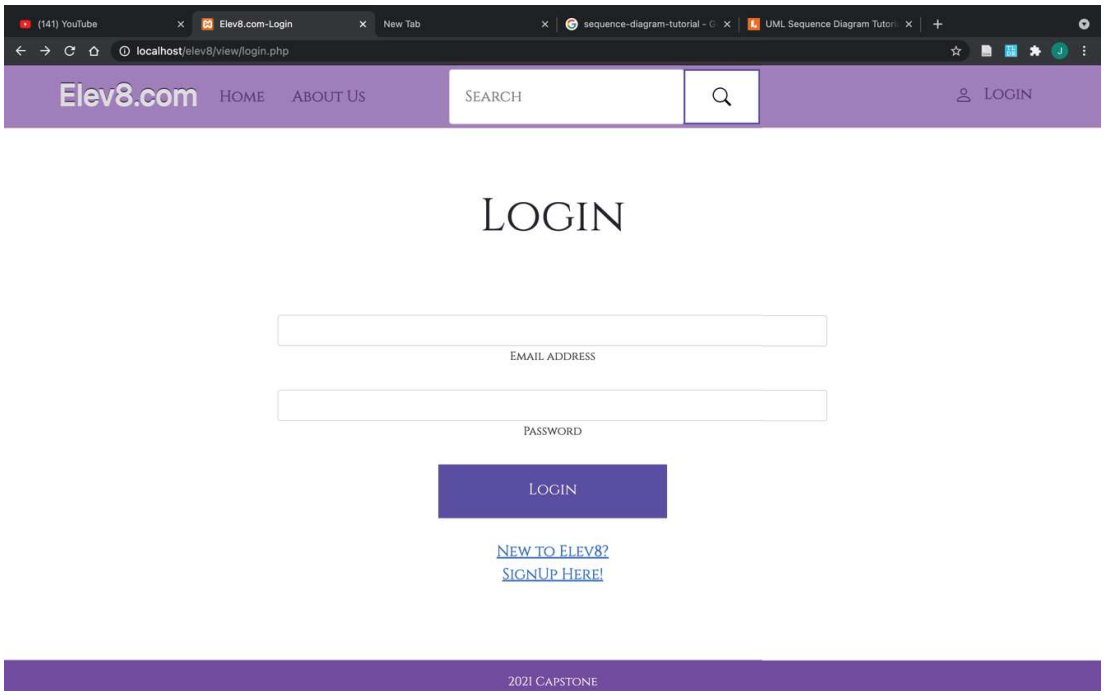

fig 4.9: The user interface for the login page

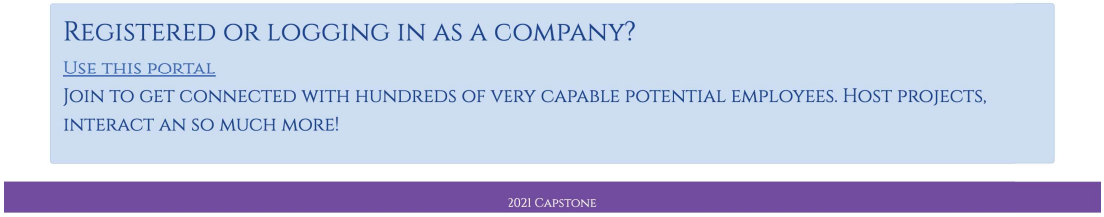

fig 4.10: The user interface for the company login/register page

```php
//check if submit button was clicked
if(isset($_POST['loginForm']))
{
    //get user data
    $loginMail = $_POST['loginMail'];
    $loginPass = $_POST['loginPass'];

    //check if fields are empty
    if(empty($loginMail))
    {…
    }
    if(empty($loginPass))
    {…
    }

    //check if email is valid
    if (!filter_var($loginEmail, FILTER_VALIDATE_EMAIL))
    {…
    }

    //if there are errors in form
    if(count($errors) == 0)
    {
        // echo "You rock G!";
        $loginPass = md5($loginPass);

        //return login info
        $loginInfo = array();
        $loginInfo = returnUserInfo($loginEmail);

        //check if email is in the db
        if($loginInfo){
        //check if they are equal:

          if($loginPassword == $loginInfo['customer_pass']){

            session_start();
            $_SESSION['user_email'] = $loginInfo['user_email'];
            $_SESSION['user_id'] = $loginInfo['user_id'];
            $_SESSION['user_role'] = $loginInfo['user_role'];



            header("location: ../userindex.php");
```

fig 4.11: A screenshot showing how a PHP session is created to track user activity on login

Logout: Users can logout after use of the system. This is encouraged by the site and is done simply by the click of a button. This reduces the risk of users from having their information stolen. Once the button is clicked, the PHP session is destroyed, and the users' data is kept safe from anyone without the password.

```php
<?php
    session_start();
    session_unset();
    session_destroy();
    header("location: ../index.php");
?>

```

fig 4.12: A screenshot showing how the session is destroyed when the user logs out.

Edit Profile: Users of the system should be able to make amendments to certain aspects of their profiles if they wish to do so. This would ensure that any changes personal to them reflect on the profile that they put out there via the website.

4.8 User Role Employer

The Employer role corresponds to the users who will be posting their job listings. As they will not interact with the web application as much, they are presented with a more 'admin dashboard' like view where they can see which users have applied for their listings and their details. Their functionalities include:

Post Listings: Listings are freelance and job opportunities the company has available. These will be posted via a form that will take the inputs and store them in a database. The listings are then displayed in a table which the Employer can monitor.

View Applications: The employers can view which employees have expressed interest in taking on one of their listings. This information is pulled from the database via a function which will display the applications using the employee's ID and the ID of the project they expressed interest in.

Post Reviews: Since there is no grading system or ranking system, there is high importance and reliance on feedback. Employers are required to document and report on the

performance of the employee they found. Poor reviews are checked by the system and users are flagged and contacted by the admin team.

4.9 User Role Employee

The Employee role is the user group that will use the application mainly for work and income-earning purposes. This group is one of the two primary users and they have full access to the website in its entirety, in that they can see both what they have permissions to and what the Student user group sees. Their functionalities include:

Apply for listings: Employees express interest in either a listing they found under a company profile or via the search. By clicking a button their IDs and the ID of the project they want are taken by the web application and stored in the database.

Manage Portfolio: Employees can show projects they have worked on in the past, update existing projects, delete projects and add new ones using basic CRUD functions and queries.

Manage User Details: Employees can Link their online work repositories and other profiles, like their LinkedIn accounts. This ensures that communication is not just limited to our website and boosts the chances of employees finding work on the internet.

4.10 User Role Student

The student user group is the user group that exists on the app solely for learning purposes. They find the material posted on the web application and if they are interested in it, they then either add it to their topics to learn or try projects on it. Their functionalities include:

Create a career path: Students have the chance to create a career path – a guide of sorts which will show them what their interests are and based on that determine where they might fit in the corporate world.

Learn material: Students can watch videos and read material on any topic in Information Technology and its related courses. These learning resources are vetted and approved by credible sources and the videos are embedded into the site from various learning sites.

Tackle Projects: Students can also handle projects that companies have dealt with, to give them an idea as to what they will be seeing when they migrate from school life to work life.

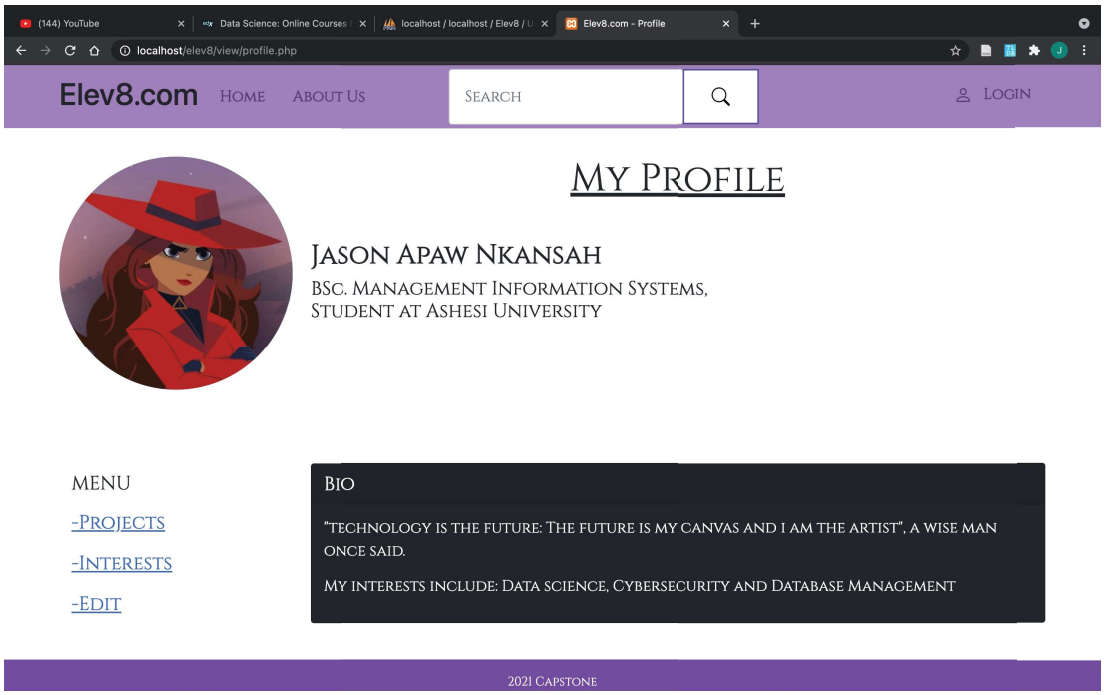

fig 4.13: A screenshot showing the Profile page display for the Employee and Student role

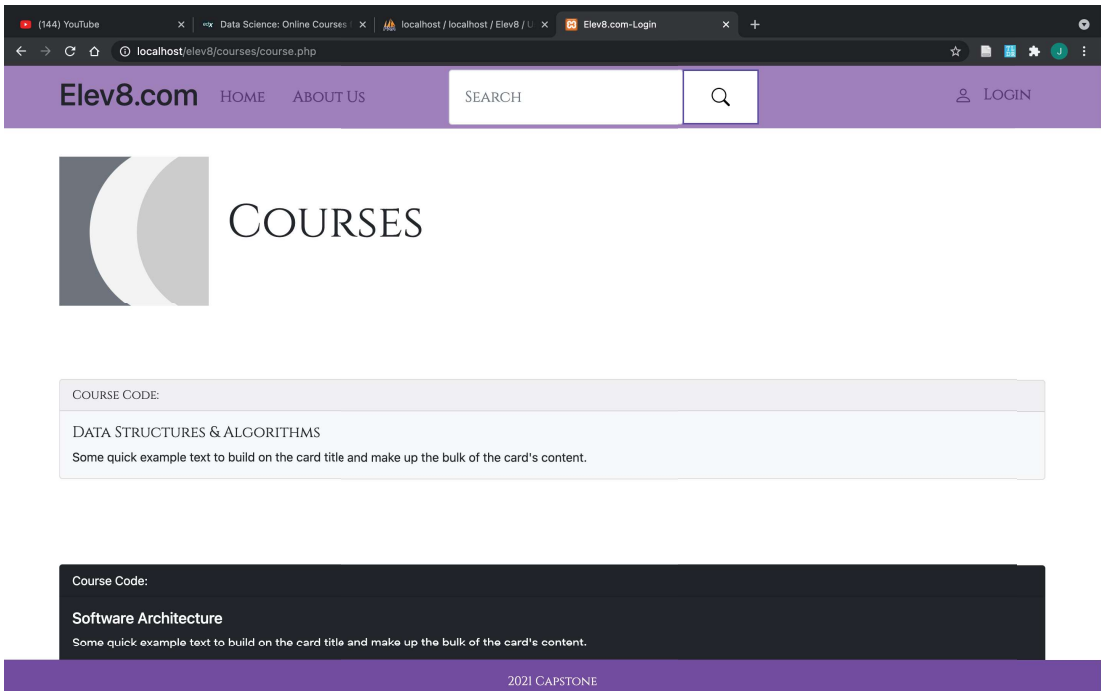

fig 4.14: A Screenshot showing the display for the Courses Page

Chapter 5: Testing

Now that the system is complete, the respondents of the survey are given the chance to explore and see how it works. From this they give feedback and give a rating for how effectively it solves their stated needs. This is the final stage of the development process. This phase was conducted in the last two weeks of April 2021. The sole purpose of this phase is to ensure that the user requirements for all three user groups have been met and also that the system is free of glitches and errors. These tests occurred in phases:

5.1 Development Testing

Development testing involves tests conducted during the implementation process. This allows for the identification of bugs and other potential errors that came up during the implementation of the project.

5.2 Unit/Component Test

A component test or unit test is a test conducted on a given system to see if the given components work as fine as they should. In this, each function was tested to see how it performs. For instance, the addListing and diplayUserInfo functions were tested by secluding them from the overall code and testing them to see how well they fulfil their required task. The same was done for all the other functions.

Additionally, each function and class was tested by using error handling methods like displaying alerts when an error occurs a seen in figure 5.1. The if conditional in the code snippet allows messages to be displayed for the registration of a new user, given the case where details entered are incorrect or are not valid. If this is the case, an alert pops up in the browser to notify the user of the issue, otherwise, the alert shows a message saying that the user has been successfully registered on the application

```php
// Create new user
function register($name, $dob, $mail, $password, $phone, $gender, $location, $userrole)
{
    //create an instance of User class
    $appUser = new AppUser();

    //run the add User method
    $registerUser = $appUser->createUser($name, $dob, $mail, $password, $phone, $gender, $location, $userrole);

    if ($registerUser)
    {
        //return result (True)
        echo "<script>alert('User registered s')</script>";
        return $registerUser;
    }
    else
    {
        echo "<script>alert('Check the usercontroller file')</script>";
        return false;
    }
    }
```

figure 5.1: Code snippet for the error handling display

The alert, although being generated from the server side, was generated through the use of a combination of the PHP **echo** command and the **<script>** tag from HTML and JavaScript. This enabled the error messages to be displayed to the users.

The Unit tests were conducted based on the given requirements and codes

Table 5.1: Table showing results from functional requirements test.

Code	Requirement	Result
FR01	Create a profile (career path). Users will be required to create profiles to use this application.	Success. Users are able to create profiles and edit them.
FR02	Login/Logout. Users will be able to log in and logout of the profiles they have created.	Success. Users can login and logout of their accounts and information they input is stored and tracked with sessions.
FR03	Find relevant topics for study. Users can find a course from our list of available ones.	Success. Users can find videos and text to aid with the process of learning.
FR04	Provide simple question and answer tests to assess understanding.	Unsuccessful. Short quizzes will be better if linked to an external

		website with pre specified question and answers.
FR05	Tackle past industry projects Users can take on previously completed projects, published by companies that have tackled these.	Partly Successful. Users can download information and prompts to work on projects. Answers will have to be catered for as no regulation for this is possible.
FR06	Apply for a job available in listing. Users can opt to apply for job listing available to certain career paths .	Successful. Users can find company listings and apply for them as freelancers/employees.
FR07	Create an online profile. Users of the system should be allowed to create an online profile that they can link to their other relevant accounts like LinkedIn, GitHub and even other social media accounts to help people find them. They should be able to attach their CV as well, if they wish to do so.	Successful. The website allows for the user to store their CV and any other relevant information as well as include links to past projects

5.4 Cross User Testing

Given that the system operates in three parts, tests were conducted to see how effectively these user roles could work together on the system. This was done by:

Testing how user roles could be changed (from student to employee). Given the case where a person decides to upgrade from the student role to the employee, the system had to accept this and make the transition seamless. This was done by using a “Graduate” button to notify the system that the user was ready to take on the advanced role. This was also easy since the employee user role could still see the learning material as well as the job listings.

Another test was to see how companies would see users who applied for listings and users would be able to apply for listings. This was implemented successfully as well. Companies were given the name and contact details of the users who applied for listings and were able to communicate without outside the platform. They could also view the portfolio of the employee who applied.

The last test conducted was to see how well the authorization and restrictions work. This test meant that given a user with role Student, employee-related pages should be restricted. In the same rationale, companies should not be able to see what the employee and student users see. This was tested by logging as the various user roles and manually typing the URL for the page of interest.

After implementing the failsafe, the desired result from this test was achieved, as since the users did not have the authorization, the php file redirected them to the index page.

```
<?php
    session_start();
    if(($_SESSION['user_role']==1))
    {…
?>
  <style media="screen">…
  <div class="main" style="padding-top:10px;">…
  </div>
<?php
  }
  elseif ($_SESSION['user_role']==2)
  {
    include("../Navigation/navbar.php");

?>
<style media="screen">…
<div class="main" style="padding-top:10px;">…
</div>
<?php
}
else
{
  header('location: ../index.php');
```

fig 5.2: The authorization code snippet that restricts users from viewing unauthorised pages

5.4 Integration Testing

Once all the other tests had been passed, the system was monitored to see how it works as a whole. It was hosted on an Azure server and monitored to see how the system takes input, retrieves data, displays the information and generally performs.

The result of this test was to a major extent desirable. In testing, everything functioned as it should, and the performance speed was not alarming. The virtual server created was also very effective and simple to manage.

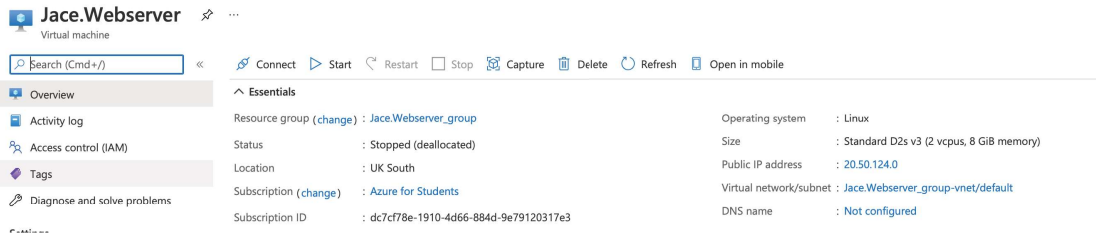

fig 5.3: The virtual server created for this project

5.5 Browser Compatibility Testing

The purpose of this test is to ensure that the application behaves correctly on multiple platforms as some browsers are cross-platform. All the components and modules in this project performed as they should on Mozilla Firefox, Opera, Google Chrome and Safari. Additionally, the system works on mobile phone browsers as well making it much easier to use as all that is required is an internet connection and a browser. It should be noted that there are some browser testing tools available, but they are not 100% effective. The only proven way to ensure browser compatibility is to visit the website using different browsers.

5.6 Usability Testing

Now that the project has been completed, 5 users were selected to test the system as hosted on the webserver. These five came from the qualitative sample used in the interview. This served as the alpha testing phase. Of these five participants, two were students, two

were employees and one was an employer. Once completed, a larger sample of 30 users was selected and given a feedback form to fill. The following results were obtained:

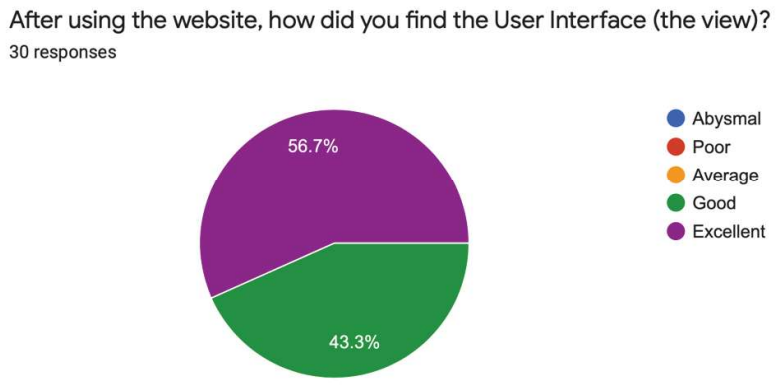

fig 5.4: A pie chart showing the proportion of users and their opinion on the interface

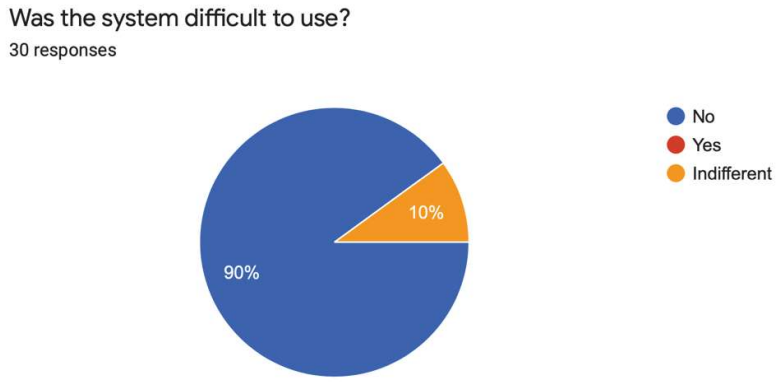

fig 5.5: A pie chart showing the proportion of users and their opinion on the interface

fig 5.6: Screenshot of a request for users to provide insights if they found challenges

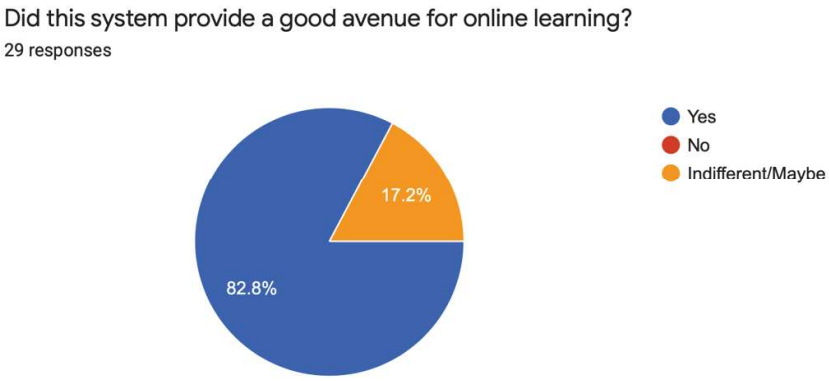

fig 5.7: A pie chart showing the proportion of users and the use of the platform for learning

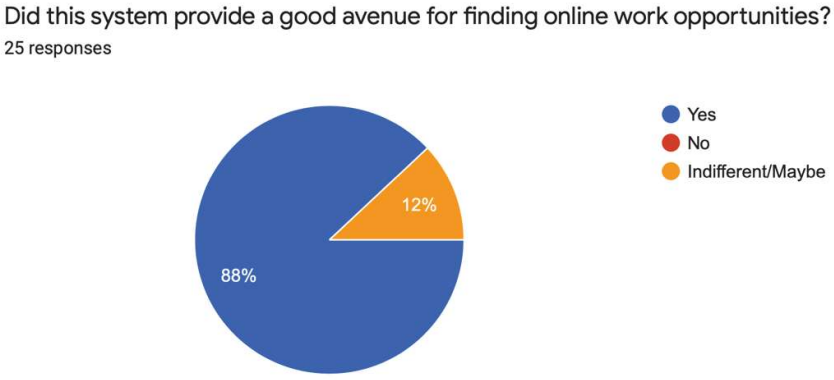

fig 5.8: A pie chart showing the proportion of users and the use of the platform for work

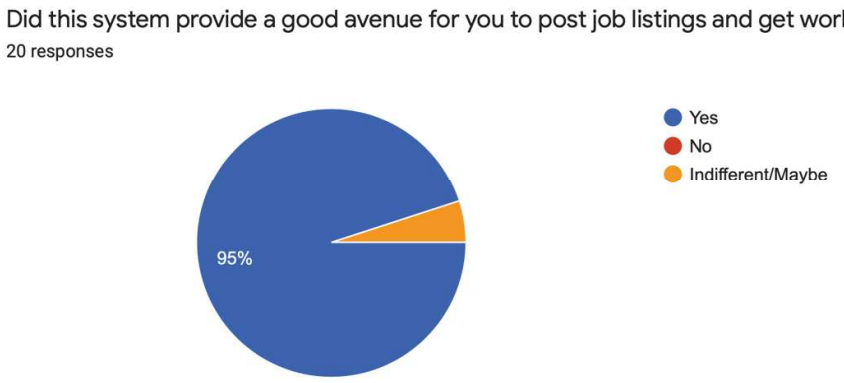

fig 5.9: A pie chart showing the proportion of companies and their use of the platform

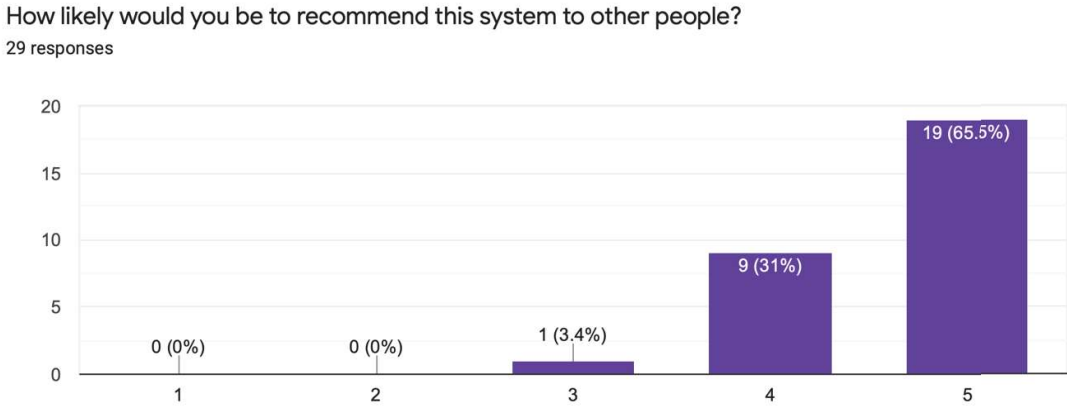

fig 5.10: A bar chart showing the proportion of users who will be eager to recommend this website.

fig 5.11: A screenshot of the additional comments users have in relation to the system.

The results from the testing were very encouraging as out of all the users who tested th1e website, seventeen of them gave it “excellent”, whilst the 13 remaining gave it “good”. A further 90% found the use of the system to be easy and not complicated, with only 3 users being indifferent or not having an issue with it.

Concerning online learning, users found it very easy and effective to use the material provided on the website with 82% giving satisfactory results on the usage. The proportion of users who used the website for work was similar, with a little over 82% saying that they found the use of this website effective. The employers had the chance to test as well and upon the result from the feedback form showing that they were pleased with the use of the website.

The website application was an overall success; users gave high ratings for the likelihood of them recommending to another person, with majority of them being absolutely certain that they would do so. Elev8 was a success in the end.

Chapter 6: Conclusion

This chapter marks the conclusion of the system development process for Elev8.com. It includes how the system meets the requirements specified by the users of the system and to the degree it worked. It also states the flaws identified in the system and areas that need to be improved.

6.1 Challenges Faced

Throughout the process of development, the biggest challenge was time, as the project was initially set to be in Laravel, but due to lack of sufficient understanding, the system had to be moved to PHP to meet deadlines.

Another setback was the global COVID 19 pandemic. This meant that meetings with users like company representatives, as well as testing and collating data from users, posed a slight challenge. As a result, only a few companies were keen on the idea of partnering with a new web application with no reviews and not sufficient information.

Lastly, the use of the Azure webserver requires payment. This was challenging as the project was carried out using limited finances.

6.2 Future Works

As at now, the need for a reliable and cost-efficient webserver is needed. Alternatively, a budget could be made for the Azure Webserver as it is very effective.

A payment system will be considered to facilitate payment between the employees and employers. Currently users have to do these transactions externally, but the introduction of a payment system will make using the system more practical.

Extensive study will be done on Laravel as this is a much more effective way to implement the system as against using vanilla PHP.

Steps will be taken to find a better encryption method to hash the passwords before the input gets to the controller in order to prevent the man in the middle attack

6.3 Conclusion

The application has become and overall success and match the requirements of that the users specified. This platform could be a potential panacea to the problem that the Ghanaian society, as well as Africa as a whole in line with the Sustainable Development Goals, faces and as such the project can be considered to be a success.

Although the project has a number of challenges, like any other software, reiterating to the best version it can be, it should ultimately work to meet the needs of the Information Technology sector of education and employment.

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Appendix

Appendix A: Code to show how the database connection is made.

```php
<?php
    //Database credentials
    define("DATABASE", "Elev8");
    define("SERVER", "localhost");
    define("USERNAME", "root");
    define("PASSWD", "");
?>

```

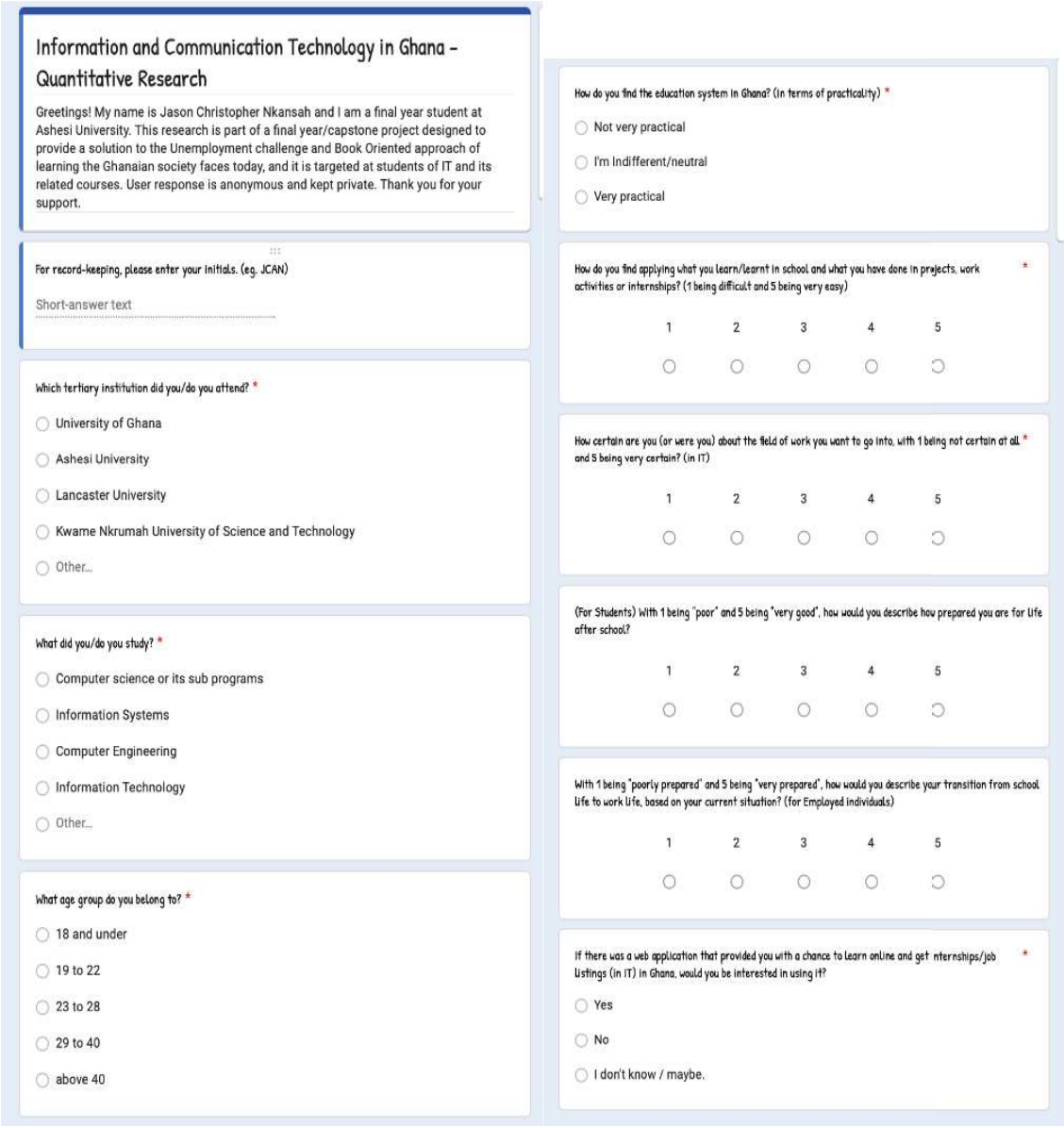
Appendix B: Code to show how queries are executed in the website.

```php
 *@author Jason Nkansah
 */
class db_connection
{
    //properties
    public $db = null;
    public $results = null;

    //connect
    /**
    *Database connection
    *@return bolean
    **/
    function db_connect()
    {
        //connection
        $this->db = mysqli_connect(SERVER,USERNAME,PASSWD,DATABASE);
        //test the connection
        if (mysqli_connect_errno())
        {
            echo "<script>console.log('this connection does not
work')</script>";
            return false;
        }
        else
        {
            echo "<script>console.log('this connection works')</script>";
```

```
            return true;
        }
    }

    //execute a query
    /**
    *Query the Database
    *@param takes a connection and sql query
    *@return bolean
    **/
    function db_query($sqlQuery)
    {
        if (!$this->db_connect())
        {
            return false;
        }
        elseif ($this->db==null)
        {
            return false;
        }
        //run query
        //echo($sqlQuery);
        $this->results = mysqli_query($this->db,$sqlQuery);

        if ($this->results == false)
        {
            return false;
        }
        else
        {
            echo 'dead';
            return true;
        }

    }

    //fetch data
    /**
    *get select data
    *@return a record
    **/
    function db_fetch()
    {
        //check if result was set
        if ($this->results == null)
        {
            return false;
        }
        elseif ($this->results == false)
        {
            return false;
```

```
        }
        //return a record
        return mysqli_fetch_assoc($this->results);

    }
}
?>
```

Appendix C: Requirement Gathering Questionnaire and Survey (Quantitive)



Information and Communication Technology in Ghana - Quantitative Research

Greetings! My name is Jason Christopher Nkansah and I am a final year student at Ashesi University. This research is part of a final year/capstone project designed to provide a solution to the Unemployment challenge and Book Oriented approach of learning the Ghanaian society faces today, and it is targeted at students of IT and its related courses. User response is anonymous and kept private. Thank you for your support.

For record-keeping, please enter your initials. (eg. JCAN)

Short-answer text

Which tertiary institution did you/do you attend? *

- University of Ghana
- Ashesi University
- Lancaster University
- Kwame Nkrumah University of Science and Technology
- Other...

What did you/do you study? *

- Computer science or its sub programs
- Information Systems
- Computer Engineering
- Information Technology
- Other...

What age group do you belong to? *

- 18 and under
- 19 to 22
- 23 to 28
- 29 to 40
- above 40

How do you find the education system in Ghana? (In terms of practicality) *

- Not very practical
- I'm Indifferent/neutral
- Very practical

How do you find applying what you learn/learnt in school and what you have done in projects, work activities or internships? (1 being difficult and 5 being very easy) *

1 2 3 4 5

How certain are you (or were you) about the field of work you want to go into, with 1 being not certain at all and 5 being very certain? (in IT) *

1 2 3 4 5

(For Students) With 1 being "poor" and 5 being "very good", how would you describe how prepared you are for life after school?

1 2 3 4 5

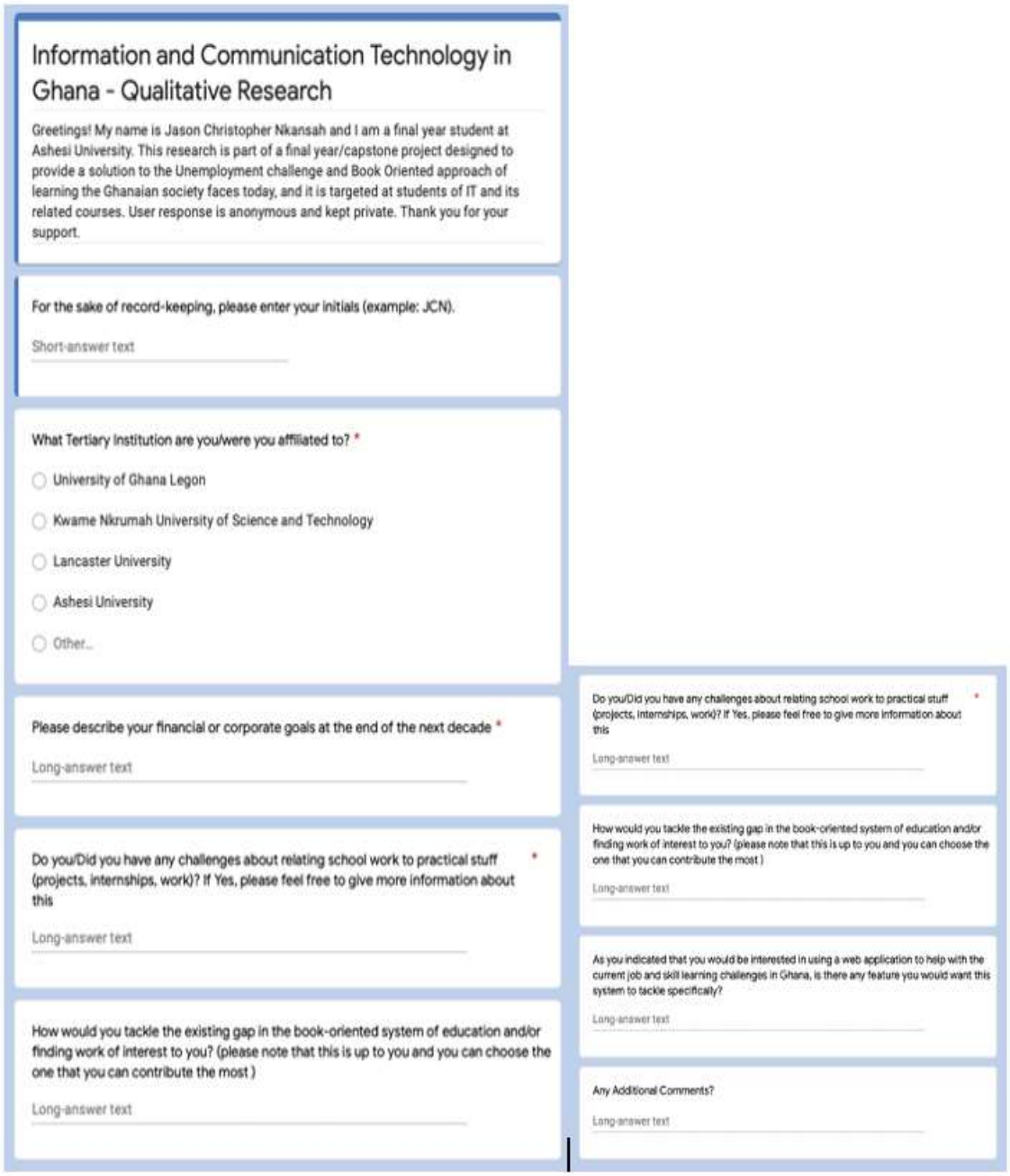
With 1 being "poorly prepared" and 5 being "very prepared", how would you describe your transition from school life to work life, based on your current situation? (for Employed individuals)

1 2 3 4 5

If there was a web application that provided you with a chance to Learn online and get internships/job listings (in IT) in Ghana, would you be interested in using it? *

- Yes
- No
- I don't know / maybe.

Appendix D: Requirement Gathering Questionnaire and Survey



Information and Communication Technology in Ghana - Qualitative Research

Greetings! My name is Jason Christopher Nkansah and I am a final year student at Ashesi University. This research is part of a final year/capstone project designed to provide a solution to the Unemployment challenge and Book Oriented approach of learning the Ghanaian society faces today, and it is targeted at students of IT and its related courses. User response is anonymous and kept private. Thank you for your support.

For the sake of record-keeping, please enter your initials (example: JCN).

Short-answer text

What Tertiary Institution are you/were you affiliated to? *

- University of Ghana Legon
- Kwame Nkrumah University of Science and Technology
- Lancaster University
- Ashesi University
- Other...

Please describe your financial or corporate goals at the end of the next decade *

Long-answer text

Do you/Did you have any challenges about relating school work to practical stuff (projects, internships, work)? If Yes, please feel free to give more information about this *

Long-answer text

How would you tackle the existing gap in the book-oriented system of education and/or finding work of interest to you? (please note that this is up to you and you can choose the one that you can contribute the most)

Long-answer text

Do you/Did you have any challenges about relating school work to practical stuff (projects, internships, work)? If Yes, please feel free to give more information about this *

Long-answer text

How would you tackle the existing gap in the book-oriented system of education and/or finding work of interest to you? (please note that this is up to you and you can choose the one that you can contribute the most)

Long-answer text

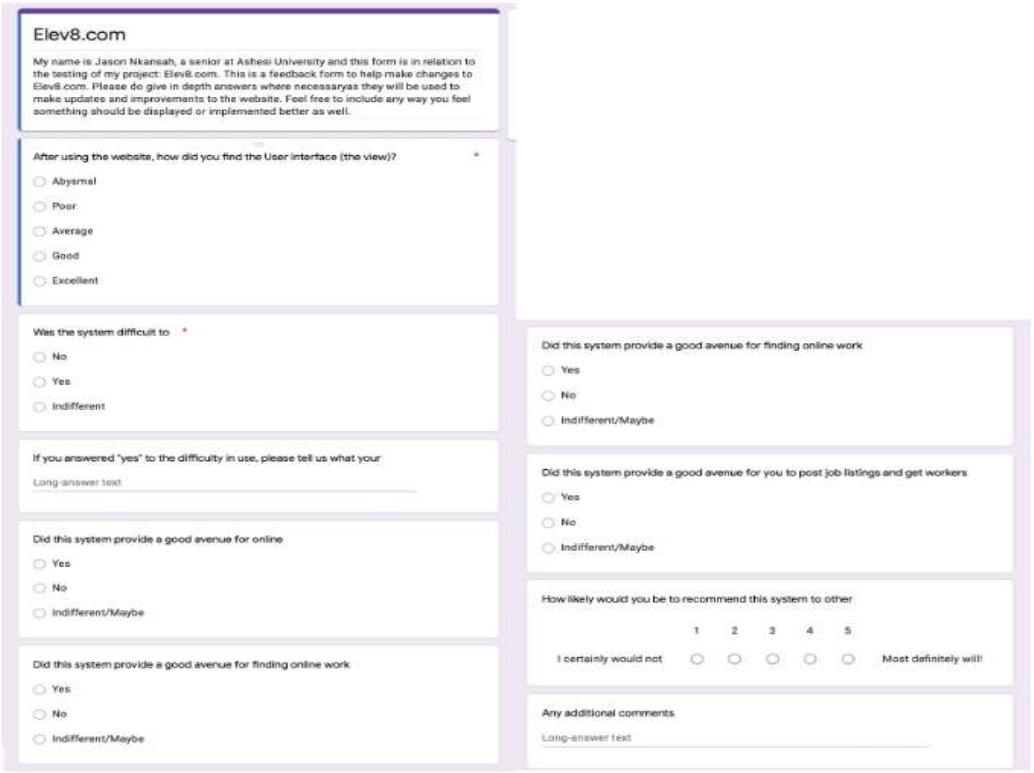
As you indicated that you would be interested in using a web application to help with the current job and skill learning challenges in Ghana, is there any feature you would want this system to tackle specifically?

Long-answer text

Any Additional Comments?

Long-answer text

Appendix E: User testing feedback form



Elev8.com

My name is Jason Nkansah, a senior at Ashesi University and this form is in relation to the testing of my project: Elev8.com. This is a feedback form to help make changes to Elev8.com. Please do give in depth answers where necessaaryas they will be used to make updates and improvements to the website. Feel free to include any way you feel something should be displayed or implemented better as well.

After using the website, how did you find the User interface (the view)? *
- Abysmal
- Poor
- Average
- Good
- Excellent

Was the system difficult to *
- No
- Yes
- Indifferent

If you answered "yes" to the difficulty in use, please tell us what your
Long-answer text

Did this system provide a good avenue for online
- Yes
- No
- Indifferent/Maybe

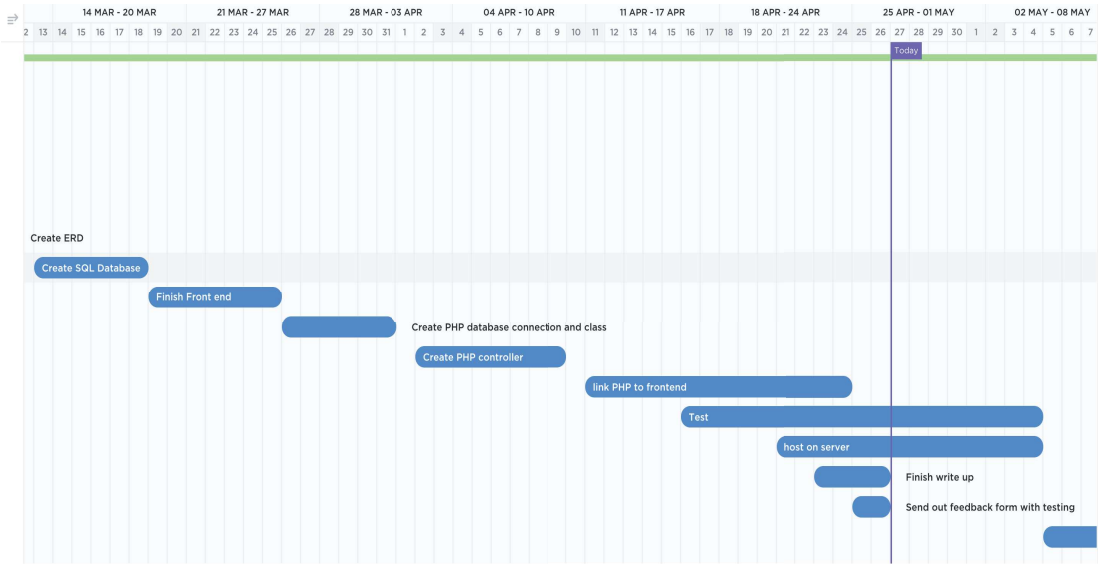
Did this system provide a good avenue for finding online work
- Yes
- No
- Indifferent/Maybe

Did this system provide a good avenue for finding online work
- Yes
- No
- Indifferent/Maybe

Did this system provide a good avenue for you to post job listings and get workers
- Yes
- No
- Indifferent/Maybe

How likely would you be to recommend this system to other

	1	2	3	4	5	
I certainly would not	○	○	○	○	○	Most definitely will!

Any additional comments
Long-answer text

Appendix F: Gantt chart for project management.