



Careers Pathfinder

Final Report

Bad Apple Software

David Hall Tyler McAllister Lewis McNeill Donald Redpath

Husnain Sultan Jack Webster



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Marketing Analysis and Strategy

Executive Summary

Bad Apple Software has taken on the task of creating an application that offers advice to pupils on the cusp of leaving school. This application, called Careers Pathfinder, will take in user's personal information, such as qualifications and part time work, and create a personal pathway that is unique to the user. This pathway will suggest realistic options, taken from a database of university courses, for the user to follow.

Bad Apple Software identified a set of marketing goals that they wish to achieve using the Careers Pathfinder.

- **Increase awareness**
- **Build a Large User base**
- **Improve Bad Apple Software's reputation**

We hope to achieve these goals by dealing with customers and business partners in a positive and effective manner.

The application will be initially only available to pupils in Scotland to allow us to create a service that is perfect without trying to spread it too thin and cover different countries which have different education systems.

Once we and our users are satisfied with the system, we plan on expanding to other countries and offering more features.

We aim on providing excellent customer service to our users, ensuring they know their opinion is valued and made use of. In doing this we hope to become the first choice in choice advice applications with a strong and positive brand and reputation.



Overall Objectives

Bad Apple Software is a young software company that has developed an application designed to help young people as they are about to leave school. This is a time when they can find themselves swamped with the overwhelming amount of options they have to choose from. We believe our application can help them sort through the labyrinth to find what's best for them.

Overall Goals

User Satisfaction

To provide our users with an effective and simple application and helpful support to ensure they are able to realise and record their desired career option. To ensure any problems experienced by the user are handled quickly and correctly.

Continuous Improvements

We aim to maintain the Careers Pathfinder to the best of our ability by implementing updates and fixes. We plan on using user feedback to prioritise new features and bug fixes to ensure the user is always happy and knows their opinion matters to us.

Efficient use of Resources

We strive to use our resources and funds as efficiently as possible to ensure we can set a reasonable price for our service.



Product and Market Background

Background

Bad Apple Software has developed a web application called, Career Pathfinder, which can assist school leavers in finding out what they want to do after leaving school. The application is capable of working on both computer and mobile platforms and allows users to create their own personal career plan. This includes offering suggestions as to what the user is able to pursue based on their previous qualifications. Income will come primarily from schools who will pay a membership fee to allow their pupils to use our application. Another main source of income will be from universities, who can pay to become a sponsored result and have greater visibility on the resulting pathway. Through constant updates and fixes we hope to continually improve the application which would result in a larger number of users, increasing the revenue. Hopefully through positive user experiences the reputation of the Careers Pathfinder will grow to an extent to where it is the leading form of assistance for school leavers.

Product

The web application offers assistance to those who are leaving school and are unsure of where they want to go next. The application enables users to plan their career path, starting with what they have, the application can help them decide where they want to go and tell them how to get there. Users can save this pathway and use it to track their progress towards their goals. The initial release supports only pupils from Scotland but planned developments would allow the application to extend to users through the UK.

Market

Many young people in school get to their final year and don't actually know what they want to do when they leave. It is not always obvious on how they can find assistance and ideas on what to do. Due to the large amount of pupils per teacher, it can be hard for a pupil to get time to get personalised advice and often they are left to decide without help. Current advice applications are too vague and do not offer personalised options, instead just a list of many options.



Potential Target market

The identified target market would be young people who have left or are leaving school, mainly 16 to 20 year olds, although older people would still be able to use the Careers Pathfinder.

With the initial release only catering for Scottish qualifications, this web application will be targeting school leavers in Scotland as its main market. Although future versions will expand into other countries and include all job seekers

Market trends

There are far more students leaving school to go to university than ever before. This can be attributed to the growing number of jobs which require a degree.

Modern families are having less children, which is resulting in less children in school. The Scottish Government stated that in the year 2000 there was 317,000 pupils in secondary schools. Moving ahead to 2015 they found that there was only 281,000 pupils.

Main competitors

There are other websites which offer a similar service such as the UCAS website. However they only offer a list of the possible choices. The UCAS website's career finder only posts job offers which isn't that similar to our application. This service is inferior to ours but if they were to copy our application then our website would lose its main competitive advantage. In the current market there are no real market competitors that offer a service on the same level as we do.



Marketing Analysis

PESTLE

Political

UCAS have recently changed their points system to lower numbers which can lead to confusion for student applying for university or other places that require a UCAS score.

In 2011 the SQA began to implement the Curriculum for Excellence which brings in new qualifications. These will replace the older qualifications. Careers Pathfinder must be able to handle both old and new qualifications to ensure it is usable by all young people in Scotland

Economical

The web application may make a suggestion to a user where the only options involve moving away from home to study or complete a course. This might not be a viable option for many poorer families as the options for funding are not substantial enough to enable the user to move. Generally Schools do not have a large budget to spend so may be reluctant to buy our product.

Socio - cultural

Due to the job market being highly competitive, many jobs in the modern day require an applicant to have a degree to be considered. As a result more young people are going to university to improve their chances of finding a job.

With new advanced technologies being invented continually, new jobs are being created to work with these technologies. Most of these jobs will require a degree to be qualified.

Technological

Developments in open source software are making technologies more powerful and accessible to all, making development of applications more inexpensive than ever. This might lead to more competitors appearing down the line. It will also allow us to use newer technology to further improve our service.

Using more servers to host the web application can result in the application being able to handle more traffic if it proves to be popular and has to handle large numbers of users accessing the web application at once



Legal

The website will be handling user's private information and must adhere to the the data protection act. Since this website will be handling information from minors, we will have to be extremely careful to ensure we comply with the legislations.

Environmental

Increased pressure on organisations to reduce waste and as such the application shall be required to use as little as possible in terms of consumables such as paper. This will involve ensuring there is little or no information required to be printed.

SWOT

Strengths

The pathway application is unmatched in the service it offers, allowing users to build their own personal path and save it. The user is able to select the qualifications they have attained from a list which is drawn from the SQA website. The applications then uses them to offer suggestions to possible courses.

Weaknesses

As a new addition to the market, the website will be unknown against the more established competitors and because of general consumer behaviour, it can be hard to build a recognised brand without support from recognised establishments such as the SQA or UCAS.

The website will have a low visibility and will people will rarely 'stumble across' it.

Opportunities

In 2014 UCAS came under fire for selling user's contact details to advertisers. This has resulted in a reduced trust in the organisation. Due to Bad Apple Software being a small company with a friendly face, we can assure our users that such schemes will not take place with our users' information. This can help to build up trust in our brand.

We are negotiating with the SQA to become their endorsed product. If we had the SQA publicly backing us and encouraging schools to use our product, then we would have all the visibility we need and schools would be more likely to make use of or product.



Threats

There are competitors in many forms. Many websites offer a service similar to ours UCAS have their own careers service and it will have a much higher visibility due to UCAS already being an established name and familiar to all pupils leaving to go to university.

Schools already offer their own assistance to pupils in the form of teachers who can offer their own experiences to help decide what they want to do. Because of this there is a chance schools will not bother to pay for our service, especially if they have a small budget.

Marketing Strategies

Target Markets

The Careers Pathfinder will target young people mainly between 16 and 20 from Scotland looking to go to university. Future developments of the application will allow us to target pupils throughout the UK and those not looking to go to university.

Competitive Advantages

We hope to gain competitive advantage by utilising the three generic strategies that Porter(1985) identified and specific areas in which The Careers Pathfinder can outperform competitors.

The three strategies that Porter identified are:

Cost Leadership

Offering a low product price but also having low input costs which still allow services to be delivered at an acceptable quality. This can involve Bad Apple Software making use of open source software as much as possible to reduce running costs which allows us to set lower prices on products.

Differentiation

Advertising the unique selling points in the product that are hard for competitors to copy. A successful differentiation strategy allows a company to allocate a premium price to the product. This strategy is more suited to larger companies due to the intensive marketing campaigns that are generally required to highlight the superiority of the product. An example of this strategy is seen in the way Apple sells their products. By showing of the design and



features of the phone or computer they can put a high price tag on them because of the consumer's desire to have it.

Focus

Adopting a narrow focus on a low number of target markets. This is a suitable strategy for a small company such as Bad Apple Software because it avoids competition with larger companies. A focus strategy involves tailoring the marketing to one or two market segments where the product can better satisfy the needs of the customer.

In order to achieve a competitive advantage, we will aim to achieve as many of these generic strategies as possible with extra emphasis on the focus strategy as we are a small company and do not possess the resources or reputation of larger companies. The Careers Pathfinder offers a service that is aimed at the market segment containing school leavers, which fits the description of a focus strategy.

Product Positioning

We plan on establishing ourselves as market nichers as we are targeting a small market and offer a service that is unlike any other. Due to us operating in a niche market there is not much in the way of competitors who offer a similar service in our market.

Strategic Intent

We are committed to providing constant support to our users; accepting feedback and responding accordingly. We plan on implementing continual improvements to grow our application to reach more people; this will allow our brand reputation and visibility to grow.

While we are committed to expanding to reach more users, we will try to get our application to a level where its current users are happy with the service offered before we think about expanding into other areas.

We plan on utilising a defensive strategy to ensure we maintain a strong position among competitors in our market.



Marketing Goals

Increase awareness

Our first marketing goal is to increase awareness of the Careers Pathfinder. A good awareness of the application will make it easier to gain new customers.

Build a Large User base

For our application to be considered a success it must have a large base of active users. We plan on expanding our application so it can cover more areas; allowing us to increase the size of our user base.

Improve Bad Apple Software's reputation

As we are still a young software company we do not have much of a reputation. It is important to build a positive reputation and this can come from taking a professional and helpful attitude when it comes to dealing with customers.

Marketing Programmes

School Leavers

Product - Customers expects a high quality product and friendly service in which they can trust for investing and managing their wealth. The product will need to be well maintained for bugs and issues as well as updating for gradual improvements in the wealth management tool.

Price - We will base our price off of what we feel is a reasonable price for the product because there are not many competitors which we can base our price on. We will take into account how much it cost to make the application and how much a school would be realistically willing to pay. As we are aiming to selling memberships to schools, we will set a reasonable price for the product. There will be different levels of memberships depending on how many users they will have; larger schools will require a more expensive plan to cater for larger pupil numbers. We also plan on including a price for individual users who aren't part of a school. This will allow individuals who aren't at school to make use of our service and even pupils that are at school which does not use the service. We plan on releasing a free trial version which would either last for a set time period or a limited number of users. A trial version for individual users will also be available and will have a time limit for how long the user can use the application before paying.



For universities willing to pay to be a sponsored result we will charge a price dependant on the level of exposure they desire. Obviously the most exposure will be the most expensive

Place - The product is based online so it can be sold to any school that is eligible regardless of location. Electronic communication in the form of email and conference calls allow us to contact customers no matter where they are.

Promotion - A website has been created which has a suitable domain name and because a large amount of customers use search engines in order to find services and products, it is important that our website shows up on a search engine. Also if our negotiations with the SQA are successful, we will be visible to all high schools in Scotland.

Implementation

Search Engine Visibility

We plan on making our website visible on search engines. This will increase the chance of an individual finding our website.

Promotional Strategies

If our negotiations with the SQA are successful, schools will be encouraged by the SQA to use our application. This will place us in the spotlight and all schools will be able to see our application. If schools are unsure whether to invest in a membership we offer a trial membership which will either last a certain amount of time or allow a certain amount of users access.

There are other ways to advertise our product as well. We can contact schools directly, which if successful can create a strong relationship with the customer. As our customer base grows, schools will be more inclined to make use of our service because they know we can be trusted.

Affiliation

Our affiliation with the SQA can help to improve our brand as they are the part of the Scottish government in charge of education. With their backing schools would not hesitate to place their trust in us. When we expand into other countries we will try and build an affiliation with the country's education board.



Marketing Supporting Documents

Pestle Analysis

<u>Political</u> <ul style="list-style-type: none">● Lower UCAS points system● Curriculum for Excellence	<u>Technological</u> <ul style="list-style-type: none">● Technology is constantly improving● Investing in more servers allows more traffic to be flow through the site
<u>Economical</u> <ul style="list-style-type: none">● Poorer people are limited in their choices	<u>Legal</u> <ul style="list-style-type: none">● Must adhere to legislation
<u>Socio - cultural</u> <ul style="list-style-type: none">● Highly Competitive job market● New technologies bring new skilled jobs	<u>Environmental</u> <ul style="list-style-type: none">● Restrict amount of consumables used

SWOT Analysis

Strengths <ul style="list-style-type: none">● Unmatched service● Personalised Suggestions	Weaknesses <ul style="list-style-type: none">● New addition● Low visibility
Opportunities <ul style="list-style-type: none">● Friendly Face● SQA backing	Threats <ul style="list-style-type: none">● UCAS have a service● Schools offer their own version● Schools with small budgets might not bother



Usability Test Evaluation

Objectives and Hypothesis

The objectives we plan to meet to allow our testing to be successful are:

- Collecting data from participants that benefits and follows our user requirements to ensure that these requirements have been met and can be performed by users without any difficulties.
- Discovering any immediate usability issues with the system.
- To collect quantitative and qualitative from all of our test subjects.
- To ensure that both desktop and mobile versions of our system are of a high standard

Our hypothesis for this testing protocol is that the site will be simple to understand for basic functions, but will be vague and inadequate for higher level functions and overall website design. This testing protocol shall provide us with confirmation on this hypothesis and allow us to make the necessary changes to develop a complete system with clearly thought out and developed usability functions.

Participants

We intend to select university students with a variety of different backgrounds and skill sets. We intend for each participant to have a different level of knowledge on computers and website design. However the participants we expect to gain are from Users expected to utilise the system are; teenagers leaving school or in university each with a variety qualifications and degrees. Therefore it is important that the usability tests reflect the main demographic of the website.

Task Scenarios

We want to test how participants can interact and understand our application by being given specific tasks to complete on the finalised version of our application. It was important to give the participants only a basic guideline of how to complete certain tasks without immediately giving them the solution to their tasks. Tasks will largely focus on having the participant complete various tasks that relate to the functionality of the website. We take note of how long it takes a participant to confidently complete a task as well as gauging how strongly they agree or disagree with the the difficulty of tasks. This will provide us with sufficient quantitative data to allow us to have a deeper understanding of user performance on our system which will allow our group to determine how successfully we rectified issues from our previous usability study. Other questions asked will make the user write descriptions of the various features and design



choices we have made. This expands our view of how accurately we meet user needs within the application.

Goals

The goals of our usability tests are ensuring that at least 80% of all participants using the system have a basic understanding of our design choices and do not find any of the tasks to be too challenging and can fully answer all of the questions with relative confidence. It is essential that both versions of our system are near identical in user satisfaction, especially our mobile website due to the importance of responsive design.

Data Collection

Using the difficulty of task completion as quantitative data collected from the participant testers allows us to gain a deeper insight into specific issues our system may contain. By gathering this data we can make all of the main functions and features that are necessary for the website to be simple and easy to use. Other quantitative data collected from our exit questionnaire allows us to look for any key flaws in the mobile or desktop versions of the website.

Our qualitative data is done in the form of basic user understanding of functions with use of descriptions and explanations to allow each individual participant to give their own unique view of our website.



Findings

Use of Data

A number of likert scales were used within the usability tests, similarly to the previous one taken in the first stage. Originally we intended to use a scale going from 1 to 10 that asked the user how difficult a specific task would be for them to complete based on their interpretation of mockup screens that were used in stage one. This system is no longer used within this stage because we can now use the existing final application to record the amount of time it takes a user to complete a task and take note of any outliers within our data that don't fit within, what we would consider an optimal time to complete a task. Because of this system we can implicitly determine which tasks can be defined as more challenging or confusing for users without directly asking them before they do the task. This puts less pressure on participants as they will not feel like they have to meet a specific standard when completing a task, they are free to perform each task at a pace they are comfortable with. Usually after one task has been complete we query the user for more qualitative data such as writing out their initial opinions or thoughts for a deeper insight into the successfulness of our application.

Entry Questionnaire Findings

Our entry questionnaire form remained exactly the same as the one used in the usability testing in stage one. Overall, the participants were in their late teens or just above who were currently students, which was the demographic we were reaching for in our testing.

Age

18	4
19	2
20	2
21+	1
Total	9



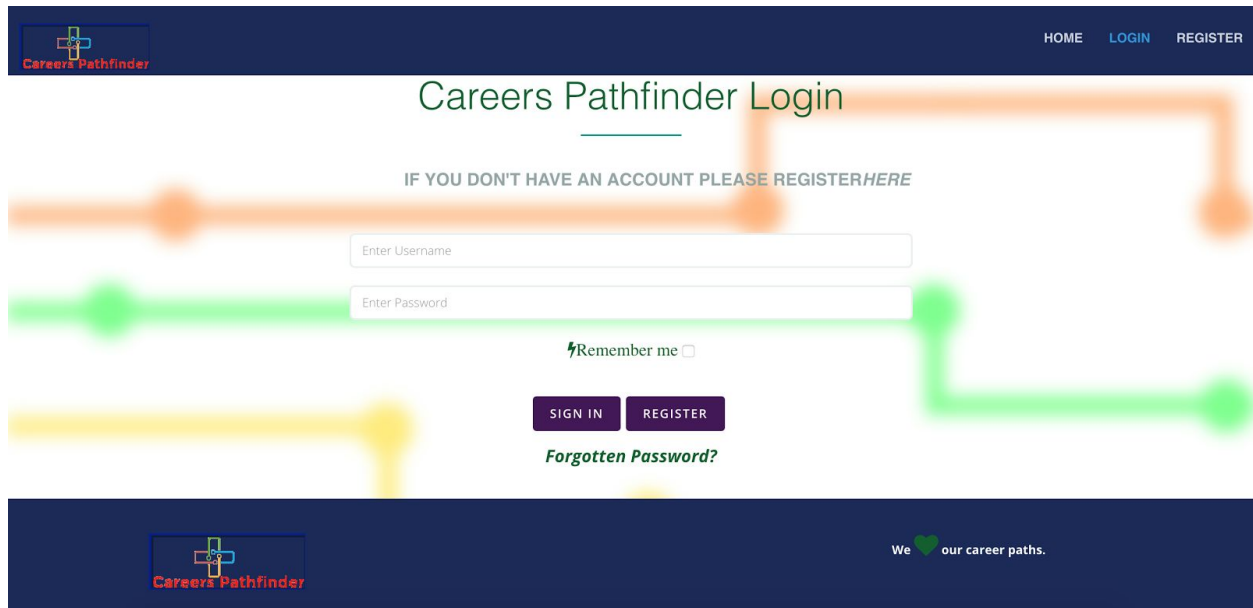
How much computing experience do you have?

None	A little	Moderate	Reasonable	Experienced	TOTAL
0	1	4	3	1	9

One aspect that should be noted for this usability test was that we did not gain many inexperienced users for testing, only getting one user who would only describe themselves as having a little bit of computing experience. Participants who are more familiar with technology can be harder to test for user friendliness of a system, conversely they are also able to be more critical of systems in place. This is also not a huge issue because as we plan to capture students as our main demographic and it is very common for students have at least moderate computing skills when it comes to navigating websites and using web browsers.

Task Findings

Below is a task by task breakdown of the various exercises the participants were asked to complete. Each participant completed each task with reasonable success which provided us with good amounts of data.



Example screen of what a user may see.

1 - Login Page

1.1) What is your opinion of the overall design of this page?

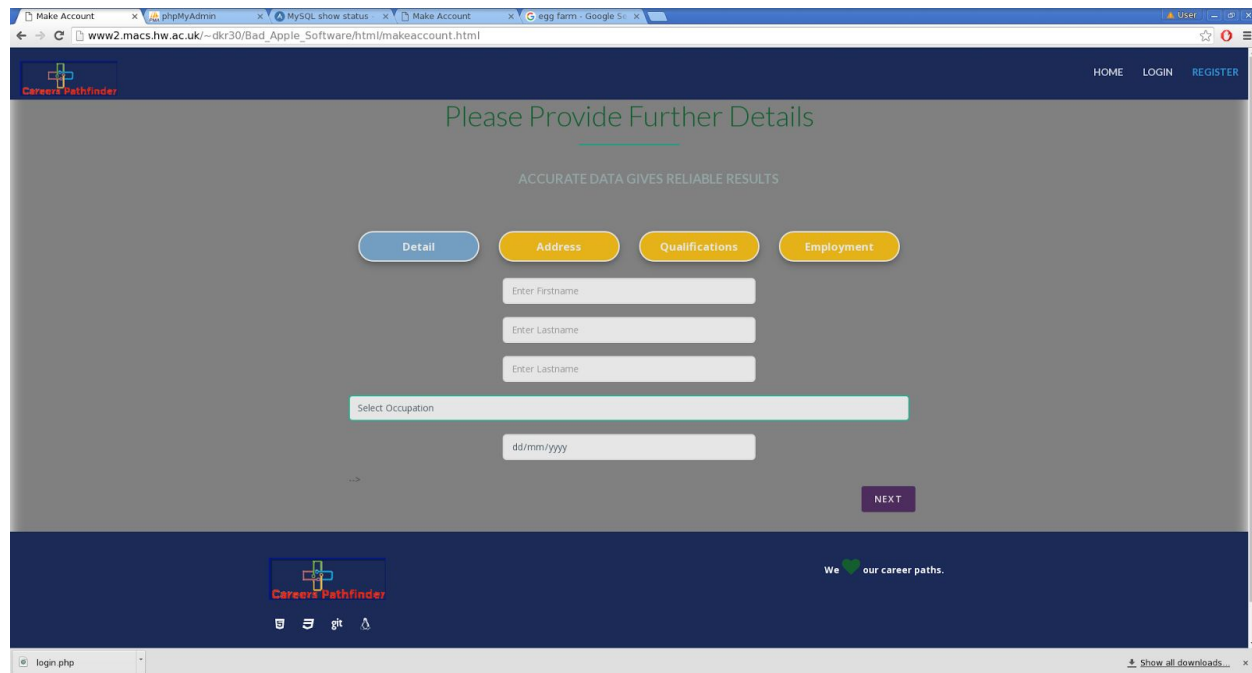
Overall we found that the majority of users found the aesthetic appeal of the login page to be very effectively done. Some even describing it as “very professional” and “a lot better than our last one” which was exactly what we were aiming for in terms of improving our design. The dark blue coupled with white gives a professional appeal to the application. The background is now slightly blurred, taking away from what some called a “basic” design.

1.2) Could you demonstrate how you would begin to register a new account on the application?

There were multiple ways to complete this task and both involved only one click. Both solutions simply involved clicking either the “Register” button located at the bottom of the screen or the “Register” menu button located at the top of the page. Because of this in stage 1.3) and 1.4) majority of participants found the login interface to be user friendly and found starting account creation to be simple to do.

From here we moved into the account creation wizard process, Task 2.

2 - Account Creation Wizard Part 1



Example screen of what a user may see

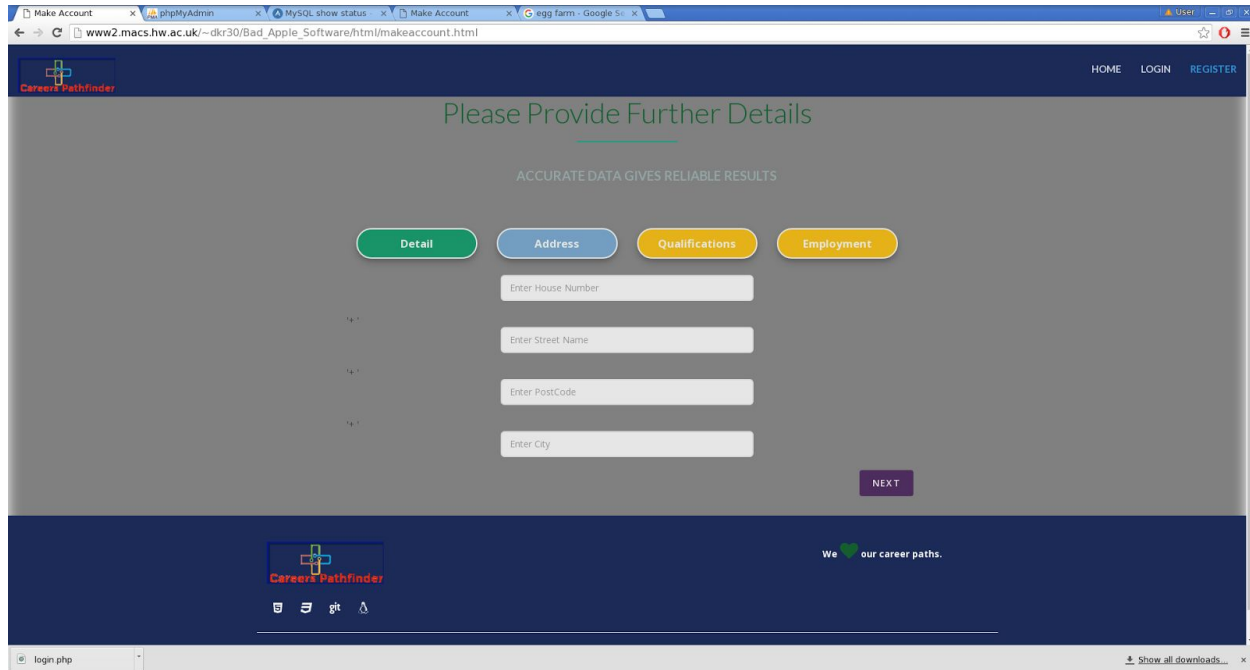
- 2.1) Can you demonstrate how you would successfully enter your user details on this page?
- 2.2) Did you find it easy to understand what each field on this page required from you?
- 2.4) Navigating through the user details section of this page was simple.

Each input form on the account creation wizard was identified with a suitable placeholder text to give users a clue on what was required from them on this page. There is also a menu bar at the top which gives a brief idea of what is needed from the user. For the first part of the account creation wizard all participants found this to be simple enough as it only required simple input from them. Some users took their time on this task to try and understand every part of the account wizard as it highlights future details that must be input by the user. One experienced user described it as “simple to understand but not particularly necessary” which is what we expected from a user of this caliber. Our user with little experience in computing commented that the account wizard was easy to understand and was of the opinion that navigating through the page was simple.

2.3) What is your overall opinion of the design of this page?

The account creation wizard is a large container in the middle of the page. Coloured buttons and labeled menus are laid out in on the container giving the user a simple idea of what is required from them. Most users did enjoy the overall design of this page, with more experienced users saying it was still “a bit basic in terms of design”.

3 - Account Creation Wizard Part 2



Example screen of what a user would see

This account wizard page captured the user's address information to be securely stored within the database.

3.1) Is the information being displayed currently the kind of information you would expect?

The wording of this question was not ideal. Some participants seemed to be confused about what we were asking about. Many of the participants thought we were asking if taking their address information was the correct thing to do, morally, and not whether clicking the next button would lead to the next tab displayed at the top of the container. Therefore the results for this task were spotty at best and therefore we decided to not take this question into complete consideration although it does highlight something we should have perhaps notified users about before beginning this task.

3.2) From this page would you demonstrate how you would add your address details into the system?

3.3) Navigating the account wizard is simple

By this point we expected all account wizard tasks to be simple for the user to complete. Thanks to familiarity of the account wizard at each stage and the dynamic loading of the page the user is forced to go through tasks quickly and picks up how to do them easily. All users successfully completed this task in a short amount of time and were now all finding the navigation of the account wizard to be simple which is exactly what we wanted.



4 - Account Creation Wizard Part 3

Example of what a user may see

This page of the account wizard focused on adding qualifications to the user's account.

4.1) Could you demonstrate how you would add 6 or 7 qualifications to your account?

This was a relatively new task that had to be completed by the participants. Each participant managed to get the task completed but some small inconsequential errors were made on their way to completion. Some users tried to add grades one by one and used the “submit” button to put their grades in rather than their building a list, which was what we intended users to do, and inserting this all into their profile at once.

4.2) Do you think this is a good method of adding qualifications to your profile?

As stated above some most users commented that the difference between submitting and adding was a bit difficult for them to understand and some found the process as something that “can take a long time if you have a lot of grades” which is a consequence of submit each grade individually. As a result we have taken note of this and a possible solution would be to use checkboxes or something similar that need to be ticked for submission to be successful. This means if a user attempts to submit and haven't ticked a checkbox they are informed of this, the implication of a checkbox also tells the user that maybe more than one grade can be listed at once on this page.



5 - Account Wizard Part 4

Example of what a user may see

This page of the account wizard focused on adding an occupation(s), if any, to the user's account.

The first task required from users was similar to the previous one, by the time we reached this task users had understood how to add their employment.

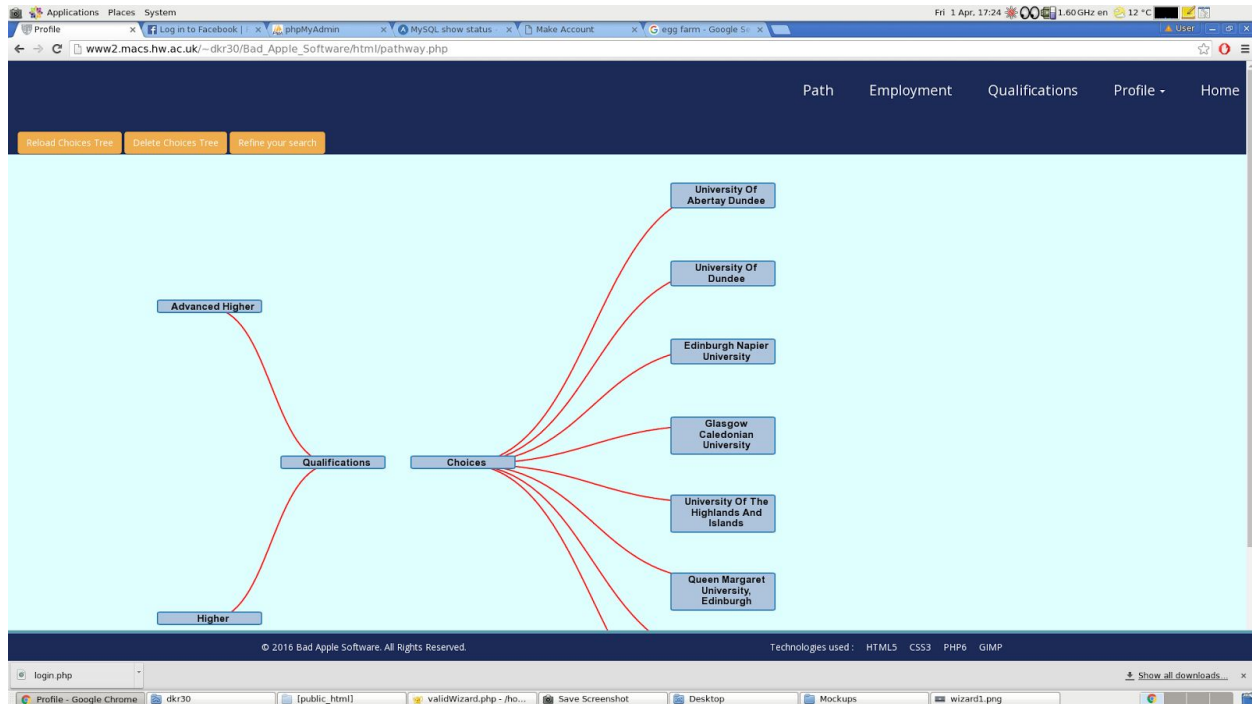
5.3) While keeping the aim of the web application in mind, do you find that adding an occupation is a useful feature?

This was a bit of an odd question to ask from users as it stands out among the rest, focusing more on an opinion of a built in site feature that isn't directly involved with the current task. Most opinions were good, with one users saying "I can see how my occupation could effect my pathway".

5.5) Overall the account wizard was a helpful tool for setting up a valid profile.

This question was also received greatly by participants, every participant said that the account wizard was helpful to account creation except for our experienced participant who said that "a step by step navigation isn't needed" which we think is fair to say for someone who is extremely familiar with computing applications.

6 - Pathway



Example of a pathway being viewed on a user desktop

We did not consider our pathway to be a 100% complete part of our application. However we were able to display some data successfully to every user who used it. The questions asked at this point originally included more functionality but we could not comfortably set this up as it was still a work in progress at the time. As a result there were more hypothetical questions and those to do with the visual appeal of the pathway instead.

6.1) What is your opinion of the design of the pathway?

“It fits well against the background colour” and similar comments were quite common from the participants. Design is one of the largest features of our web application and as such we were proud to hear that the presentation of our pathway was received well among participants.

6.2) Is the appearance of the pathway similar to what you expected when the main function of the web application was explained to you?

The opinions given to us here were mixed overall. “It doesn’t seem much like a pathway” and “I’m not quite sure what it is supposed to be showing” were two comments that we took on very seriously. This may be because of an unfamiliarity with this kind of architecture as it is very non-standard but it could also be due to there being little to no in depth explanation of the pathway’s feature and aesthetic design. In the future, users who use the application may have the same issue so perhaps a “Help” page would be more suitable so users who have issues can be redirected to a basic page.



6.3) While keeping the aim of the web application in mind, please navigate through the path and feel free to comment on the information that is being displayed to you.

Pathway navigation was relatively simple for all users once we gave them the freedom to experiment with the pathway. As all of its functionality was being displayed we heard a variety of interesting opinions from the participants. "It works well enough but the data doesn't seem meaningful" was one thing a participant said that stood out to us incredibly well. We also agree, currently the pathway can display data to the user but overall this data is largely irrelevant for displaying anything other than giving the user courses that meet their UCAS level, which is too large to be considered interesting and meaningful data. This function of the pathway was something that our team absolutely needed more time to focus on and as a result we would have needed more time to fully flesh out this functionality for future versions of the application.



7 - Deletion

7.1) Can you demonstrate how you would successfully delete your account from the system?

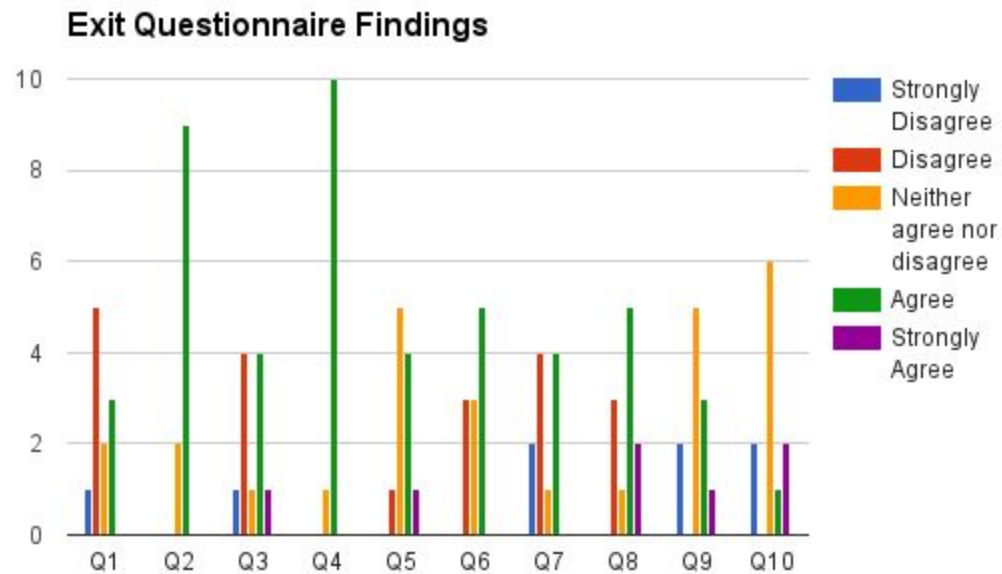
7.3)Deleting my account from the system was a simple process.

This was a unique task that we asked to remove the user from our database but also test if they had developed a quick developing familiarity with the application. The time taken for this task varied depending on the user. Most users were able to complete this task in under 20 seconds but there were some outliers overall. Despite some issues users had, most seemed to agree that the deletion process was relatively simple to do even if they took a little longer to complete it than we had initially expected.

Exit Questionnaire Findings

Questions	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1.Overall, the application was visually appealing.	0	0	1	5	3
2.Overall, the application was user friendly.	0	0	2	4	3
3.Buttons and menus were labelled well and easy to find.	0	2	3	4	0
4.All of the layouts were	0	0	3	4	2

clear and understandable .					
5. Some features of the application were hard to understand.	1	4	1	2	1
6. I understood the function of each button presented to me.	0	2	3	4	0
7. There were features of the application that were clear and easy to understand.	0	3	3	2	1
8. All of the features in the application worked as I expected them to.	1	1	4	3	0
9. The pathway displayed useful information to me.	0	4	4	1	0



Conclusion

Overall our main strengths lay within the overall aesthetic design of our website. Many participants felt that it was simple to navigate on top of being overall well made when it came to user account creation. From the exit questionnaire which acquired data from our participant's completion at the end of testing. They followed a similar trend, participants tended to have a preference for the design of the application over its raw functionality. This was to be expected as our pathway was not in a



Final Application Design and Implementation

Introduction and Purpose

The following document shall be, to some extent, a more developed version of the stage 2 progress report which detail a, mostly, high level overview of our web application. Similarly this document shall take the reader through a high level system overview of the application in it's final state. As well as more detailed and concise report of the application's various design technologies and methodologies and a brief run through of the front-end and back-end implementations with relevant UML diagrams and the agile techniques and testing done to help us reach the finalised application.

For details regarding appropriateness of design and implementation decisions please refer to our Project Evaluation document.

Scope

The primary aim of our web application(Careers Pathways) is to allow students who have recently left, or are currently attending, secondary education to develop a generated, user specific, easy to follow pathway of possible career ideas and university courses. This pathway is created using the current qualifications achieved by the user as well as their individual skillsets and occupation. We plan for this project to be fully functional, running on its own server along with a safe and secure account system for users to allow the system to be used confidently and appeal to a majority of users.

Additional features that were added to the scope of our project are the requirement for it to be responsive on a majority of internet browsers on both desktops and phones due to the target demographic for the application being young students who will be using a variety of technologies, such as phones and tablets, to access it. Another intended feature we added to the intended scope our web application was a simple, secure admin interface to allow for administrators to deal with basic users on the website and perform actions such as account deletion and password resets.



The scope of the pathways generator is limited to all the institutes in Scotland and all the courses that they offer. The qualifications that the user can enter and thus the scope of the qualifications tree is also bound to Scottish courses only, with the courses being taken from the SQA website.

This means that the user will only ever be able to see options that are within Scotland.

Technical Terms

The following table lists all of the technical terms that will be referenced within this document.

Technical terms used within this document	Names and Definitions
HTML	<i>Hyper Text Markup Language - Markup language used as the basis for the creation of web pages.</i>
CSS	<i>Cascading Style Sheets - A style sheet language used to control the formatting and structure of pages made in markup language.</i>
PHP	<i>Hypertext Preprocessor - Server-side scripting language to allow web pages to communicate with a database</i>
MySQL	<i>My Structured Query Language - A relational database management system(RDBMS) used for the creation of relational databases that can be utilised alongside web pages.</i>
Apache	<i>Web server software used for hosting websites.</i>
Javascript	<i>An essential scripting programming language for developing modern web pages.</i>
jQuery	<i>A cross-platform Javascript library used to simplify many javascript features, such as animation, event handling and Ajax.</i>
AJAX	<i>Asynchronous Javascript And XML - Used to exchange data with a server to update pages without the need of reloading.</i>
D3.js	<i>Data-Driven Documents - A javascript library for producing a variety of dynamic, interactive visualisations such as graphs, trees and charts.</i>



Bootstrap	<i>An open source front end framework used to create modern, responsive web pages.</i>
Scrum	<i>A software development framework used by our team</i>

References

As previously stated, this document will refer to previous documents that our team has submitted. Documents that are referenced include Stage One's Bid and Usability document and Stage Two's Progress Report. In particular Stage Two's Progress Report will be a main focus.



High Level Overview

This high level overview will cover the various technologies and components utilised for the finalised version of our web application. This will be similar to the high level overview from our Stage Two Progress Report. We aim to focus on how these technologies and components work in their current state and relate to the completion of the web application. Another aim of this high level overview is to display, to the reader, a general abstract review of each component used within the application. The overview will be split into two sections, one focusing on the technologies and components mainly used for the front-end design of the website and the second focusing on those used within the back-end development.

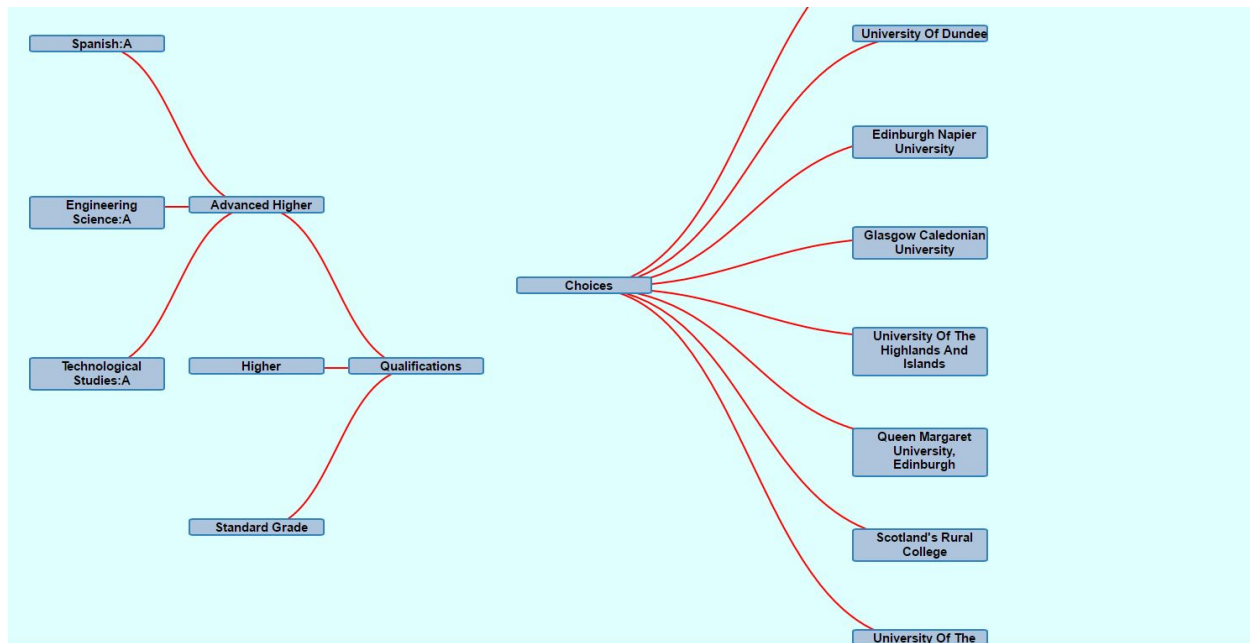
High Level Overview - Front-End

Our front end development has undergone significant changes at each stage of development. Nonetheless we kept consistent with the framework chosen for the front end. Bootstrap 3 was chosen as our front end framework. Bootstrap allows for the basis of all of our work to be natively responsive and easy to change thanks to it's built in CSS and HTML elements which allow for modern buttons, containers and interface components to be seamlessly implemented into web pages. To stray away from Bootstrap's built-in CSS design standards we were able to change these by creating our own CSS files that allow for considerable but simple to make adjustments and overhauls. This allowed our front-end developers to make quick, precise changes whenever needed throughout development.

In addition to our Bootstrap framework; the front-end follows many web design standards that allow for a number of meaningful features to be implemented into each web-page. For example, Javascript, AJAX and jQuery have been applied to their relevant web-pages to make them both fast and dynamic meaning user's utilising the web application conform to similar modern standards used on other popular websites.

Finally the visualisation and functionality of the pathway itself was mainly a collaborative effort between both the front-end and back-end developers. The pathway is a creation of the D3.js library. Here we shall focus on how the visualisation of the pathway was decided and how we added it to it's relevant web-page. To find the high level overview of the pathway's functionality please refer to the "High Level Overview - Back-End" section of this document.

An example pathway(*fig1.1*) is shown as a tree-like structure with a single root node that can be expanded into multiple branches that may, or may not, contain their own children. This design was implemented as it allowed for an easy to understand and simple to navigate pathway to be revealed to the user. The tree structure was also very simple to add to a web-page and is immediately recognisable without difficulty.



Screenshot of users Qualifications and Choice pathway

High Level Overview - Back-End

The back-end development of the web application was the highest priority within the final stages of development. With the front-end being steadily finalised within the end of stage 2 and beginning of stage 3 we put the majority of our focus onto this crucial part of the web application. This following section will detail a high level overview of the technologies used within the back-end and their overall purpose and utility within the web application.

The technologies used within the back-end include; MySQL for the creation of relational databases that are used to store user and administrator details to allow for account systems that can interact with the web application. PHP to allow web pages to interact with the database and perform user validation for increased security. Apache to host the application on a server that will overall remain stable and be able to handle a gracious amount of users. D3.js the previously mentioned data visualisation system that heavily interacts and communicates with the database to give precise information to the user.



MySQL was chosen as it played to our team's strengths. Everyone in the team was familiar with the relational database design MySQL offered and were able to understand a majority of the queries that are made within the application. This meant that among the front-end and back-end development teams there was a clear understanding of how the database worked and how it was queried, this meant it was simple for both sides of the team to implement their parts in tandem with each other. Overall the relational database management system that MySQL offers allowed for quick and structured development that prepared us for the greater challenges ahead, such as our PHP implementation.

PHP is the most substantial aspect of our web application. Almost every web page in the application refers to, or contains, some PHP coding within it. Each member of the team was also familiar with PHP meaning tasks could be attributed to both front-end and back-end developers, although majority was covered in the back-end developers of the team. The use of PHP allows for built in integration to MySQL databases, meaning it was ideal for our team. Web pages that must query the database are the most common to use PHP. Overall, PHP allows for simple queried access to the database we created and allows for dynamic features to be included within certain web pages. Some examples of PHP scripting within our web pages, include validating that a user is logged in when they attempt to access a page only a logged in user can, if they are not logged in they are automatically kicked back to the login page. Another example would be querying the database for information on the user's qualifications that are used to display our pathway.

The pathways generation uses lots of technologies to help create the end result. To start with the pathways generation uses a prepared mySQL query in PHP. The result of this query is then passed to a function that gives the JSON object that was returned from the query a hierarchy. This indented JSON or hierarchical JSON is then passed to the function that draws the tree using the d3 library. This is as far at the user qualifications tree goes however the user choices tree implements some additional complex php scripts. These scripts allow the user to refine the array returned from the initial query to the database. Once the user clicks update the additional constraints are added and the tree is updated. The initial constraint on the users choices pathway are centered around their UCAS points total. The query shouldn't return any institutes or courses that have a greater number of UCAS points than the user.

High Level Overview - System Requirements

The following section will detail the main functional and non-functional requirements that have been met by our implementation. Each requirement that has been successfully implemented shall be briefly described, coupled with a short overview of how the requirement was implemented and what it does. The use case diagram(fig.2.1) below annotates all of the



functional requirements within our web application. For a more in depth overview of all implemented requirements and any requirements that could not be implemented please refer to our Project Evaluation document.

[

USE CASE DIAGRAM

]

Account Creation

Our account creation feature remains mostly unchanged, however the process has largely been changed. Now, rather than making the user navigate through pages sequentially we have created an account wizard interface that makes all user details be entered within one web page dynamically. This allows users to create an account with even less confusion than before. This change was made to increase the accessibility of the application, which was received positively in our usability study evaluation. All details recorded are the user's first name, surname, occupation, address details, date of birth, a valid email address as well as a username and unique password chosen by the user. The password must contain at least one uppercase letter, at least one lowercase letter and at least one number. Additional data that is taken from user's at this stage is their previous, or current, employment and their qualifications. By doing this at the account creation stage rather than making users enter these details after account creation we allow for a fully functional account to be created straight away. Meaning users can access the main feature of the application, the pathway, immediately which reduces any possible confusion beforehand.

Account Management

Account management ties in with the account creation functionality stated above. The management of a user account allows for registered users to successfully edit their details with ease. Any registered user can edit their current occupation or add more. Similarly this process can also be done with qualifications. This is done simply by selecting the aptly named menu, named "Edit Info" which drops down from the "Profile" category on the site's top navbar. As expected, each account can be deleted from the database by the user, none of their details are kept if they choose to use this process. As expected, when a registered user attempts to delete their account they are given a failsafe warning that tells them that account deletion is final and cannot be reverted.

Overall this functionality reached a point that we were happy with. All data taken from users is utilised in a meaningful way within the application and significant improvements were made to



the web pages that display the user information and the web pages that ask them for the relevant information during registration.

Staff Controls

The web application completely supports Super-Administrators and regular Administrators. A regular administrator can view and maintain the website using administrator pages that can only be accessed by these accounts. These admin pages allow for super and regular administrators to maintain all users on the website, delete and reset accounts and view all data stored within the database except for sensitive details such as passwords. Passwords on the web application are all encrypted and cannot be viewed even by administrators. Password resets give the registered user a new password rather than emailing a user their current password as some websites do. This ensures a greater deal of security is put into the application, password resets are safer overall. The Super-Admin can only be taken by one user, intended to be the owner of the application. All features of the site can be performed by the Super-Admin however they can also assign other users to become administrators and strip users of administrator status.

Analytics and Data Gathering

As stated in the stage 2 progress report data is gathered from registered users on the system. Previous employment and qualifications are used for the generation of the pathway in the application but none of this data is currently used in any significant analytical way..

Pathway Generation

The pathways in this application are drawn as an SVG using the d3 javascript library. The design of the trees is customised to present the relevant info in an easy to read way with the size of the node dynamically scaling to the size of the text. The choices tree is generated by making a tree of all the institutes that the user has enough UCAS points to attend at least one of the courses from, the user can then refine the tree by ticking certain institutes and fields resulting in a smaller tree that match the new criteria.

Site Navigation

The application is able to display and function responsively on desktops, modern smartphones and tablets. It also runs on a variety of browsers, those tested being, Mozilla Firefox, Chrome, Opera, Safari, up to date Internet Explorer versions and Edge. Thanks to the Bootstrap framework used within the application we can easily create a responsive system. The main design of the web application has undergone a major overhaul, modern panels are used in

many of the pages and the creation of the account wizard show striking differences from older versions of the application. These changes were relevant to improving the user accessibility of the system as we saw necessary.

System Performance

The use of web pages that take advantage of javascript and AJAX technicalities allow for dynamic loading which reduces the number of web pages needed and reduces server load. The web application can handle a large number of users due to being hosted on an Apache HTTP server which is adequately set up to deal with high server load.

High Level Overview - Architecture

The underlying architecture of the web application is a 3-tier architecture made up of the user interactions(client or presentation tier) on the web framework(logic or application tier), the only section of the architecture the users can interact with. However these user interactions can query and alter the database, sometimes inadvertently, connecting the web framework(logic or application tier) to the database(data tier). Therefore fully developing a 3 tier architecture. Implicitly this 3 tier architecture means that independently we can change one of these tiers without directly affecting one of the other tiers to a point where it would need to be critically redesigned. For any possible future updates to the application this architecture is immensely useful. The basic overview of the 3 tier architecture within the site can be seen below(fig2.2)

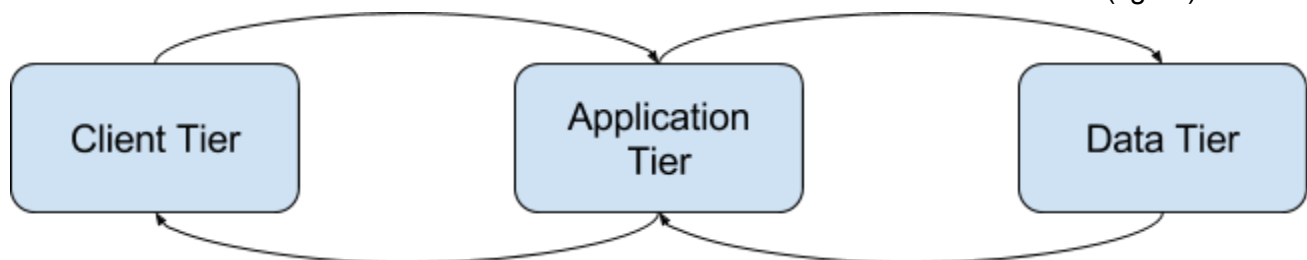


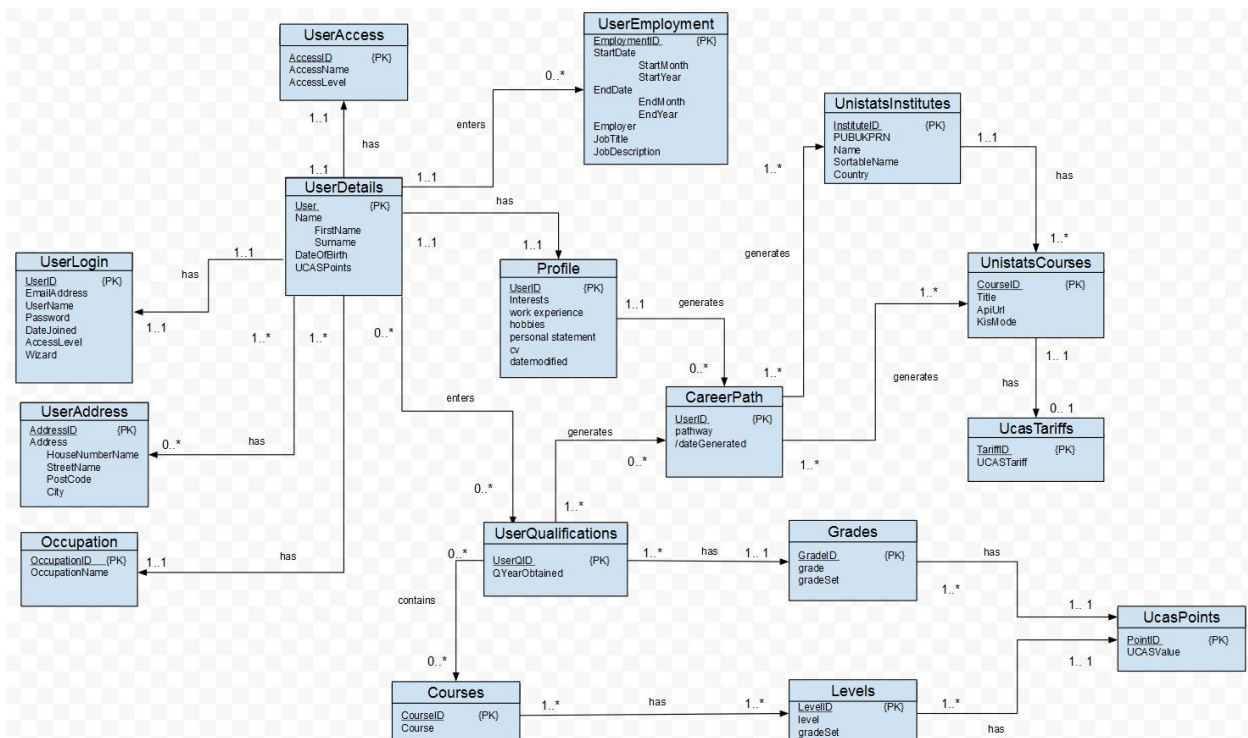
Figure 2.2

Detailed Design

The following section details a more in depth overview of the various systems and technical aspects used within the system. Aspects of the application that will be focused on at this point are, the database design, all relevant UML diagrams which give an accurate representation of various methodologies and working aspects of the application.

Database Design

Below is the entity relationship diagram of the current database that has been applied to the finalised version of the application. As efficiency was key when it came to database development we have ensured that our database is in third normal form, which means there is no needlessly duplicated data among the tables that form the complete database. Because of this we managed to achieve a database than we can query and efficiently process data that we fetch and send into it.

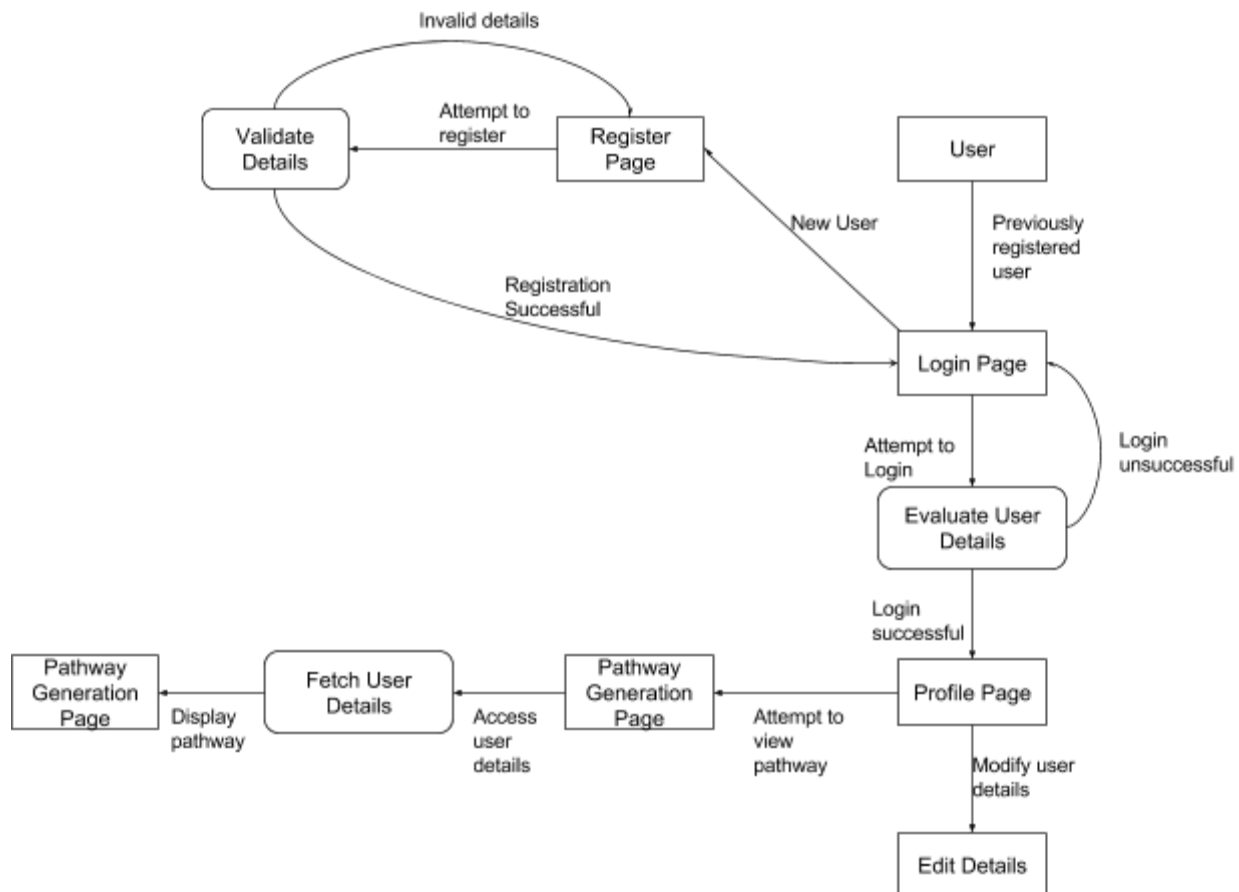


All tables within the database play an important role. However the one with the most relevance to the main features of the application are the “UserDetails”. It relates to a great number of other tables within the database. As our application relies heavily on user interaction and their details this was to be expected. Another entity within our database that plays a heavy role is the creation of the users pathway. The pathway utilises all of the courses that are stored in our database from the unistats API. the user qualifications pathway also relies on the users stored data to generate their qualifications tree.

Dataflow Diagram

Below there is a basic dataflow diagram of the application’s base features. We start at **User** which is defined as either a possible new user or an already existing registered user. If the user

is new they navigate to the **Register Page** and from there, if their input details are correct, are navigated back to the **Login Page** to successfully log into the application. On logging in their details are **Evaluated** against the stored user details contained within the database and are lead to the **Profile Page** upon a successful login. From the profile page the user can view all of their relevant details, as well as edit existing qualifications and employment details. The final feature of the application is the generation of the user's unique pathway which occurs when the relevant menu is chosen. The **Pathway Generation Page** will then fetch the user details used to create the pathway and display it to the user.



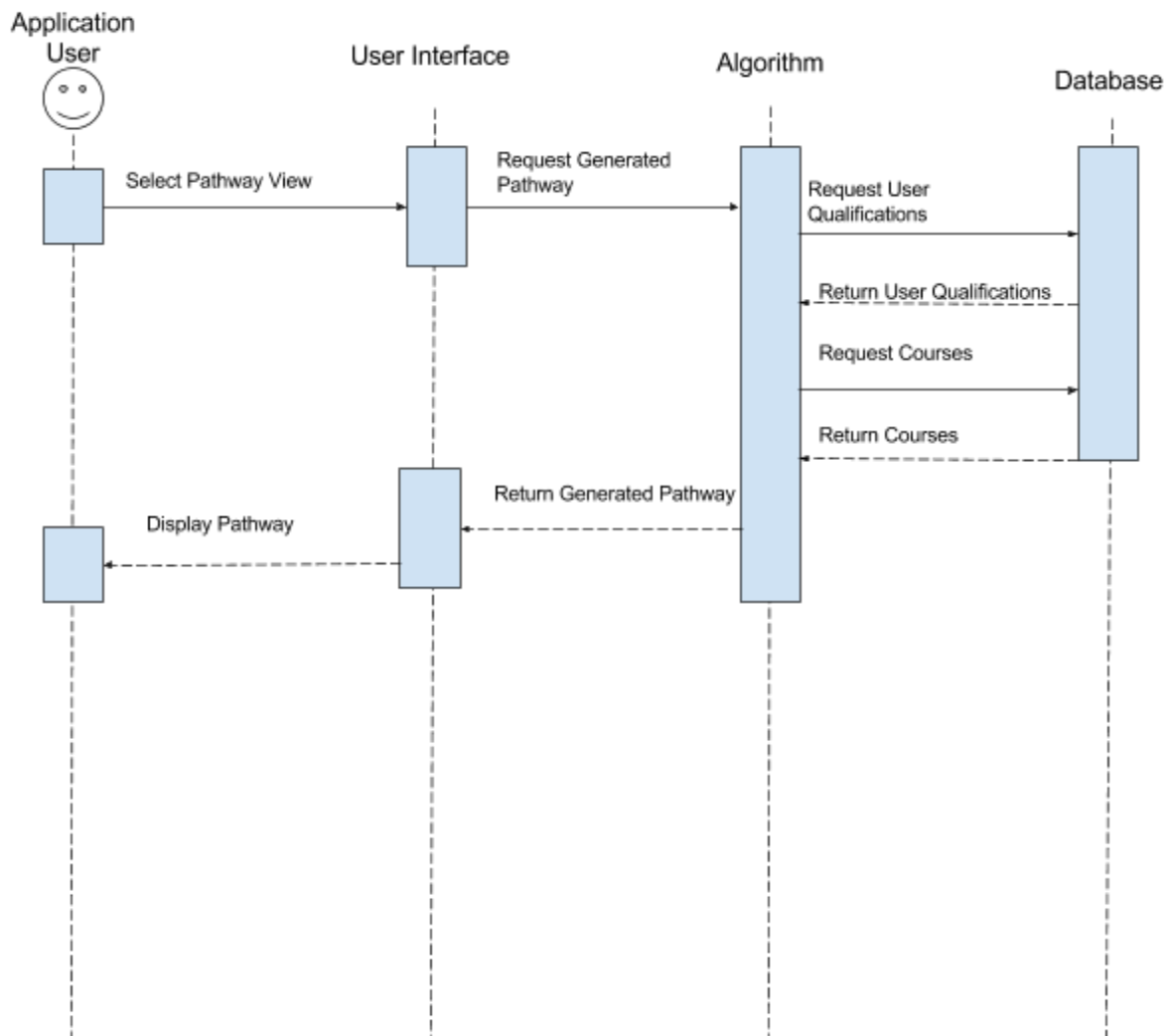
Sequence Diagrams

The processes used for pathway generation and account registration are fully detailed below in sequence diagrams. Previously, in our stage two report, we only focused on the logging in aspect of the application. The process for logging in remains identical as before. Pathway generation and account registration are the main aspects of the application. In each sequence diagram we can see the process is started by the **Application User** who is any registered, or currently registering, user on the application. The **User Interface** and the user interact with each



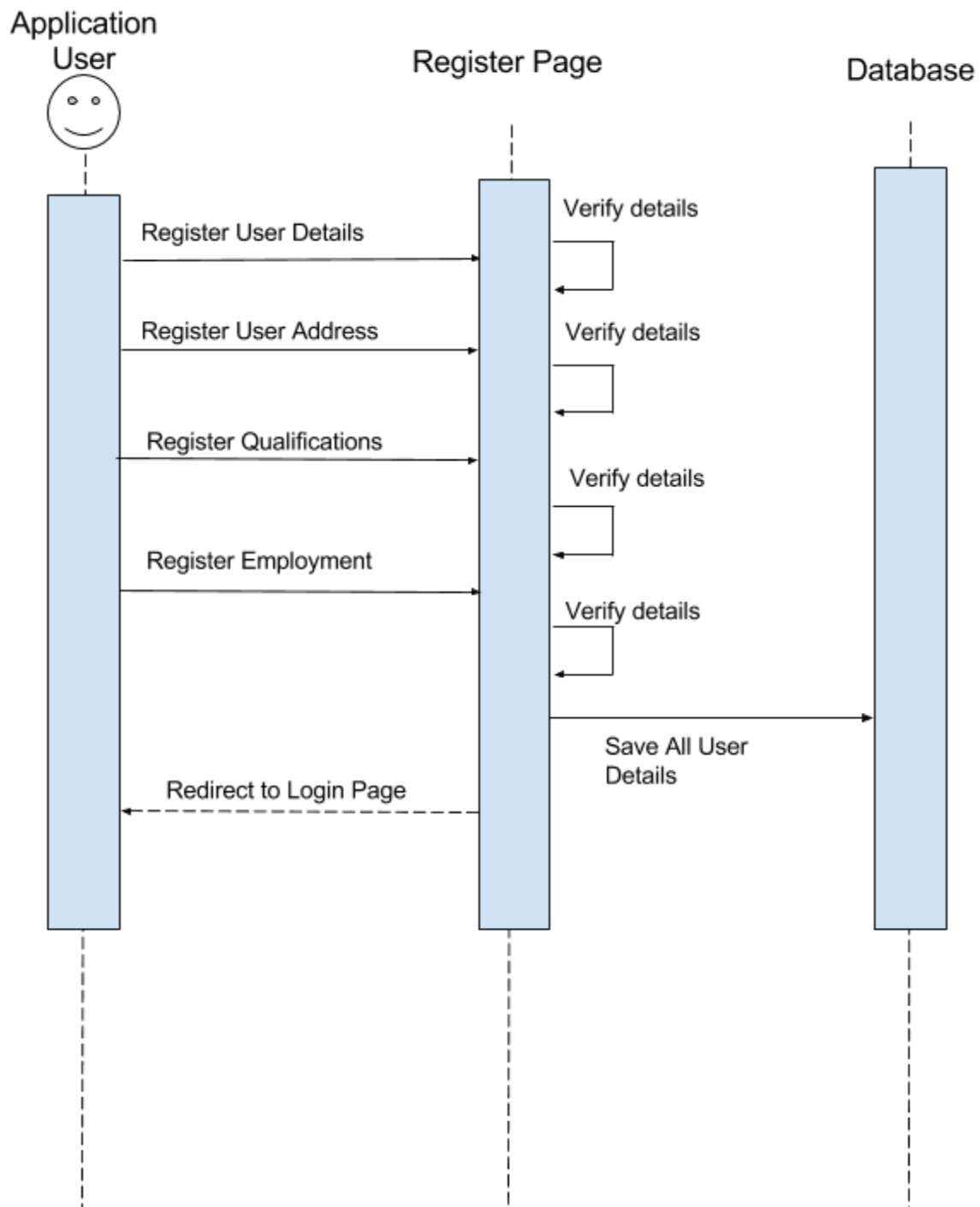
other to determine the user's actions and can either retrieve from the **database** or run **scripts** embedded within the interface.

Pathway Generation



This sequence diagram details the pathway generation process. The application user chooses to select the pathway menu on the navigation bar within the application. A built in script within the user interface runs an algorithm that queries the database for the application user's current qualifications so the application can generate a pathway of their past. The algorithm then calculates possible future courses that the user may be able to take and queries the database for all information relating to these courses. This is then displayed on a separate pathway that represents the user's possible future, this pathway connects to the past pathway.

Account Creation Wizard



The account creation wizard allows is a unique, late, addition to the web application. However it is fully functional and user friendly which is a huge benefit. The application user will register their user details, address, qualifications and employment into one web page. Each use entered



detail is verified, allowing for the user to change anything before they fully submit. The database then saves all of these details once all of the data entered by the user is fully verified.

Pathway Visualisation

The pathway utilises a converter script that fetches UCAS points data from each Scottish university through an API system. This script compares the users current UCAS points data with the UCAS points available for each course within every Scottish University. Data from these Scottish universities is kept in the database and are fetched using an API known as Unistats which contains statistical data for each university in the UK, in the current iteration of the pathway we focused on Scotland alone.

Input/Output Documents Used

Input/Output documents include JSON files for the Pathway which are loaded when the pathway is successfully run. Other I/O documents include a text file containing a list of randomly generated names which were loaded into the database and given randomly generated qualifications and careers. This allowed us to test a multitude of functionality on a variety of different possible users, simulating a realistic system.

Agile Techniques

Scrum

Since the beginning of our project we have decided to use a Scrum software development framework for the creation of the web application. Scrum involves regular meetings between the team in which we communicate and share our ideas, completed tasks and overall progress with the web application. Scrum involves a concept known as “sprints” which were also utilised by our team. Sprints are assigned to specific members of the team and are set to be complete by the time the next regular meeting comes up. In stage one our sprints were weekly, this allowed for quick development and was necessary as the project was still in its early stages and each week was crucial for our bid. In stage two we continued with our weekly meetings that focused on the development of web pages and setting up basic PHP scripts and database design. Overall this stage included our most important sprints as the progress of stage two would set the tone for our stage 3 implementation when meetings were bound to become less frequent as personal commitments were beginning to arise. The final stage of development, stage three, had our scrum meetings become biweekly allowing for more complex tasks to be completed in reasonable amounts of time. This was also done as by the time we had finished stage two there



each team member knew their specific role and what they had to do. Therefore meetings were becoming less necessary as a result.

A detailed listing of our Scrum meetings can be found in our project evaluation and the tasks completed are listed below.

Stage One	Stage Two	Stage Three
Cost Analysis	Investigate Frontend frameworks	Back End: Password Reset
Logo Design	Front End: Create initial webpages for testing	Back End: Administration Accounts
Assign Roles	Implement Database Plan	Pathway: Retrieve data from database
Risk Assessment	Front End: Discuss finalised End User Interface	Pathway: Display user data from the past
User Requirements	Investigate Pathway Design	Pathway: Parse retrieved data in correct format
System Requirements	Back End: Create Users	Pathway: Display past user data
Use Cases and Diagrams	Back End: Delete Users	Pathway: Connect with API system
Activity Diagrams	Back End: Input User Information	Front End: Create pages needed for new features
Usability Testing	Back End: Edit User Information	Back End: Creation of algorithm for the pathway
Gantt Chart Creation	Back End: Delete User	Completion of Documentation and Presentation
Completion of Documentation	Setup Encryption	-
-	Validate HTML forms	-
-	Evaluate Database Plan	-



-	Testing Login & User Creation	-
-	Completion of Progress Report	-

Testing and Technical Correctness

Test Overview

Within stage two testing was a high priority for us. All HTML documents were validated against the current HTML5 standards set by the W3C Online Markup Validator. Despite numerous changes made throughout development, all of the HTML pages created were successfully validated. Basic PHP testing was also performed throughout the creation of the web application using the PHPUnit framework which allowed for various testing dependencies to be focused on my the PHP scripts used in the application. This method of testing allowed us to determine if our PHP was completely valid and without error. The database and all queries used by PHP scripts that involved it were also tested using a “User Generation” script that was included in the Admin Dashboard. This created dummy users within the database, each with their own dummy qualifications and employment. By using this we were able to successfully test on a large numbers of users - simulating a more realistic database for the commercial implementation.

Conclusion

Overall the full functionality of the system did not meet every single standard were wanted to and not all requirements were met. These are focused on in our project evaluation report. Nonetheless we are satisfied with the system and the collaborative effort from each team member that has managed to develop a fully working web application that we are confident delivers in the main functionality our client was looking for.



Project Evaluation

Organisation

Our group originally consisted of 7 members, 6 Computer Science students and 1 Information Systems student. The group was split into groups to handle different parts of the implementation. The Information Systems student handled the marketing and business side of the project. Two members were assigned to designing and implementing the user interface, two members were in charge of creating the pathway functionality and the final student was responsible for connecting the website to the databases and implementing user account functionality.

Problems that arose in terms of organisation was the departure of one of our members part way during stage two of the project. This was quite a significant and unexpected blow to our team as we were not given any previous warning by this member and he was originally set to develop the initial pathway to be used for the finalised project. To deal with this we had to put some of the less important developments on hold and put more of our members onto the pathway development and implementation. Other issues included the serious extended departure of a member due to personal reasons during the end of stage two. This slightly affected developments during our stage two progress report and demonstration but the issue had been sorted out by the time we reached the third stage.

Online Tools

Google Drive

We used Google Drive as our primary storage location for all documentation and diagrams. Due to Drive having its own word processor and drawing application we were able to edit shared documents and diagrams simultaneously. Also, since Drive uses cloud storage, we were able to access our materials using multiple different computers.

Trello

We used Trello to assign tasks to each member. This was effective as it allowed everyone to see what task they were a part of, including the start and deadline of the task. We found this to be effective when allocating tasks as we were able to see who had already been assigned tasks so that the workload is evenly distributed. We were also able to comment on each task



which means we were able to attach notes and any points that we came across to the tasks they were appropriate to.

Github

Github allowed for stable version control of each implementation and allowed for collaborative efforts toward the project to be seamlessly implemented. Some of the team members were familiar with Github's interface and functions so we were quickly able to build a repo that connected everybody working on the application. Occasionally there were issues among members of the team that were unfamiliar with Github as it can be daunting for newcomers but overall it was a helpful tool in keeping a safe secure version of the application that anybody could work on.

Collaboration

As a group we regularly met up. Sometimes this would be a meeting to discuss problems and progress but more often the group would meet so that we could collaborate on tasks and help each other. These were where we would try and overcome any problems we were having but if we were unable to then would take the problem to the manager.

We held weekly meetings with our manager where we would discuss our progress, allowing the manager to offer his insight and help us with any problems we were having. Minutes were taken at every meeting (see Project Diary in Appendix) to ensure what was said was documented and could be referred to later on. These minutes were then stored on Google Drive which allowed anyone with permission to view them. This meant if someone had to miss a meeting for any reason they were able to view the minutes to see what was discussed. During the second stage of the project we changed our regular meeting times to bi-weekly rather than weekly. This was because by this point in the implementation we all knew our roles and tasks, less issues arose as we began implementing the simpler parts of the application. However meetings were changed back to weekly once we reached the midpoint of stage three so we could continue troubleshooting ideas and sharing more strenuous tasks along with guidance from our group manager.

Facebook Messenger

We decided to use Facebook Messenger as our primary method of communication as every member of the group was a member of Facebook. Facebook allows group chat with built in file sharing which meant we were able to communicate and share work effectively while on a



computer or through mobile platforms. A group chat was necessary to ensure that we were all kept up to date with meeting times and alerts from the chat ensured it was unlikely for someone not to see the message.

Implementation

Scrum

Scrum was the agile method chosen for our group. Scrum enabled us to make weekly meetings with our Scrum team - which consisted of the entirety of the team and our group manager. These meetings consisted of sharing information and taking tasks to contribute to the development of the application. Sprints involved within the Scrum structure were uploaded to Trello to allow for the entire group to view what tasks were being done and when they were due. Because of this Trello acted as our scrum task board for displaying each sprint and kept a sprint backlog to allow for manageable and plannable completion of tasks.

Schedule

The Project Plan (see project plan in appendix) shows our estimations of how long each task should take; taken at the start of the project. We used Sprints to outline the rate of progress that we wished to follow. The tasks were allocated loosely in the sprints. We felt it best to have a continuous workrate which meant when we finished a task, we would immediately start the next which meant sprints became out of sync with our workrate. We found our estimations to be off in a few areas and tasks were being completed faster than expected and some slower. The tasks balanced themselves out and we were always able to finish in time for the deadlines.

Languages and tools

Our team members with the most confidence in HTML and CSS coding began work on the front end of the implementation. We decided to use the Bootstrap frontend web framework to develop base templates to be used for all future websites. All of the team was fairly new to Bootstrap's functionality but due to its implicit simplicity there was only a small learning curve involved. While we initially intended to use CakePHP as a framework, all of the backend team members were more comfortable coding and testing all PHP scripts themselves as they considered themselves to be very knowledgeable on the language and did not want to commit time to learning a new framework. Additionally MySQL was chosen as a



database system to store all of the relevant database information on. This was chosen because we had covered MySQL before and every member in the team was confident with querying the database and recognising database standards. It was exceedingly important that all team members were familiar with MySQL to some degree as the database is the main backbone of the application's functionality.

Most web pages contained embedded javascript and jQuery functionality. Some of these were built in Bootstrap features but others included popup menus and user validation. One major issue that our group ran into was late into the project. As some members were relatively unfamiliar with Github's interface and functionality there was a lapse in judgement by a member of our team which resulted in a significant amount of work to be lost or altered to a state where it was of a much poorer standard than we originally planned. This set our group back quite considerably and a lot of time was spent on fixing previously working functionality rather than finalising the project. However we were able to mitigate these issues eventually and work towards the finalisation of the project.



Product

Functional Requirements

Below is a list of the functional requirements, both user and system, showing whether they have been completed or not.

Requirement	Description	Complete
Account Creation		
F-UR-01	Users must be able to create an account	✓
F-UR-01.1	Users must be able to create their personal profile	✓
F-UR-01.2	Users must be able to enter their school qualifications	✓
F-UR-01.3	Users must be able to enter their skills	
Account Management		
F-UR-02	Users must be able to edit their account details	✓
F-UR-03	Users must be able to delete their account	✓
F-UR-04	Users must be able to grant permissions to support users	
F-UR-05	Users should be able to opt in to receive emails from educators and employers	
Roadmap Interaction		
F-UR-06	Users must be presented with roadmap	✓
F-UR-07	Users must be able to navigate roadmap	✓
F-UR-08	Users must be able to filter job information	
F-UR-09	Users must be able to see what qualifications are required to follow a certain pathway	✓
Support Users		
F-UR-10	Support users must be given limited access to user pages	
F-UR-11	Support users must be able to create accounts on behalf of primary users	



Staff Controls		
F-UR-12	Super-admins should have full access to the website	✓
F-UR-13	Administrators must be able to view and maintain the website	✓
F-UR-14	Administrators must be able to manage all accounts on the system	✓
F-UR-15	Housekeeping staff must be able to update career paths	
Social Media		
F-UR-16	Users must be able to login using social media platforms	
F-UR-17	Users must be able to share their roadmaps on social media	
Inter-User Communication		
F-UR-18	Users must be able to contact other users at the same point in their roadmap	
F-UR-19	Educators and Employers must be able to contact users at any point on the roadmap	
Account Verification		
F-SR-01	User accounts shall be verified by email	
F-SR-02	User accounts subject to basic verification	✓
F-SR-03	User account details must be data sanitised	✓
F-SR-04	System should accept foreign qualifications	
Roadmap Presentation		
F-SR-05	Roadmap must show past qualifications behind user	✓
F-SR-06	Roadmap must show future qualifications ahead of user	✓
F-SR-07	Roadmap must show goals ahead of user	✓
F-SR-08	Roadmap must show pathway costs	
F-SR-09	Roadmap must show multiple pathways when applicable	✓
F-SR-10	Roadmap must highlight changes since last visit	
Analytics and Data Gathering		
F-SR-11	System must collect analytical data from users	✓



F-SR-12	System must collect the number of users registered on system	✓
F-SR-13	System must collect data on popular pathways used by users	
Social Media Functionality		
F-SR-14	System shall allow social media integration	
F-SR-15	System shall provide user forums for discussion	

We were able to achieve 51% of our functional requirements. While this seems like a poor result, the majority of the requirements that were not achieved were not critical to the overall application and looking back seemed quite overzealous. The requirements were created at the start of the project and when we had time to reflect on them at a later stage, we agreed that the account requirements and the pathway requirements were the most important and should be prioritised above the rest. We achieved 72% of these requirements which we considered a success. We decided not to include social media functionality in the initial release because it was not vital to the completeness of the application as mentioned by the client. Similarly, the same was decided for inter user and company to user communication as these features were decided to be low on the priorities list. These features would be useful if we were trying to include a social element to the application but for now that is not the direction we want to take the Careers Pathfinder in.

Additional Features

Additional features that were implemented into the application were our registration wizard which is a dynamic web page that guides the user through a multitude of required user details. Originally, at our stage two implementation stage, our registration process required the user to go through sequential web pages each with their own HTML and CSS files. While this was adequate enough for users to make accounts, it was not very efficient in terms of page loading. By dynamically containing all required user details into one web page we cut down the amount of pages we need to build and the number of pages a user needs to navigate through. By containing all registration into one page users can get started quicker, as highlighted in our usability study.

Previous, or current, employment can be taken in by the web application. By doing this we can take in each occupation as a keyword and use these to select unique courses from our database to be displayed on the generated pathway.



Robustness

The system has gone through continual testing to ensure it is both reliable and robust. We tested our website for robustness by entering both valid and invalid data. We were able to prove that the website can handle all invalid data by rejecting it and requesting valid data be entered. These validation checks were implemented on all fields requiring user input on the login, registration and editing pages.

Summary of Usability

Our usability study highlighted the strengths and weaknesses of our team. From the results we gathered we learned that our design and aesthetic appeal were both very strong aspects of our application but further functionality on the pathway was something that we struggled with and did not achieve to a considerable standard where a user would have found it useful or fitting to the theme and design of the application.

What makes our Product special

We decided, from the start, that it was especially important to have a product that was secure and safe for the users especially since the majority of them will be minors. We allowed a large amount of our implementation time to focus on security and validation to ensure our website and the user's personal information was secure.

For a website in the modern world it is important that a website is both responsive and simple to use. To this end we made sure there was never too much of anything on a single page and if an action prompt was on the screen it was visually obvious that it would do a task and what the task was.



Evaluation Appendix of Supporting Documentation

Project Diary

28/09/2015

Achieved Since Last Meeting:

First Meeting

Discussed During Meeting:

Scope Potential for Project

Localisation of Data

Grades, Apprenticeships, Internships

Free Data Sources

datahub.io, opendata.gov

To Do List:

Create Bad Apple Logo

Create Company Website

Gather Job Information from discussed sites

Determine Scope

Decide on Methodology

Prioritise Use Cases

Set up GitHub Repository

7/10/2015

Achieved Since Last Meeting:

Decided on scope of project

Focus on Scottish jobs and qualifications in initial prototype

Discussed During Meeting:

Support Roles

Can support roles create accounts on behalf of students?

Do teachers and parents use the same support template?



- Support roles granted different permissions by users
- User requirements
- Create user stories first and then list requirements based on those
- User requirements offer different perspectives
- System requirements satisfy all users at the same time
- User requirements are what you wish; System requirements are what it must do
- User requirements are not non-functional requirements

To Do List:

- Create main document
- Create template to populate with data as project progresses
- Prioritise User Requirements
- Create Balsamiq mockup
- Cost analysis
- Risk Assessment

21/10/2015

Achieved Since Last Meeting:

- Finished Use Case diagram
- Created main document
- Prioritised user requirements
- Created Balsamiq mockup
- Cost analysis
- Risk assessment

Discussed During Meeting:

- Usability testing
 - Helen has sample ethics forms
 - Talk to Helen to ensure our questions are suitable
- Preferred people for usability testing
 - Computer Science students not ideal as have a high level of computer knowledge and generally pretty poor at recognising good design
 - Have access to Psychology students
 - Flatmates
 - Tell subjects “they don’t need to enter real details”
- Users
 - Maintain a level of abstraction in admin/user relations
 - Data not an actor
- Software
 - Use SQL for backend (e.g. LAMP!)
 - Try to use free open source code



Consider making donations
Stick to what we know, don't try to learn new languages and software
Investigate helper technologies and frameworks

To Do List:

Usability test is critical
Polish other documents
Start looking at the next step in the project after week 8

28/10/2015

Achieved Since Last Meeting:

Usability testing has almost been completed

Discussed During Meeting:

Usability testing should be focused on
Consider adding Office 365 to cost plan

To Do List:

Usability Testing
Gantt Chart
Main Document corrections
 Fix aims & objectives from plural
 Remove references to Heriot Watt
 Check whether limitations are actually limitations
 Intended user has access to internet
 Remove constraints and capabilities
Add Trello as a risk avoidance measure
Right align numbers in cost analysis
Give UML diagram system name

4/11/2015

Achieved Since Last Meeting:

Discussed During Meeting:

Final Document Appearance
Test Subject suitability
 Age of subjects may be a problem
 All subjects students
 Potential bias and other problems
Make sure to include problems with our testing
 Problems with scale
Future testing with prototype
Average Results and Include

To Do List:



11/11/2015

Achieved Since Last Meeting:

Stage 1 Document Submitted

Discussed During Meeting:

Submission Quality

Gantt Chart used inconsistent time scale

Cost Analysis too vague

Too many sprints

What are the main challenges facing us in Stage 2?

Visualising Pathways

Read qualifications of user and get appropriate data

How interactive will our roadmaps be?

How is our team split up?

One sub-team needs to focus on data visualisation for rest of stage. Another needs to focus on EUI & Backend.

Less Sprints

Ability to create accounts

Ability to add qualifications

Ability to generate pathways

How do we want to visualise a user's journey so far?

Timeline?

D3.js

Google visualiser

Meetings fortnightly from now on

To Do List:

Look at the info available on vision

Begin work on Stage 2

27/01/16

Achieved Since Last Meeting:

Front End almost complete, fully responsive

**Discussed During Meeting:**

Whether there should be a distinction between actual grades and predicted grades

Demo

What functionality can be shown

what will be implemented

user evaluation should be done by week 10

To Do List:

Progress Report

Arrange Next Meeting

Plan Demo

Create new master branch

24/02/16**Achieved Since Last Meeting:**

Users can now edit employment

Delete account function fixed

Discussed During Meeting:

Register page should either be infinite scroll or three separate pages

To Do List:

Pathway function

Website aesthetics

Host website on server

15/03/16**Achieved Since Last Meeting:**

Qualifications and careers more editable

Admin page CSS

Added admin functionality

Discussed During Meeting:

Error 403 keeps occurring

Presentation - show all functionality in an effective way

Usability - if testing on multiple platforms use a larger test group

Needs to work well on mobile as market predominantly mobile

Demo needs a presentation then go onto demo. Use zoom on projector

To Do List:

Finish making qualifications editable

Polishing the website

Get data into the Pathway



Finish CSS
Start usability
Discuss use of a location feature
DEMO: 9:15am room G44

23/03/16

Achieved Since Last Meeting:

Pathway can display with dummy data
Admins can now delete users

Discussed During Meeting:

Change update table button on admin page to restore backup
Smart dress for demo
Everyone must talk during the demo
Demo should be high level quick intro per person not all at the start
Admin page should be mentioned but not too much

To Do List:

Finish Application
Prepare Demo
Report
Evaluation

Original Project Plan

The days are based on a working week, only working week days and weekends off. Group members were allowed a christmas holiday from the 23rd of December to the 1st of January.

<u>Task</u>	<u>Duration (days)</u>	<u>Start</u>	<u>Finish</u>
<u>Stage 1</u>	33	17/09/15	06/11/15
Requirements Specification	2	17/09/15	21/09/15
Risk Analysis	1	21/09/15	22/09/15
Project Plan	2	22/09/15	24/09/15



Project Costing	1	24/09/15	25/09/15
Diagrams	4	01/10/15	6/10/15
Mock ups and Usability	8	06/10/15	16/10/15
Final Document	15	16/10/15	06/11/15
<u>Stage 2</u>	51	09/11/15	29/01/16
Database planning	5	09/11/15	16/11/15
Website mockup	6	09/11/15	17/11/15
Pathway Planning	15	16/11/15	07/12/15
Database Creation	10	16/11/15	30/11/15
Interface Creation	10	17/11/15	01/12/15
User registration and login	10	1/12/15	15/12/15
Validation and Encryption	10	15/12/15	08/01/15
Xmas Holiday	8	23/12/15	01/01/16
Take in and display user information	10	08/01/16	22/01/16
Final document	5	22/01/16	29/01/16
<u>Stage 3</u>	44	01/02/16	01/04/16
Pathway functionality	20	01/02/16	29/02/16
User profiles	20	01/02/16	29/02/16
Marketing Strategy	15	01/02/16	22/02/16
Display Pathway	10	29/02/16	14/03/16
Admin functions and page	10	29/02/16	14/03/16



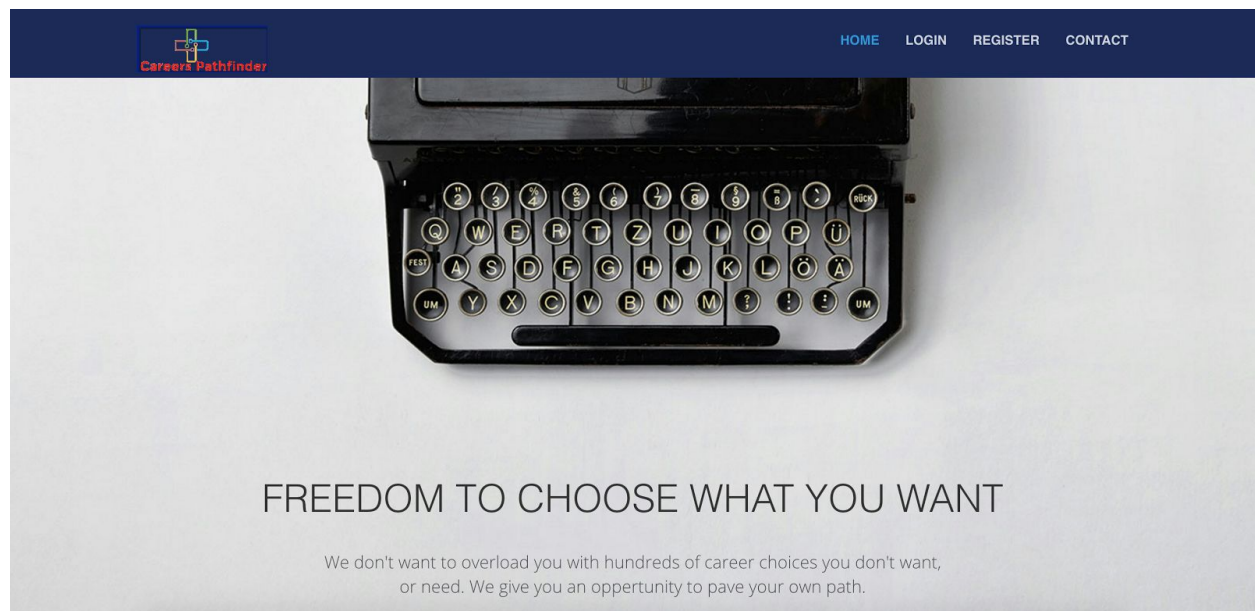
System Testing	5	14/03/16	21/03/16
Usability Study	5	21/03/16	28/03/16
Final Documentation	4	28/03/16	01/04/16

Guides

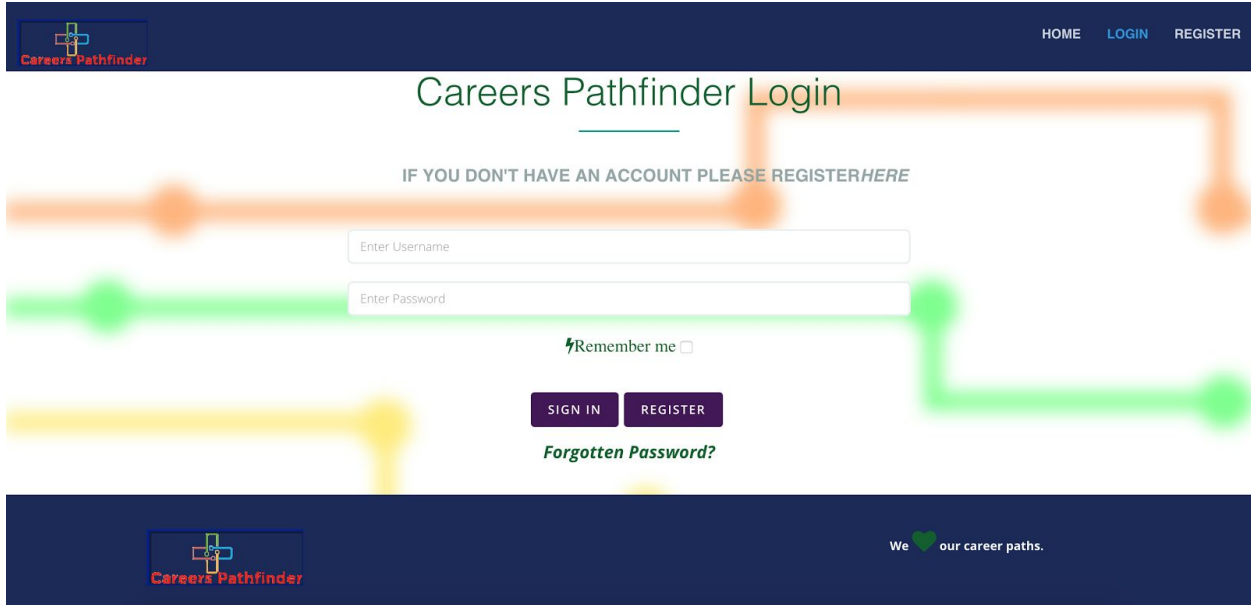
User Guide

The System is intended for 2 different user groups: General User, Administration. Everything a user of the system will need to know is in this document. This guide includes an overview and screenshots which enable a new user to see quickly what sort of thing they can do and what the screens will look like.

[1] As a General User you will first be welcomed by Careers Pathfinders' home page:

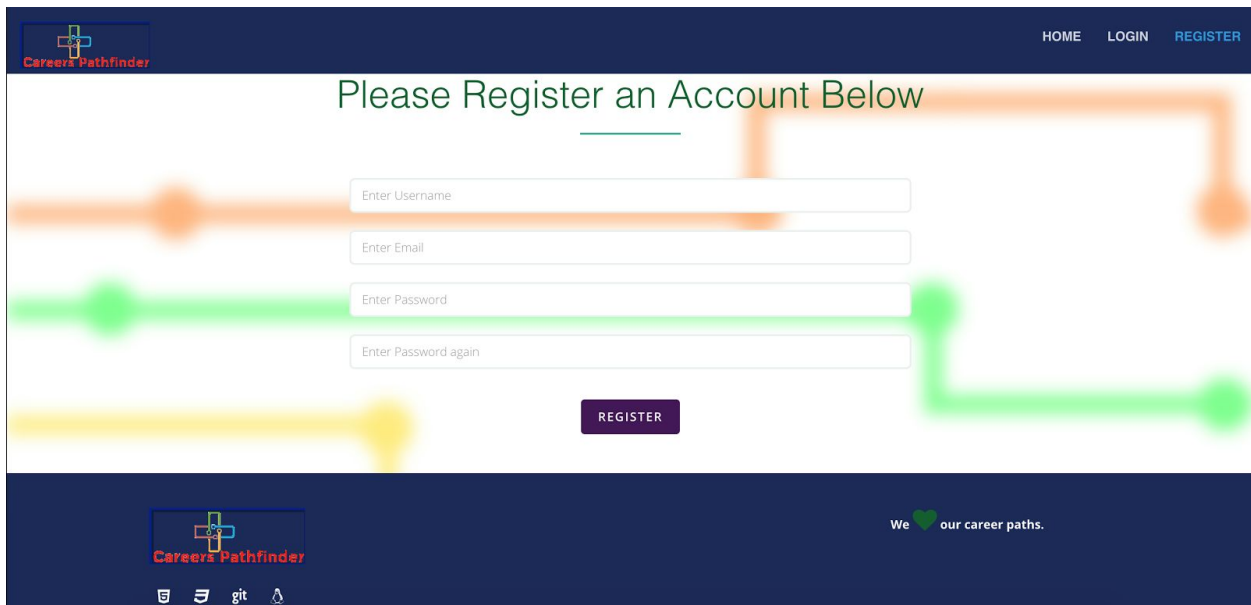


[2] The User should then choose to Login or Register an account; When Login is selected it should automatically log you in if you have cookies enabled otherwise enter Login details.



The screenshot shows the 'Careers Pathfinder Login' page. At the top, there is a dark blue header with the 'Careers Pathfinder' logo on the left and navigation links 'HOME', 'LOGIN', and 'REGISTER' on the right. The main heading is 'Careers Pathfinder Login' in green. Below it, a link says 'IF YOU DON'T HAVE AN ACCOUNT PLEASE REGISTER HERE'. The login form includes two input fields: 'Enter Username' and 'Enter Password'. There is a 'Remember me' checkbox with a lightning bolt icon. Below the fields are two buttons: 'SIGN IN' and 'REGISTER'. A link for 'Forgotten Password?' is also present. The footer features the 'Careers Pathfinder' logo and the text 'We ❤️ our career paths.'

[3] The other option is you can Register an account by entering your: Email, Username and a desired Password. The Password must be entered a second time for validation.



The screenshot shows the 'Please Register an Account Below' page. It has the same dark blue header with the 'Careers Pathfinder' logo and navigation links 'HOME', 'LOGIN', and 'REGISTER'. The main heading is 'Please Register an Account Below' in green. The registration form includes four input fields: 'Enter Username', 'Enter Email', 'Enter Password', and 'Enter Password again'. A 'REGISTER' button is located below the fields. The footer features the 'Careers Pathfinder' logo, the text 'We ❤️ our career paths.', and social media icons for GitHub, Facebook, and Git.



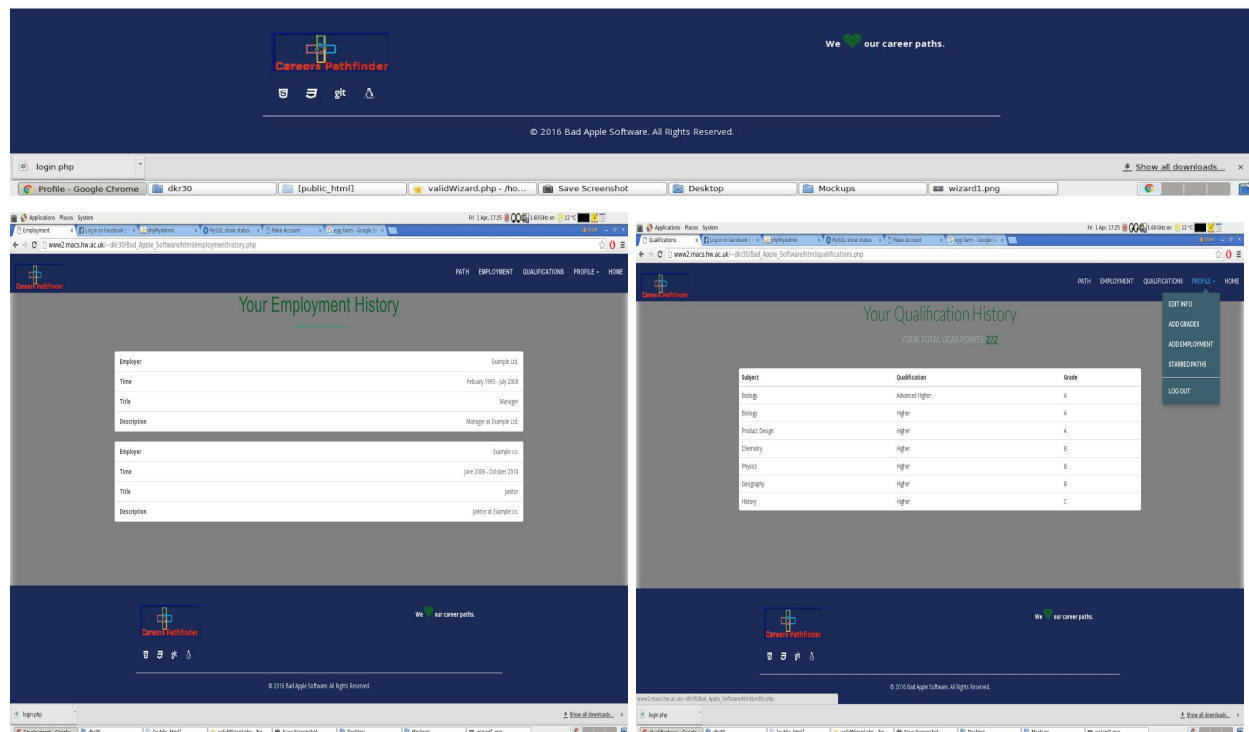
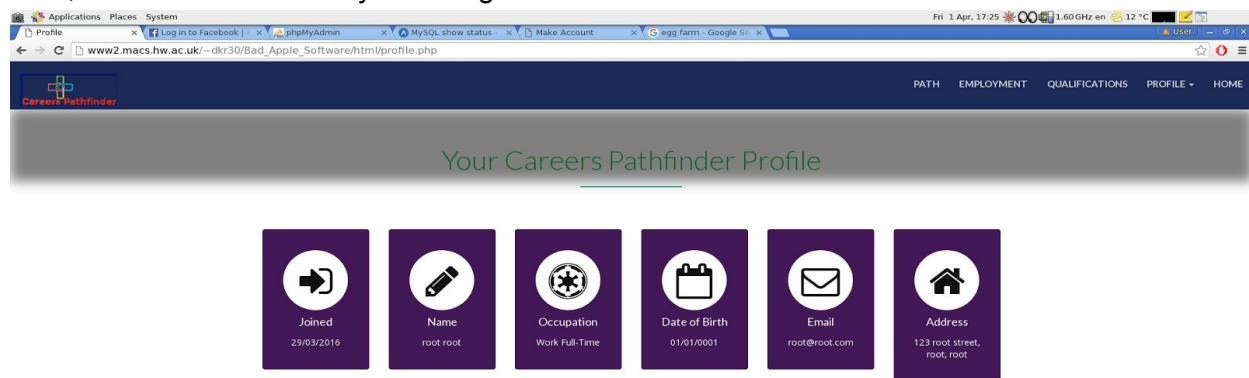
[4] After successfully Logging in, the user is taken to the Profile page. Because user is signed in more options are shown on the navbar. New Options are: Path, Qualifications, Employment and Profile.

Clicking Path will take you to your current Pathway (this will be induced from all of your details to date).

Clicking Qualifications will take you to your current Qualifications page. Qualifications will be presented with UCAS points respectively.

Clicking Employment will take you to your current Employment history.

The Last option of Profile is a dropdown menu, which allows your to Edit Info, Add Grades, Add Jobs, View Starred Pathways and Sign Out.





[5] If the User takes the latter path of registration, They will then be presented by the Account Creation Wizard. This page is designed to receive more account information from the user. Such as the user's first name last name and date of birth. Next is clicked to continue.

[6] Next the user should include their current address including city and postcode. As this is a 4-part creation wizard User is required to continue and press next to obtain a completed profile for careers pathfinders.



[7] Next step is the User enter his/her qualifications obtained. This can be from a variety of levels. Standard Grades to Advanced Highers and everything inbetween. Click on add grade to add to your file. A grade can be added as many times as needed.

The screenshot shows a web browser window with the URL www2.macs.hw.ac.uk/~dkr30/Bad_Apple_Software/html/makeaccount.html. The page is titled "Please Provide Further Details" and has a sub-header "ACCURATE DATA GIVES RELIABLE RESULTS". There are four tabs: "Detail", "Address", "Qualifications" (selected), and "Employment". The "Qualifications" tab contains the following fields: "Course Name *" (with a dropdown menu), "Select Course" (text input), "Select Level" (text input), "Select Grade" (text input), and "ADD GRADE" (button). A "NEXT" button is located at the bottom right of the form area. The footer of the page includes the "Careers Pathfinder" logo and the text "We love our career paths."

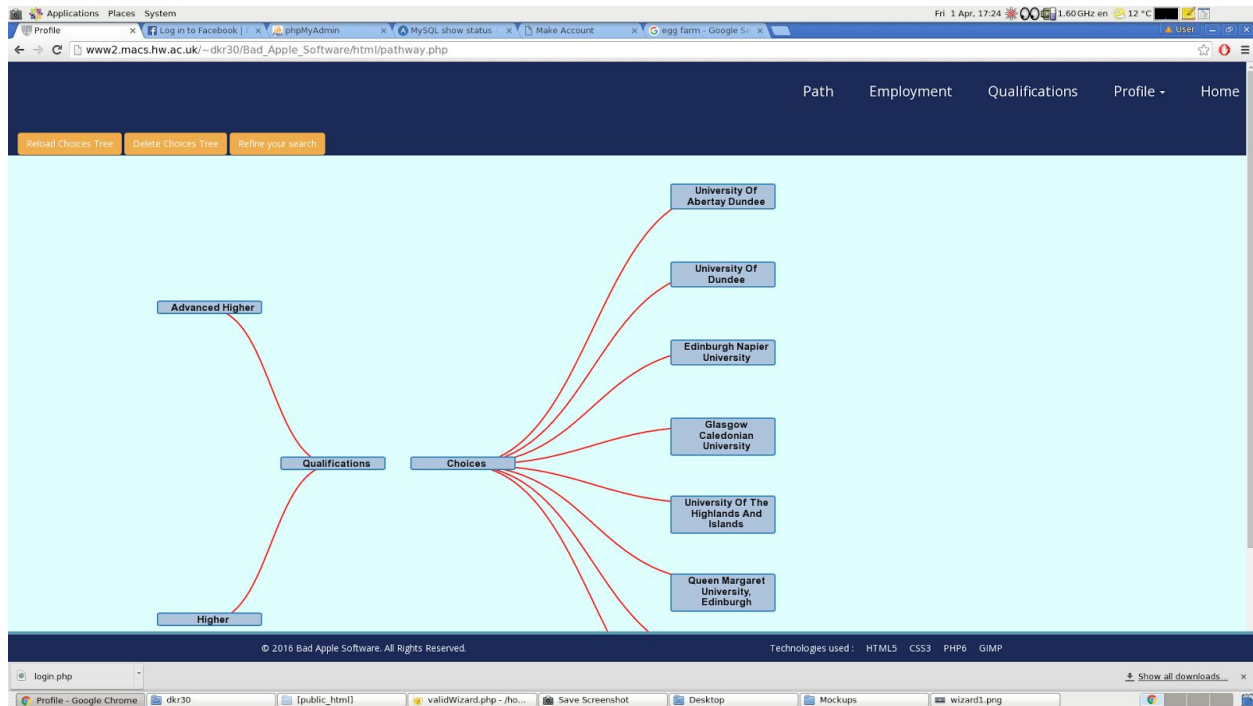
[8] The User is now on the final part of Account creation wizard. Enter user's Employment history. Any job the user has had in the past may be entered. As many jobs can be added as necessary.

The screenshot shows the same web browser window as before, but the "Employment" tab is selected. The "Employment" tab contains the following fields: "Employer" (text input), "Job Title" (text input), "Select Month" (dropdown menu), "Select Year" (text input), "Select Month" (dropdown menu), "Select Year" (text input), and "Job Description" (text area). There are two buttons at the bottom: "ADD ANOTHER JOB" and "CLEAR JOB FORM". The footer of the page includes the "Careers Pathfinder" logo and the text "We love our career paths."



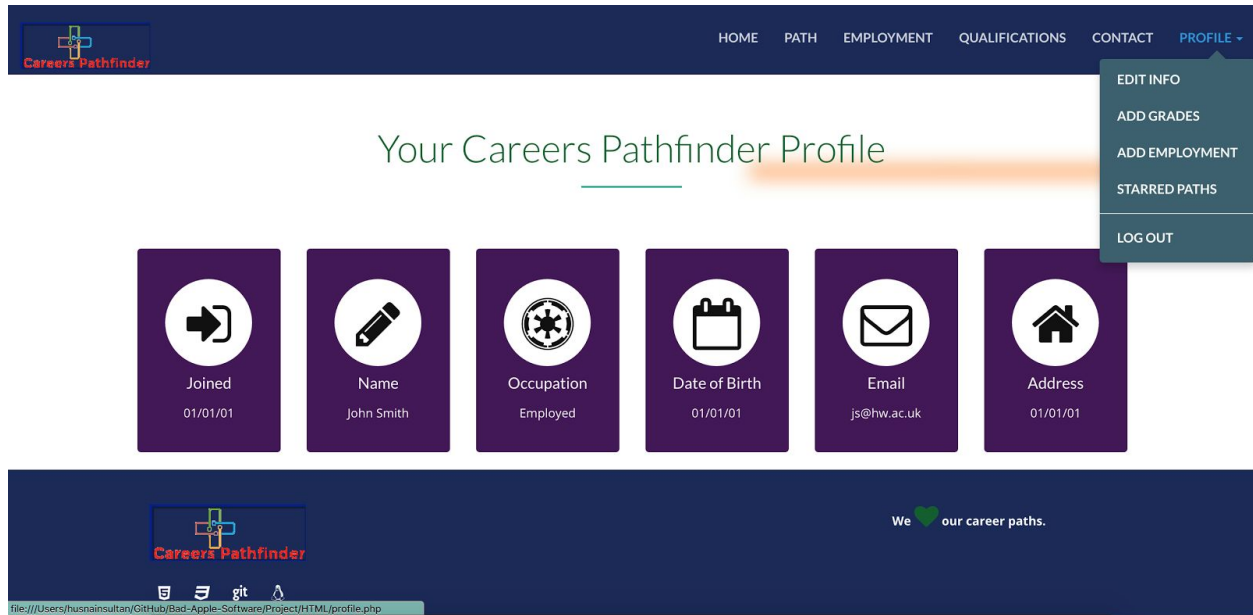
[9] After these 4 steps of account creation the user should be redirected to the Profile page (refer to Figure [4] above).

[10] User can now go straight to generating some pathways for future career routes. The boxes with names of university are possible places that you could go to. Clicking on said boxes will allow them to expand further opening new opportunities.. All content is generated being biased on your academic and employment information.

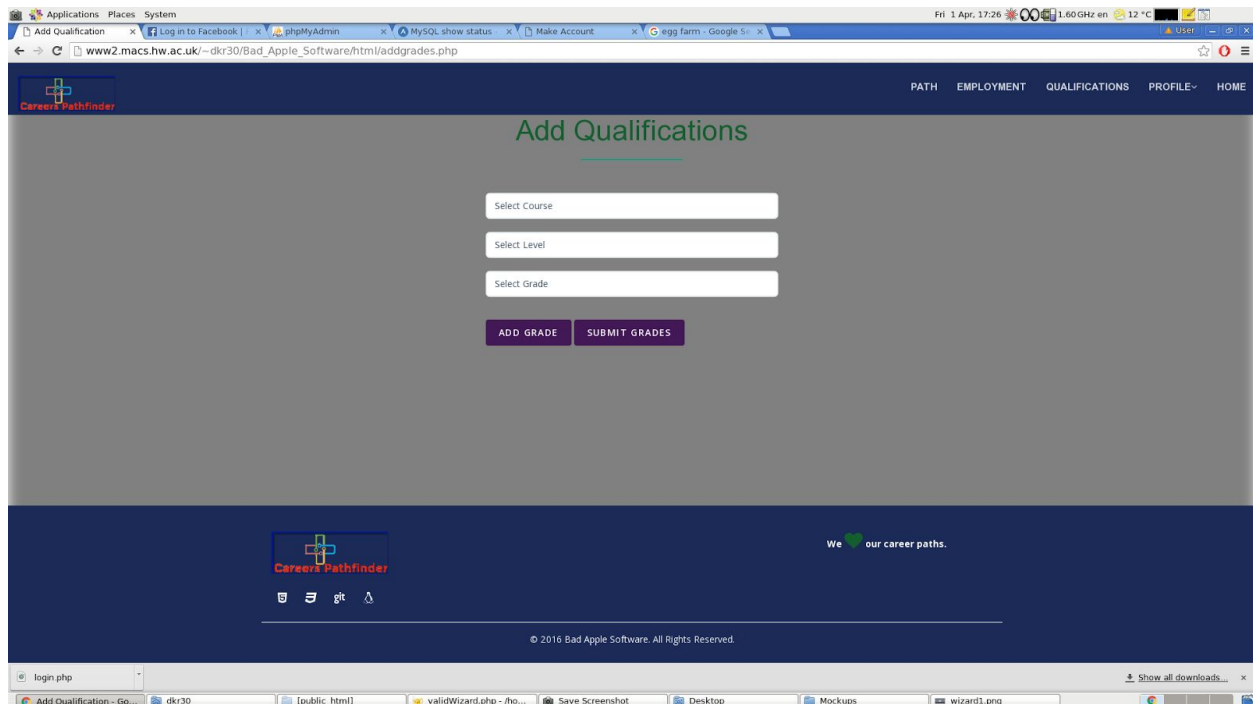




[11] If you want to add more information about yourself you can click the Profile Tab which drops down. You can Edit your current system held information or Add more. Such as Academic and Employment information.



[12] Clicking Add Grades will take user to the following page, where you can add more of your qualifications.





[13] Clicking Add Employment will take user to the following page, where you can add more of your previous employment situations. User is free to add as many jobs as one desires.

[14] If all else fails the user is legally allowed to delete own account by pressing the delete button on the right of page Clearly labeled 'Delete'. Once clicked the button will confirm the deletion of your account.

Joined	Name	Occupation	Date of Birth	Email	Address
25/03/2016	root root	Work Full-Time	01/01/0001	root@root.com	123 root street, root, root

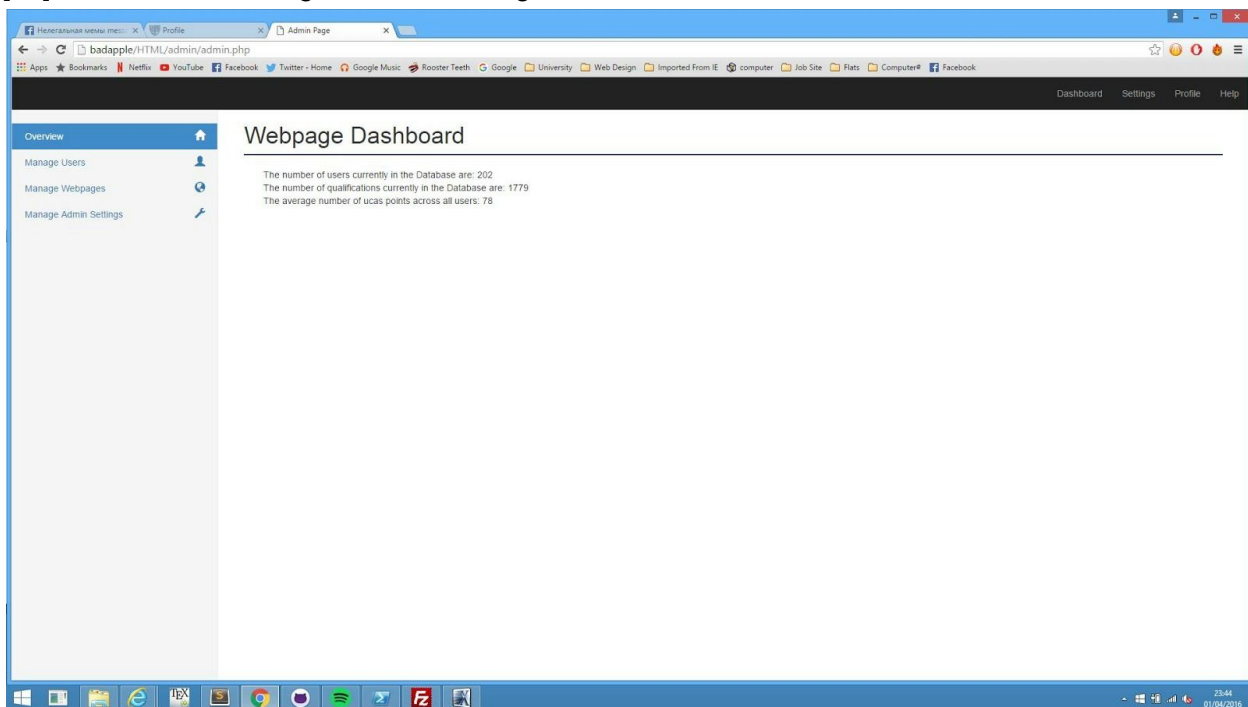


Operations and Maintenance Guide

Initially, how is the system installed and configured? Are there special procedures needed to set up initial data, users and access rights?

Once it is running, what are the routine operations performed by the IT staff as opposed to other users. These operations could include adding new users, backup, recovery and periodic archiving.

[15] When an Admin logs in the following screen is shown:



A Webpage Dashboard, it indicates how many users are in the database and the number of qualifications currently in the database. Simple.



[16] Admins also get to manage the users in the database. Admins have the privilege of searching through the database:

Administrator Dashboard

Search: jac Number of users: 4

User ID	Username	Firstname	Lastname	Email	Join On
50	Carmen9721	Carmen	Jacey	Carmen9721@sivics.co.uk	2016-04-01
2	Emilio6769	Jack	Seaton	Emilio6769@ovkucg.co.uk	2016-04-01
4	Pranav3490	Jack	Webster	Pranav3490@eichol.co.uk	2016-04-01
174	Jacob7157	Jacob	Macle	Jacob7157@pplety.co.uk	2016-04-01

Searching can be done name also.



[17] Admin can also delete or edit user profiles within the database :

The screenshot shows a web browser window with the address bar displaying `badapple/HTML/admin/userinfo.php?userid=4`. The page title is "User Control Panel". On the left, there is a sidebar menu with options: Overview, Manage Users (selected), Manage Webpages, and Manage Admin Settings. The main content area displays the following user information:

User ID	4
Username	Pranav3490
Firstname	Jack
Surname	Webster
Email	Pranav3490@ekhoi.co.uk
User Access	user
Joined	2016-04-01

Below the table, there are three buttons: "Reset Password" (blue), "Delete Account" (orange), and "Make Admin" (orange). The browser's taskbar at the bottom shows various application icons and the system clock indicating 23:45 on 01/04/2016.

Can also change privileges of other users to make them Admin.



[18] Admins have the ability to alter the DB on the system by either deleting or editing. They can also update course tables, so if one University had new courses they would be uploaded accordingly.

