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March 2008

Design and Development of a Video Upload/Viewing Website for University Students to share videos on student life.

URL: http://cms-stu-iis.gre.ac.uk/uj504/gradvideo/index.php

User Login – Username: jamesu2002 Password: chelsea

Admin Login – Username: admin Password: password

Word count: **15,988**

Product and Development files:

1. Uploaded as a zip file

ABSTRACT

Video sharing websites have become increasingly popular in recent years and has become an accepted part of the Internet community. Vast amounts of money have been invested in these websites and high profile takeovers have shown that video sharing websites are big business. Yet these websites only exist because of the recent technological advances and the increase of Internet download speeds. However, with all the numerous services available, there is a lack of video sharing websites that are dedicated to students. This report aims to detail the development a video sharing website specifically for students. The report will encompass research and requirements analysis to better understand what is needed by a video sharing website. A completed website that has the functionality of a video sharing website was then produced.

ACKNOWLEDGEMENTS

Below is a message of thanks to the following people:

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1 INTRODUCTION

1.1 Background Information

It has become increasingly popular in recent years for people to share their social life with millions of other people on the Internet (Alexa.com, 2008). Social Networking and Video Sharing websites have allowed people to express, create and communicate all of their inner most thoughts.

Video Sharing websites in particular have constantly been in the news. Back in 2006 YouTube hit the headlines when the large Internet search engine Google bought $1.65bn (£883m) of the website's shares (Weber, BBC, 2006). TV broadcasters are also well aware of the impact of this media form and have produced their own similar websites.

It is clear that users no longer want just static text and pictures but also want to be amused, intrigued and fascinated by videos. The statistics from Alexa.com show that the Top 500 most visited websites are dominated by video sharing websites.

1.2 Project Scope

The project was conceived from the widespread popularity of video sharing websites but the lack of specific websites for students. During the spring of 2007 the original idea for such a website was chosen and was never changed even after the official project proposal was made.

The overall aim of the project is to design, develop and implement a video sharing website designed for University Students. The website will have content management qualities allowing the website to be maintained via an online CMS (Content Management System).

In-depth research will be undertaken to better understand the requirements of a Video Sharing website. This will allow the website to appeal to students but function using standard conventions of video sharing websites.

1.2.1 Objectives

In order to achieve the overall aim of the project a set of objectives were produced via the project proposal. The final website and report should meet all of these objectives and the requirements.

The following is a summary of these objectives (See Appendix A for detailed objectives):

Objective 1 – Research current Video Sharing Websites

Objective 2 – Research how usability affects Video Sharing Websites

Objective 3 – Research how accessibility affects Video Sharing Websites

Objective 4 – Research the video technologies used on a Video Sharing Websites

Objective 5 – Design, Develop, Implement and Test a Video Sharing Website

Objective 6 – Evaluate the completed Video Sharing Websites

Objective 7– Conclusion

1.3   Project Management Methodology

The chosen Project Management Methodology for this particular project was the Waterfall Model. The waterfall model is a sequential approach that divides the development into separate process phases (Parekh, 2005). This was selected as the right methodology because it allows the project to be split into separate processes that can be worked on at different stages and thus managed easier. Figure 1.1 shows how the waterfall model works and how it is the right choice for this project. The model allows changes to be made throughout the project lifecycle and allows for continued testing to make sure the website functions as intended. The project will follow this model via chapters on research then requirements, design, implementation and testing. Discussion on maintainability will also be included to satisfy the last step of the model.
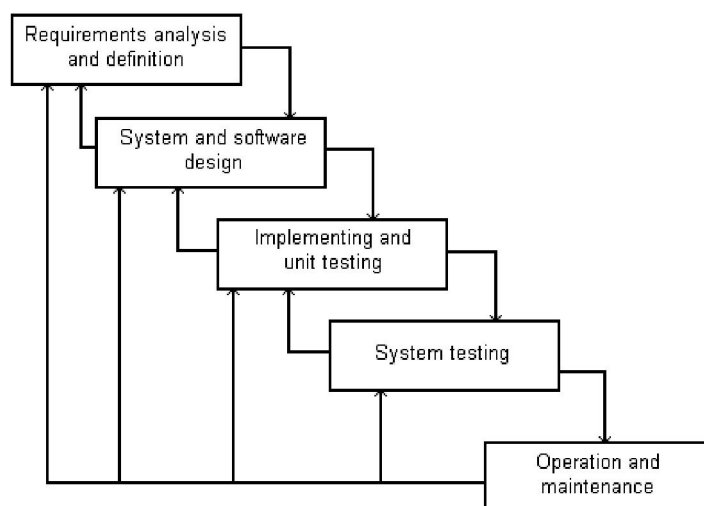
Figure 1.1 – Waterfall Model Diagram (Parekh, 2005)

2 LITERATURE REVIEW

2.1 Introduction

2.2 Web Usability

Web Usability is an important factor in making a website successful. If the user cannot use the website for whatever reason then it does not matter how good the content is. High-profile redesigns such as the British Broadcasting Corporation Homepage were researched and developed using web usability to create better functionality (The Glass Wall, The Homepage Redesign, 2002).

In order to prevent web usability failures guidelines by leading experts have been developed to help web designers build better websites.

2.2.1 Web Usability Guidelines

There are around 142 million websites on the Internet (Netcraft, 2007) and with such a wide choice why would someone continue to visit an unusable website? This is why Web Usability is so important when developing a website.

Jakob Nielsen is a well-respected usability expert in the industry. Over the years Nielsen has produced many journals, books, articles and other publications relating to web usability.

The following guidelines are a combination of four publications by Jakob Nielsen,
'Ten Good Deeds in Web Design' (Nielsen, 1999), 'Top Ten Guidelines for Homepage Usability' (Nielsen, 2002), 'The Ten Most Violated Homepage Design Guidelines' (Nielsen, 2003) and an updated article in 2007 called 'Top Ten Mistakes in Web Design'. The guidelines here are a summary of key points.

These guidelines focus on good practises of web usability and how to apply them to your website.

A Content and Formatting

With any website content is the key ingredient in making it successful. So on a website do not hide this key ingredient but showcase the best content on the homepage, thus making it easier for the visitor to obtain the best content.

The use of clear and simple headings or page titles help the user understand what the page is about. So as to avoid confusing and over whelming the user with information structure the website with hypertext to provide content over multiple pages.

B Consistency

It is recommended that the website should have it's name and logo on each of it's web pages. This helps keep consistency and familiarity for the user, which helps avoid user uncertainty when visiting your website.

C Liquid Layout

A liquid layout is a website that will resize depending on the user's monitor resolution or size. If for example a user has a small monitor then the website should still be viewable and resize to fit the resolution.

D Search

A search option is an important part of any large website that may contain lots of data or information. Thus it is recommended that the website has a search facility but only if developed correctly. In order to allow the user to utilise the search option easily, the input-box should be at least 25 characters wide. An input-box with these characteristics is a sufficient size that will not obscure the users entered string to an acceptable point.

E Link Colours

When a user clicks on a link it's colour should change to help the user track where they have already visited. If the link colour doesn't change after it has been visited then this creates unnecessary confusion, as it is not clear where the user has already visited. The user may continue to click on the same link over and over because the link does not tell them otherwise.

F Navigation

In a different publication than the one's used above Nielsen in his 1999 book 'Designing Web Usability' makes a number of recommendations for navigation. A consistent structured navigation is a major benefit because it allows the user to understand what they can click on and where it will take them.

Descriptive links will help the user identify what pages are available and what the content will be on all the possible pages to visit. Providing Alt tags on rollover buttons help disabled users continue to use the website as it gives them a description of the button and where it may take them.

G Video

In Nielsen's 1999 book 'Designing Web Usability', the web usability expert talks about the use of video on the web. This is of particular value to this project as the website is for video upload and viewing. However, because of the age of the book the section on video talks mainly about the lack of quality and download times. With 61% of all UK Homes connected to the Internet, 84% of which are via Broadband (National Statistics Omnibus Survey, 2007) this is not such an issue anymore.

Nevertheless, Nielsen recommends that when streaming video that user control is included. Interaction is key so including the option to skip, fast forward or stop the video will help. A short text summary of the video will help the user decide whether the clip is worth viewing.

2.2.2 Implications for product

There are many other usability guidelines published by Jakob Nielsen that have not been mentioned above, however, the key ones which have the biggest impact have been. There is a sensible reason why not all guidelines have been analysed. If all guidelines were analysed and eventually applied to the website then the project may become extremely hard to complete.

When combining one guideline with another the constraints may restrict the websites design style (depending on the guideline) to perhaps something that would not be eye catching and appealing to the project's target audience, students. However, that certainly does not mean that the guidelines will not be used.

The web usability guidelines highlighted in this section are still extremely valuable to the success of the website. A combination of guidelines will be applied but in some cases they will be loosely followed. If a certain guideline makes a negative impact on the websites design or usability then it will be removed. Nielsen himself even says in his 1999 book 'Designing Web Usability' *"the skilled professional knows when to bend a rule or even break it"* and that is the exact same approach this project will follow.

The guidelines are helpful in making a website better in usability and have been developed by a respected expert. That is why the guidelines will make an impact on this project. The main areas of impact will be in it's design and the usability of the website.

2.2.3   Conclusion

The key outcome from this research into usability is the clear understanding on how it affects the success of a website. A website without good usability would be one that users would find extremely hard to use, navigate and obtain information from. The key to any website is to make it easy for the user to obtain the information they want.

Not all of the guidelines above will be applied to the website in this project. Nielsen's recommendations regarding content and formatting, consistency, search, link colours and navigation will all be followed in this project. These guidelines have been chosen to be applied because it is the belief that these have the biggest impact without restricting the websites design flair and style.

The liquid layout and video recommendations will not be applied because monitor resolution has increased in recent years with the reduction in cost of larger monitors and again with the increase in Broadband Internet the guideline about small video file sizes with poor quality will be ignored. However, the recommendation about user control when streaming video will most certainly be applied.

2.3 Video Technologies

2.3.1 Introduction

Streaming video on the Internet has always been popular but only recently has the quality improved a great deal. With the various different video codes available the improvements in quality has allowed video sharing and viewing websites to be feasible for web developers and enjoyable for users. However, all the video codecs have different properties and attributes.

The most popular and widely used codes will be compared and analysed in this section. From this research a choice will be made on the right codec to be used in this project.

2.3.2 Video Codecs

Streaming Video on the web has been dominated by three different codecs, RealNetwork's RealVideo, Apple's QuickTime and Microsoft's Windows Media Video (Lammi, 2001). More recently a popular format of streaming now comes in the form of Adobe's (formerly Macromedia) FlashVideo (Emigh, 2006) as it is now used on websites such as YouTube. However, this does not make the first three codecs redundant. Thus this report will highlight each of the codec's strengths and weaknesses.

A RealNetwork - RealVideo

Until recently RealPlayer was the second most popular media player but was overtaken by Apple's iTunes (Nielsen//NetRatings, 2006). With the RealPlayer software already including the RealVideo codec it is obviously a widely supported codec. Either way this does actually mean that a user must first install RealNetwork's software before viewing the content encoded in RealVideo.

Once installed it is clear why the RealNetwork player and codec are so popular with website developers. The RealVideo allows you to encode a single video file but with multiple bit rates (Lammi, 2001). This means that a user can select a video to stream that is optimised for their Internet connection speed. This will save time for the website content developers because they do not have to create separate video files for each user connection speed.

A study by Ben Waggoner at DV.com suggests that the RealVideo is overall a good quality codec. Yet the video is not as sharp as some codecs and videos encoded in RealVideo can contain blockiness in places.

RealVideo has been one of the video codecs used on the BBC's website for many years and seems to be a popular choice despite the RealPlayer falling to third in the media player statistics.

B Apple - QuickTime

Apple's QuickTime codec and player was originally developed for the Macintosh. It was then eventually released for Microsoft Windows (Lammi, 2001). QuickTime player supports multiple codec formats but it's own format for streaming is a 'MOV' file. The Sorenson Video is the most popular codec used on the QuickTime 'MOV' file (Waggoner, 2001). Nevertheless, you are required to install the Apple QuickTime software if you do not own a computer with the Apple Mac operating system installed.

The quality like RealVideo seems to contain more amounts of blockiness than other video codecs (Aygen, Homayounfar, ca.2002). However, frame rate is reported to be excellent (Waggoner, 2001) so jerkiness should be low or nonexistent.

As Nielsen//NetRatings study of streaming media players QuickTime is estimated to be the least used of the big three. However, Apple's own iTunes player which supports it's QuickTime format now lies in second place according to this report. Despite this study it could be suggested that this is more to do with it's popular MP3 player the iPod rather than the video codec.

C Microsoft - Windows Media Video

Windows Media Video is now on version 9-0 after being constantly developed by Microsoft. As the codec is a Microsoft product the video will happily play in the Windows operating system because of its integrated support for the format (Microsoft Support, 2007).

The Windows Media Video, streamed as a 'WMV' file, supports multiple bit rate encoding (Lammi, 2001). Like the RealVideo format this helps not only the user experience but also the web content developers.

The quality of the file format like all of the already mentioned codecs is subjective. Nevertheless, the Windows Media Video codec comes second in both the temporal and spatial quality tests when compared with RealVideo and QuickTime in Francesco Schiavon's report in 2001, 'Quality Comparison: RealVideo, Windows Media Video and Sorenson Video'. Temporal quality relates to the overall perceived quality whilst spatial refers to the perceived quality of each frame.

The Windows Media Video format suffers from jerkiness and blur but is also the highest file size when compared with QuickTime. (Aygen, Homayounfar, ca.2002). However, with the Windows Media Player being the most popular of the players on the market (Nielsen//NetRatings 2006) web developers need less worry about compatibility issues.

D Adobe - FlashVideo

Adobe's FlashVideo format has become increasingly popular as the format of choice for viewing videos on the Internet. FlashVideo is based on the Flash tool, often used for animation's and games on websites. Flash is compatible with near all operating systems and according to the NPD Group, a market research company, Flash is installed on about 98% of PCs. This makes it an even popular platform than QuickTime, Windows Media Player and RealVideo (Emigh, 2006).

Unlike many of the other formats the FlashVideo quality automatically adjusts it's self-depending upon the maximum bit rate the server can user can accept (Cheng et al, 2007). This helps keep file size and download time to an acceptable rate inline with your Internet connection speed.

However, unlike any of the other formats mentioned, FlashVideo is not a true codec but a conversion of another video codec into a FlashVideo 'FLV' format (Emigh, 2006). So when for example a video is uploaded to YouTube in a 'WMV' format the video is transcoded into a 'FLV' file (Cheng et al, 2007). This requires a script or software on the server to convert these popular video codecs into 'FLV'. Therefore, for FlashVideo to be used on this project a multimedia framework application to convert videos to 'FLV' such as FFmpeg would need to be installed on the server.

This is just not feasible for this project, as it would require administrative access to the servers to install and configure FFmpeg, which is not available.

2.3.3 Implications for product

The different video codecs have a big impact of on this project. The analysis of the video codecs has shown that they all have different advantages and disadvantages. Impact on the amount of hosting space is critical to the project as the average file size of each video codec is different. Certain video codecs may have a larger file size than others, which can cause problems when uploading the video.

A larger size video will obviously take longer to upload and the user may become annoyed by the long waiting time for it to upload and subsequently stream. The maximum file size to be uploaded on the server is 8mb so whatever codec is used there will need to be a file size checker put in place via the website code, mostly likely in PHP.

Compatibility with the users operating system is another implication. Providing links to the video codecs installer will help the user gain the necessary files to be able to view the videos on the website. These are the main two implications for this project, whilst there will most certainly be more, at this stage of the development these are the key impact areas that are of concern.

2.3.4 Conclusion

The key outcome from this research on video codecs is the various different formats available on the market. The four different avenues for streaming video on the Internet are RealVideo, QuickTime, Windows Media Video and FlashVideo.

The RealNetwork video is a popular choice with high profile websites such as the BBC so it is clear that it must still be a worthy codec. However, it requires an additional download for all operating systems for the RealVideo to play. Apple's QuickTime has the outright support of the Mac and Windows operating system via an additional download but with the quickly decreasing use of it's media player it is probably not the best choice.

The FlashVideo, as previously mentioned in the report, cannot be used for this project. It would require the installation of FFmpeg on the Servers in order to convert other video codecs into the 'FLV' file. Nevertheless, in Industry it is clear that FlashVideo is the preferred platform for delivering video on the Internet.

The chosen video codec for this project will be Microsoft's Windows Media Video. With the Windows operating system dominating 90% of the market (HitsLink.com, 2007) the support for the Windows Media Video is huge so the majority of users will have automatic support and for this reason it is the chosen format.

2.4 Web Accessibility

2.4.1 Introduction

Web Accessibility is a key issue in today's society as no longer can websites, particularly those of business or government, be inaccessible to disabled users. In 2006 a college student sued an American retail website Target.com for being inaccessible to blind users (Meyers, CNET.com, 2006). Another high profile court cases includes blind user Bruce Maguire's successful attempt against the Sydney Organising Committee for the Olympic Games, where he won $20,000 in damages against their inaccessible website (Joseph, The Guardian, 2003).

It is clear web accessibility is an extremely important factor when designing a website. For these reason this section will highlight how its possible to make a website accessible.

2.4.2 Web Content Accessibility Guidelines 1.0

The World Wide Web Consortium (W3C) published in May 2007 an updated draft version (2.0) of their 1.0 accessibility guidelines. However, because at the time of writing it was a draft version this report will focus on the W3C's 1.0 guidelines published in 1999.

The guidelines published on the W3C website are broken down to give a written description of why it should be applied and checkpoints in which the website developer can see whether their website is conforming. It must be noted that these are just guidelines and not in fact rules or laws. However, the W3C has given each guideline a priority to help the web developer prevent making their site impossible for some user groups to access, subsequently avoiding the possibility of a court appearance.

Taken from the W3C's website, these are the 3 level of priority:

Priority 1]

A Web content developer **must** satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents.

[Priority 2]

A Web content developer **should** satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document. Satisfying this checkpoint will remove significant barriers to accessing Web documents.

[Priority 3]

A Web content developer **may** address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document. Satisfying this checkpoint will improve access to Web documents.

As it states all guidelines that are priority level 1 should be met in order to allow users to access the website.

2.4.3   Priority 1 Guidelines

As the priority level 1 guidelines are so critical in making a website accessible, it is best, if those that apply to this project, are summarised and analysed in this report all taken from the W3C 1.0 accessibility guidelines. All guidelines relate to the fact that the website must be valid XHTML and CSS, which in itself helps increase accessibility.

A – Provide equivalent alternatives

The aim of the first guideline is to provide the user with an alternative. If for example a user is deaf then a text transcript of an audio object is provided. Text equivalents for every non-text element are required to meet priority level 1, so an Alt tag will help the web developer conform to this guideline.

B – Clarify natural language usage

It is recommended by the W3C that the natural language of the website is stated. This will help search engines in finding results in a certain language and improving the readability of the website, particularly for those with disabilities. This is usually achieved by inserting a piece of code at the begging of an XHTML document.

C- Ensure that pages featuring new technologies transform gracefully

The main recommendation of this guideline is regarding the issue of disabling or non-supported technologies and how it should not affect the usability of the website. There are two level 1 priorities that are relevant to this project. The first states that when a style sheet i.e. CSS, is disabled then the website should still be readable.

The final appropriate priority level 1 guideline suggests that when scripts i.e. JavaScript, applets i.e. Java, or other programmic objects are disabled or not supported, that the website should still be accessible and usable. This guideline is mentioned in a similar checkpoint in guideline 8 (Ensure direct accessibility of embedded user interfaces) as it states that scripts like the ones previously mentioned should be compatible with tools like screen readers.

2.4.4 Further Guidelines

There are further priority level 1,2 and 3 guidelines that have not been mentioned above. These have not been included because they are not applicable or crucial to the success of this project. However, in other web projects then the guidelines not applicable here maybe crucial to the accessibility success.

2.4.5 Problems with Multimedia Content and Accessibility

It is well documented that multimedia content on websites can cause conflict and problems for users that maybe impaired or have disabilities. For example when a user has a screen reader in operation and visits a website with audio, the user will hear both the screen reader and the website's audio, making it extremely difficult to navigate (Miyashita et al, ca.2007).

Another problem again with screen readers, is the change of the multimedia's state, e.g. the video has finished playing. The screen reader can not detect this change and thus despite the visual change there is no way the screen reader can update the user on the multimedia's state (Miyashita et al, ca.2007).

The research team at IBM have developed an Internet browser that solves these problems with accessibility and multimedia content. Named the 'IBM Accessibility Internet Browser for Multimedia' it was released in September 2007 in order to allow users with impairments to use the Internet like everyone else (Alphaworks IBM.com, 2007).

The browser's main features include providing keyboard shortcuts for multimedia objects to play, pause, stop, volume up/down etc, allowing the user to keep in control (Alphaworks IBM.com, 2007). It also provides an option for web developers to include an audio description in text format via Meta data (Miyashita et al, ca.2007).

It is clear that this browser is an excellent option for users with disabilities to access multimedia rich websites. However, it requires the user to download and install the browser, which in its self maybe problematic due to accessibility issues with the operating system.

2.4.6   Web Accessibility Tools

There are a number of web accessibility tools available as software or online-based analysis tools. The two most popular online tools include 'WAVE 3.0' developed by the Temple University Institute on Disabilities. WAVE 3.0 checks for accessibility issues and presents them on screen, highlighting the issues by overlaying them on the website submitted for checking.
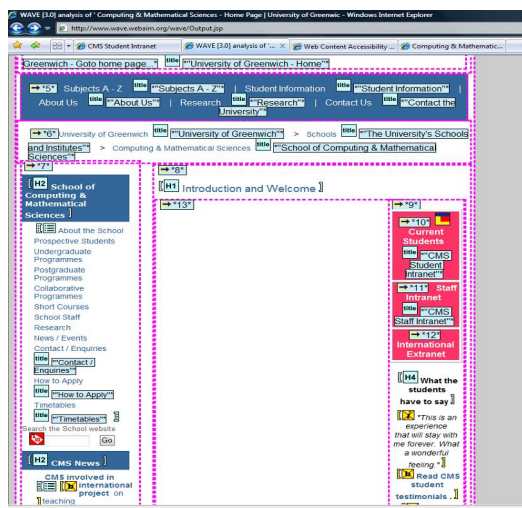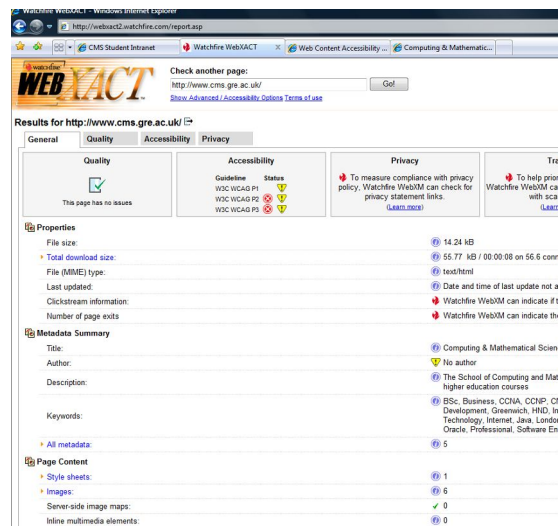
WAVE 3.0   **Figure 1.3**   **WebXACT**

Probably the most well known online tool in the Industry is 'Bobby', now renamed 'WebXACT'. Similar to the WAVE tool WebXACT tests the webpage not only for accessibility but also for quality and privacy issues. See figure 1.3 above for comparison of WAVE and WebXACT.

2.4.7 Implications for product

Accessibility is a key issue of this project and should be for all projects ever undertaken on the web. With accessibility issues also relating to legal issues, web developers must take steps in order to avoid a court appearance.

The specific implications for this project will be during development. Care will need to be taken during the coding of the XHTML and design of the website in order to incorporate the accessibility guidelines as provided by the W3C. In some areas the accessibility guidelines may restrict design but unlike the usability guidelines these suggestions have a bigger impact for certain user groups.

There will be implications throughout the websites development. However, it is key to apply these accessibility guidelines otherwise if this product was released to the public it may have legal action taken against it.

2.4.8 Conclusion

To conclude this report into web accessibility it is clear that from the research undertaken it is no longer acceptable to have a website that can not be used by certain users. Legal action maybe undertaken against the website owners if accessibility has not been considered. There are no legally binding guidelines but the W3C recommendations will help the web developer avoid any possible problems.

When considering a multimedia rich website there are a number of accessibility problems as highlighted in the report. However, because it would be near impossible to create a full accessibility compliant multimedia rich website, all of the priority level 1 guidelines mentioned will be applied to this project as best as possible.

3 REVIEW OF EXISTING VIDEO SHARING WEBSITES

3.1 Introduction

Video sharing is one of the most popular things to do on the Internet. The popularity of video sharing has been fuelled by the websites dedicated to it. The ability to view video on demand, when you want, what you want and where you want to attracts hundreds of millions of users to these websites (Alexa.com, 2008). With these video sharing websites attracting so many people, it has become an extremely lucrative business and a number of high profile takeovers supports this.

This section of the report will focus on a small selection of video sharing websites, this will include; YouTube, Google Video and DailyMotion. A brief background on each website, a comparison of the three and the key features that all three websites have in common will be stated and analysed.

3.2 YouTube

YouTube is probably the most well known video sharing website on the Internet. It is ranked fourth in the global most visited website and attracts 17% of all global Internet traffic (Alexa.com, 2008).

YouTube was launched in 2005 by Chad Hurley and Steve Chen. The idea was created in their garage when after they had shot some short video clips of their friends but they had not simple or easy was to share it with them. (Lee, San Francisco Chronicle, 2006). YouTube was and is so popular because it simplified the whole process of video sharing.

Users can upload videos and YouTube will automatically convert them into FlashVideo (Cheng et al, 2007). However, this process is available on the majority of video sharing websites. What made YouTube stand out and it's unique selling point was it's social networking and community side.
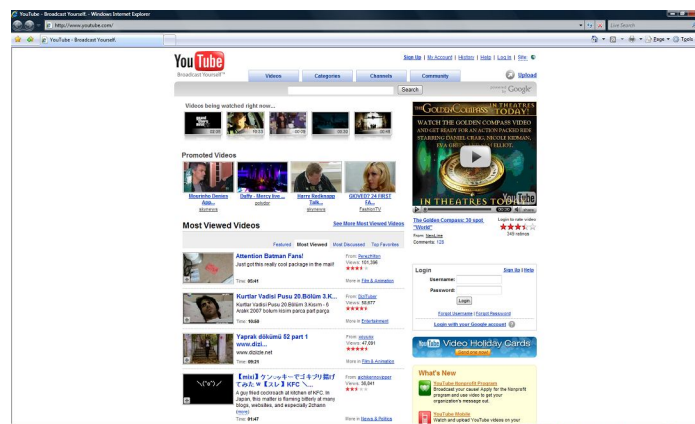
Figure 1.4 – YouTube Website

Users can create friends lists, join and create groups, subscribe to other users video and comment on videos (Halvey et al, 2006). This helped YouTube *"build a community of users"* (Lee, San Francisco Chronicle, 2006) and thus because it has the largest quantity of users, people will upload videos in order to attract the largest audience (Weber, BBC, 2006).

In 2006 the large Internet search engine Google bought YouTube for $1.65bn (£883m) in shares (Weber, BBC, 2006). This has helped increase the Internet traffic to YouTube and deals with TV companies such as CBS (Weber, BBC, 2006) has allowed research firm In-Stat to estimate that YouTube will make more than $850m a year in revenue (Lee, San Francisco Chronicle, 2006).

From the questionnaires undertaken for this report (see Appendix E), YouTube was the most popular of the video sharing websites. Out of the 50 students questioned, 47 of them stated that they viewed YouTube the most. This gives a clear understanding that YouTube is the main player in this area and should be used to help draw up requirements.

A – Usability

As stated previously in the report (Literature Review – Web Usability) usability expert Jakob Nielsen suggests a number of different guidelines that a website should follow. In order to detail YouTube's usability a number of these guidelines were applied to the website for this report.

When applying guideline 'A. Content and Formatting' (Literature Review – Web Usability) YouTube immediately meets the first requirement. Nielsen recommends that the best content should be showcased and YouTube does this by including 'Featured' and 'Most Popular' videos on it's homepage. However, in terms of formatting YouTube can seem rather cluttered and overwhelming. Animations, advertisements and large headings detracts from the excellent content that can be found on the website.

The website is consistent throughout in style, colour and structure. The navigation is placed on the top, left and right. Finally, Nielsen's guideline that is most applicable to this project 'G. Video' (Literature Review – Web Usability) saw varying results. Though YouTube provides a play and pause button plus the ability to fast forward and rewind by dragging the timeline, no skip option is provided. However, the website does provide a text summary detailing what the specific video is about. Overall, the YouTube website does well in meeting Nielsen's guidelines and it can be assumed that where the website fails is most likely a compromise by the web developers.

B – Accessibility

In order to assess the accessibility of the YouTube website the 'Bobby', now renamed 'WebXACT' (Literature Review – Web Accessibility) tool was used. The first error that appeared after using the tool to analyse YouTube was one, Priority 1 Guideline (See Literature Review – Web Accessibility for further information). The YouTube website had failed to provide alternative text (alt tags) on a number of images. This is a basic and easy to fix problem and was surprising to see.

The website also failed 5 Priority 2 Guideline, these include but are not limited to, the use of poor link phrases such as "click here" and using relative sizing and positioning rather than obsolete in the CSS. YouTube failed four Priority 3 Guidelines which included not stating the language of the website and providing a summary of tables. Generally, the YouTube website meets a number of the accessibility guidelines, however, the assibility would improve by just rectifying many of the simple problems highlighted by the 'WebXACT' tool.

C – Video Technology

The video technology used on all three video sharing websites mentioned in this chapter use FlashVideo. FlashVideo is developed by Adobe and is part of the Flash web language. As highlighted in the 'Literature Review – Video Technologies' Flash is installed on about 98% of PCs which is most likely why these websites use FlashVideo.

3.3   Google Video

Before Google had even started talks in buying YouTube, it had created it's own video sharing website. Launched in January 2005 the aim of Google Video was to provide a structured way of searching and storing videos through indexing and meta data (Hicks, 2005). Another one of it's main aims was to provide professionally made video content from established publishers for free or allowing them to charge a fee (Hicks, 2005). Google signed up a number of different partners such as ITV, Buena Vista International and FC Barcelona, hoping that this professional consent would attract more users (BBC, 2006).
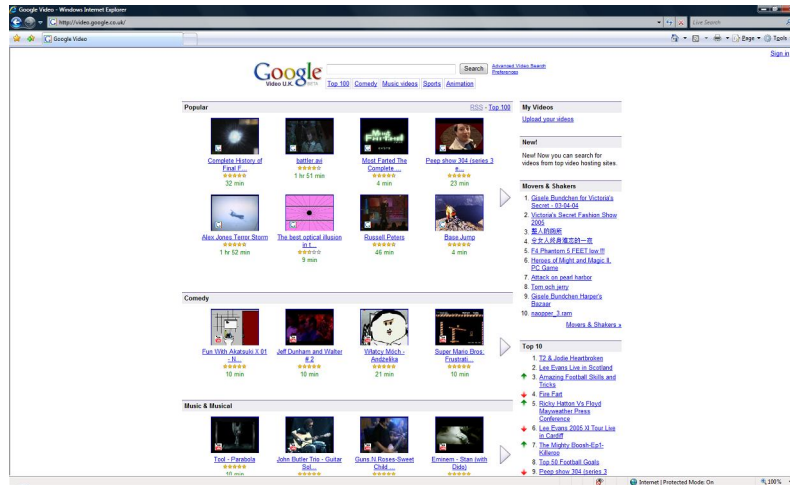
Figure 1.5 – Google Video Website

However, the strategy did not work and Google Video was nowhere near as popular as YouTube. Google Video is ranked 8,414[th] in the global most visited website table and has just 0.02% of the global Internet users visiting their website (Alexa.com, 2008). After purchasing YouTube in 2006, Google started including YouTube videos in its Google Video search results. This was seen as an attempt to attract more users to both its Google Video and newly purchased YouTube (DirectMag, 2007).

During the questionnaire process undertaken for this report (see Appendix E), Google Video was the least popular of the three services analysed in this chapter. Only one student stated that they viewed Google Video the most.

A – Usability

Unlike YouTube, Google Video is structured in a simple and efficient way. The homepage is presented in sections with the first being the most popular videos and then the rest of the page broken down into categories such as comedies, musicals etc. This helps Google Video meet the first of Nielsen's guidelines. Google Video is consistent in its design and colour scheme throughout leaving the user in no doubt. The navigation is contained within the top and right areas of the screen.

Like YouTube, Google Video provides a play and pause button plus the ability to fast forward and rewind by dragging the timeline, yet no skip option is provided. The website provides a text description of the video plus comments and other videos that the user has uploaded. However, a usability guideline Nielsen recommends is that link colours should change once a user has clicked on a link. This helps the user track where they have or have yet to visit. Unfortunately, Google Video links do not change colour so it can be confusing and annoying when you may click on a video you have already viewed. Largely despite Google Video not being the most visually appealing in terms of usability the website is easy to use and function.

B – Accessibility

Unlike YouTube, there were no Priority 1 guideline errors picked up by the WebXACT tool against Google Video. This is certainly a positive for Google Video, even though the tool cannot check for every issue it helps give an overall rating as to whether the website is accessible or not.

The WebXACT tool finds three errors under the Priority 2 guidelines. These include like YouTube, the use of poor link phrases. Then finally under Priority 3 guidelines Google Video fails on 4 tests. Again like YouTube, includes the lack of stating what language the page is in and the failure to provide a summary of what is contained in the HTML tables. Nevertheless, Google Video seems to meet a number of the accessibility propriety guidelines.

C– Video Technology

Google Video uses FlashVideo to allow viewers to watch the videos on the website. However, unlike YouTube, Google Video allows you to download the videos on the website, ready to put on your portable video players.

3.4 Daily Motion

Daily Motion is a video sharing website based in France (DailyMotion.com, 2007). It was launched in March 2005, before YouTube, (Roxborough, Masters, 2006) but is ranked 42nd in the global most visited website table and attracts 1.4% of the global Internet users (Alexa.com, 2008).

Daily Motion does not provide anything technically different to users than YouTube or Google Video but offers a number of features that are not available on their competitor's websites. The ability to upload directly from webcams or camcorders means content can be shared quickly and easily (Carlin, Business Week, 2006). Daily Motion created a promotional video available on the Internet to highlight the differences between them and the competition, it states that they provide higher quality video and is a place for creativity to be viewed. It also has a number of high profile contributors such as Channel 4 and Sony PlayStation, which provide clips and trailers from their shows or products (DailyMotion.com, 2007).

Figure 1.6 – Daily Motion Website

In August 2007 Daily Motion raised $34m of funding from investment and private equity firms (Ali, paidcontent.co.uk, 2007). Daily Motion is hoping the funding can help increase it's popularity and deals with content providers such as Viacom and Universal Music Group (Ali, paidcontent.co.uk, 2007) it certainly will be a big player in video sharing on the Internet.

The questionnaire process undertaken for this report (see Appendix E), shows that Daily Motion is the second most popular video sharing website. However, this comment is slightly deceiving as only two students voted for Daily Motion. It is clear which video sharing website is the market leader and that is YouTube.

A – Usability

Daily Motion is structured (after clicking videos) with navigation down the left and at the top. The content is displayed in the middle/right area of the screen. Navigation links are clear, the colour scheme and design are consistent throughout. This helps meet the first of Nielsen's guidelines.

Daily Motion provides a play and pause button plus the ability to fast forward and rewind by dragging the timeline. However, unlike YouTube and Google Video, Daily Motion provides a skip option that allows you to skip the video and move onto the next one. This again helps meet Nielsen's guidelines on video streaming.

However, Daily Motion's link colours do not change after a user has clicked on one. This means it is hard to keep track of what video or link you have already viewed or clicked. Overall, the Daily Motion website does well to conform to usability guidelines but if a few simple changes could be made then the user experience would be better.

B – Accessibility

Using the WebXACT tool, no Priority 1 guideline errors were found on the Daily Motion website. This certainly shows that the Daily Motion developers have worked hard to meet the accessibility guidelines.

However, the WebXACT tool does pick up Priority 2 & 3 guideline errors. The problems under the Priority 2 include the failure to include HTML label tags on forms. Also the use of poor link phrases and using the same link phrase more than once when the links point to different URLs. Nevertheless, Daily Motion does well in keeping their website accessible but like Google Video and YouTube, poor link phrases reduce the websites usability.

C – Video Technology

Daily Motion uses FlashVideo to allow viewers to watch the videos on the website.

3.5   Content Analysis Table

Included in Appendix C is a content analysis table of video sharing websites. This table highlights the key technical and design differences between the three websites analysed in this report. This table will assist during the requirements analysis, as it will help in deciding the key functionality of the website.

3.6   Conclusion

The key points that can be taken from this comparison of existing video sharing website is that they all have many similarities but also slightly differ. The key functionality such as viewing, uploading and commenting on videos are all present on each website. However, differences such as the ability to skip or download videos help differentiate the three websites. Yet they all have near the same problems with usability and accessibility.

It is clear though that YouTube has the largest market share of the video viewing and uploading sector of the Internet. It can be assumed that if a video sharing website was designed in terms of usability the same as YouTube, that a user would have no trouble in operating the new website. The next step is the requirements analysis that helped decide how the website would look and function.

4 REQUIREMENTS ANALYSIS

4.1 Introduction

In order to gain a better understanding of what is required by a video sharing website, requirements analysis was performed. To successful identify the requirements of a video sharing website the analysis is split into different areas. These include a formal specification, functional and non-functional specification.

The formal specification includes UML use cases and questionnaire results. The functional and non-functional specifications details what the system is to do and the constraints within the system.

4.2 Formal Specification

To allow a detailed specification to be produced, a UML use case and a questionnaire was developed. Unlike the functional and non-functional specifications the formal specification details exactly what the system must do, which helps identify potential problems and increase the understanding of the system. (Bowen, 2003).

4.2.1 UML Use Case

The first step before detailing a list of formal requirements was to develop a UML use case. A use case details the interactions between the user and the system, this eventually helps define the scope of the system (Malan, Bredemeyer, 2001).

The use case diagram for this system can be found in Appendix D. The use case diagram details each stage of the user interaction process with the video sharing website. First of all the user will connect to the website, once the user has successfully connected then they will register for an account. Once the user has successfully registered for an account, they may now view and comment on videos. A registered account also allows the user to upload their own videos. They can also contact Admin staff and inform friends about the website. Finally the user can safely log out of the website.

This helps understand how the user will interact with the system and allows the listing of a detailed requirement specification.

4.2.2 Questionnaire Results

The secondary step before producing a detailed list of formal requirements was to develop a questionnaire and obtain results from them. A simple questionnaire was produced with ethics and moral implications in mind and thus questions that related specifically to video sharing websites were only included. Sample questionnaires and result graphs can be found in Appendix E & F.

50 University students were asked to fill in and return the questionnaire. The results included in the Appendices allow us to understand what a user wants from a video sharing website. When the students were asked 'Why did you visit your favoured video sharing website?' the majority answered due to the widest choice of videos. This would be expected, however, the second highest reason was due to ease of use. This subsequently means that the website should have good usability and was included in the requirements.

When the students were asked what feature of a video sharing website was most important to them from a selected few, it was immediately clear that the majority give preference to websites that allow them to comment on videos and have the ability to search for them. Therefore, for a video sharing website to be successful they should allow users to comment and search for videos, thus these features were added to the requirement.

The students were also asked to state any further features they thought were important. The results from this question saw the students list the ability to contact the admin, have videos sorted into categories and the removal of offensive videos. Further features listed included the listing of the most popular videos and a help section to assist a new user. Again these were features that were added to the list of requirements.

4.2.3 Functional Requirements

The functional requirements are those that detail the intended behaviour and essential actions of the system (Malan, Bredemeyer, 2001). Combining the results of the comparison of the current Video Sharing websites, the UML use case and the questionnaire results allow the listing of the functional requirements.

Thus the following list are the function requirements of the video sharing website developed for this project:

- Allow users to visit the website
- Allow users to register for an account
- Allow users to see a list of the most popular videos
- Allow registered users to view videos
- Allow registered users to upload videos
- Allow registered users to comment on videos
- Allow users to contact admin staff
- Allow admin staff to remove videos
- Allow admin staff to edit or remove users
- Allow admin staff to edit or remove comments
- Allow admin staff to reply to user questions

4.2.4   Non-functional requirements

The non-functional requirements includes system constraints and user concerns (Malan, Bredemeyer, 2001). These can be directly related to this project in terms of usability and accessibility. The Literature Review seen earlier in this report details a number of usability and accessibility guidelines; the subsequent requirements combine the most critical guidelines from this research.

Thus the following non-functional requirements are based on that research:

- Usability – Popular videos on homepage
- Usability – Consistent design
- Usability – Provide a search facility
- Usability – Structured & Consistent Navigation
- Usability – Video controls (Stop, Play, Pause)

- Accessibility – Meet all Priority Level 1 guidelines if relevant
- Accessibility – Use Web Accessibility tools to test website for problems
- Accessibility – Valid XHTML as detailed by the W3C
- Accessibility – Valid CSS as detailed by the W3C
- Accessibility – Test for valid XHTML and CSS by using W3C validator

4.3   Conclusion

The above functional and non-functional requirements allow the project to move forward and onto design and development. Results from the questionnaire have been incorporated into the requirements to allow the website to meet user needs. Furthermore, the UML use case helped understand the functionality of the Video Sharing website.

The comparison of similar and current Video Sharing websites assisted in developing further functionality requirements. The research into usability and accessibility in the Literature Review aided in the development of the non-functional requirements.

The overall aim of this chapter is to help the design of a website that meets user needs. All of the requirements above facilitate to meet this goal and are based on the students' responses and real world video sharing websites.

5 DESIGN

5.1 Introduction

The purpose of this section of the report is to detail the design steps the project went through before development. The visual elements of the website progressed through various stages from storyboards to user feedback. Whilst the technical design focused on diagrams and research. All the design stages have been documented in this chapter.

5.2 Visual Design

5.2.1 Storyboarding

The first step undertaken for the visual design was to produce a storyboard of possible designs. Five designs were hand drawn to obtain a visual impression of what the structure of the website would look like. The full storyboard can be found in Appendix I, but only three out of the five were chosen to be developed further.
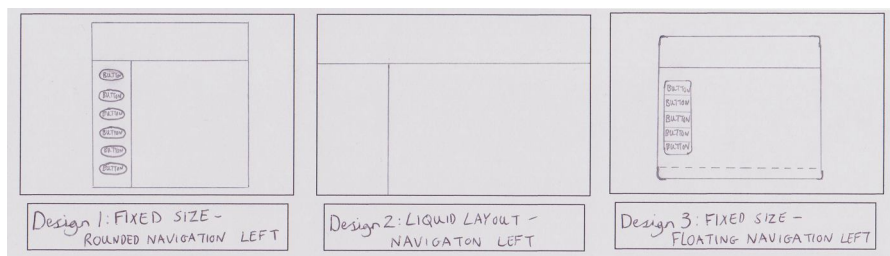
Figure 1.7 – Storyboard Designs

Three designs were then developed in the graphics package Adobe Photoshop CS2. Figure 1.7 shows the three designs that were chosen for user feedback.

Figure 1.8 – Three Prototype Designs

5.2.2 Questionnaire Results – User Feedback on Design

During the questionnaire process the users were asked to give feedback on the three prototype designs as seen above. The users detailed which design they liked the most. The results from the questionnaire saw a clear majority in favour of Design 3. 25 out of the 50 students asked chose Design 3 as they one they believed was most appealing.

From these results it was clear that the design process should focus on further development of Design 3.

5.2.3 Design of Non-functional requirements

In order for the final design to meet the requirements as set in the last chapter, the layout had to incorporate certain features. The following diagram highlights where the design has met the requirements as set out in the analysis.

Figure 1.9 – Chosen Design

Usability – Popular videos on homepage

Usability - Structured & Consistent Navigation

Usability – Provide a search facility

Usability – Consistent design

The final usability requirement not highlighted in the above screenshot is the "Video controls (Stop, Play, Pause)". This is included and is found when viewing videos. The Windows Media Player that is embedded into the web page includes as required the Stop, Play and Pause option. It also includes the ability to increase/decrease and mute the volume.

Figure 2.0 – Embedded Windows Media Player

5.2.4   Layout and Content

The design is focused on a two-column system. The navigation and content are separated into columns, which helps keep a divide between functionality and content. A header is included at the top of the page, containing the website's name and logo. The navigation is included in the left hand column, with rounded rollover buttons to provide the user with options to visit different web pages. The content is included in the right hand column; here the content can be contained away from the navigation so as to avoid confusion. This design is consistent throughout and the user will be left in no doubt as to whether they are still on the same website if the click on one of the navigation buttons. This helps meet the usability requirements as detailed in the analysis and literature review.

Figure 2.1 – Chosen Design
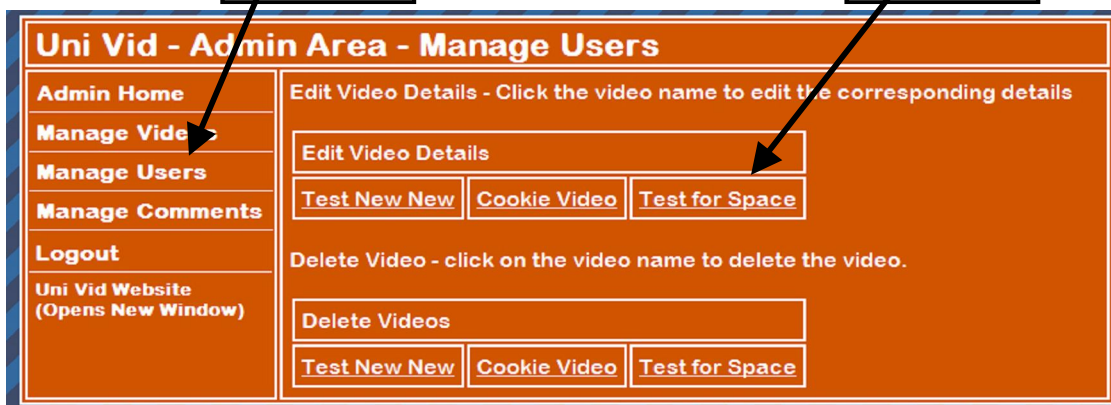
The admin area has been designed in a similar way. Like the design for the main users a header is included at the top, informing the admin where they are within the admin area. The navigation is contained on the left hand side and lists all of the different options the admin can perform. Finally the content is enclosed within the right hand column.

5.3 Technical Design

5.3.1 Navigation

As stated by the usability requirements, the navigation must be structured and consistent throughout the design. Also as detailed in the literature review, Nielsen recommends that the navigation links are descriptive and provide Alt tags on rollover buttons for increase usability and accessibility.

To allow the navigation of the web pages to be structured and consistent a hierarchy navigation diagram was produced. As highlighted below in Figure 2.1, the diagram shows the structure of the navigation and what path the user would follow when visiting the website.
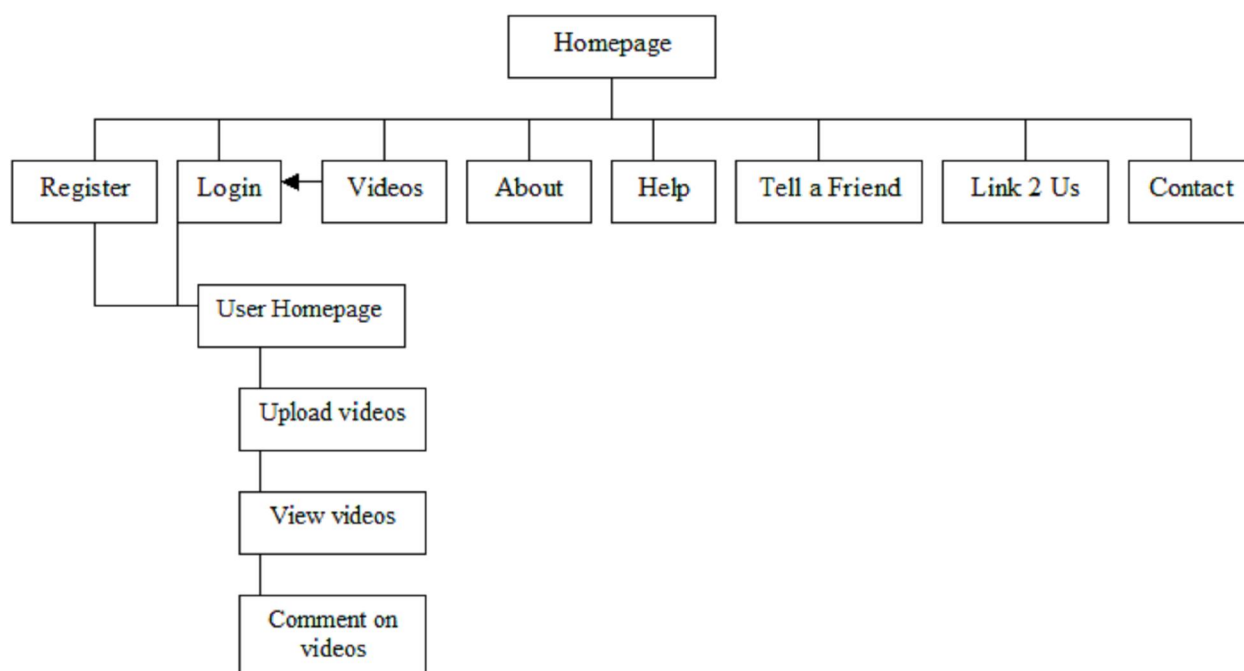
Figure 2.1 – User Hierarchy Navigation Diagram

The user will first be presented with the homepage, which allows them to visit any of the pages in the navigation list. When a user that is not logged in and clicks on the Videos link the user is redirected to the login page. After the user has logged in or registered then the user is taken to the User Homepage. Here they can upload, view and comment on videos.

The only change of the navigation list comes when the user is logged in. For example the register and login buttons on the navigation disappear because the user is already registered and logged in. These are replaced with upload and view buttons as detailed in the above diagram.
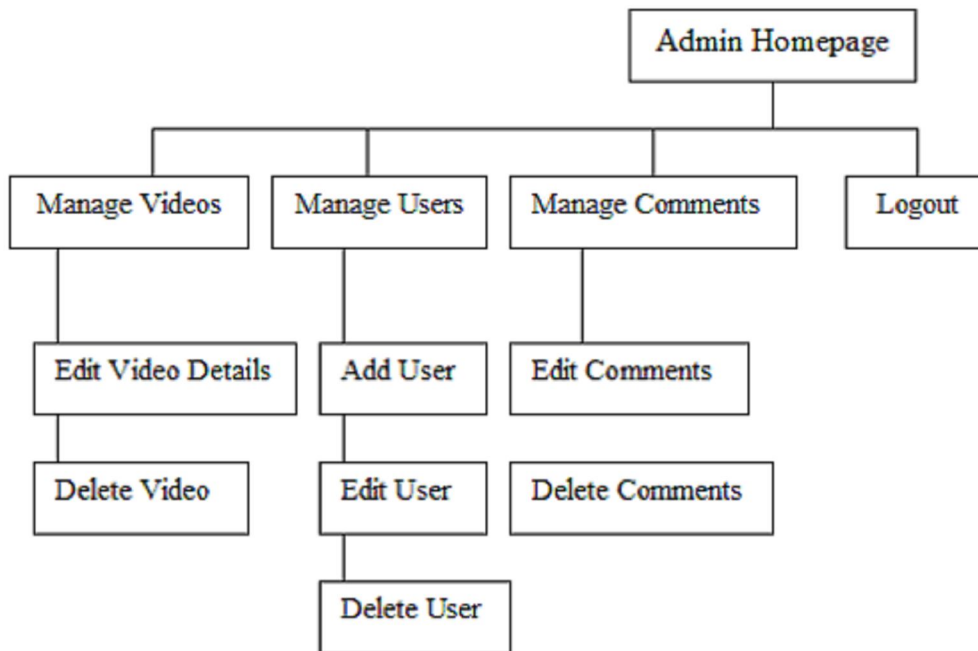
Figure 2.2 – Admin Area Hierarchy Navigation Diagram

The diagram above highlights the admin area navigational structure. All of the above navigation is only visible and available for admin users. Once an authorised admin has logged in they are presented with the admin homepage. Here they can select a number of different options and take a different path. The admin is able to manage videos, users, comments and the web pages. Depending upon the option chosen the admin can add, edit or delete the selected details. For example an admin can add, edit and delete a user whilst they can only edit and not remove the text contained on the web pages.

5.3.2   Entity Relationship Diagram

The purpose of an Entity Relationship Diagram (ERD) is to allow the developer to produce a diagram that helps database design. It helps in the aid of data integrity, database design and the entity relationships between them (Chen, 1976). Subsequently, it was critical that the database required for this project was developed using an ERD.

The ERD developed for this project's database was first drawn using pen and paper. This method allowed multiple versions to be easily created and compared. Once a suitable structure of the database was found the ERD was produced on a computer. The final ERD can be found in Appendix J.

The ERD found in Appendix J highlights how the various tables and rows are join in relationships. For example the 'videoid' row contained in the 'video' table is a primary key and is linked to two foreign keys in the 'videolog' table and the 'comments' table.

5.3.3 Database Design

It is critical to use foreign keys in a database but only when referential integrity is in place. Referential integrity in a database enforces that the data in the foreign key only contains the same values from the connected primary key (Blaha, 2005). Referential integrity is implemented during the construction of the database, thus during the development of the MySQL database.

Another key element when developing a database is normalisation. Normalisation is a process that determines the most efficient way or organising data in a database by removing redundant data and that only related data is stored in the table (Chapple, ca2007).

Database normalisation took place by ensuring that only the required data would be stored in each table. Also by splitting data items into separate rows, so for example the name of a user when registering is split into first name and surname. Each table also has a primary key that allows for accurate identification of data within the table.

5.3.4 Accessibility Design Considerations

One of the accessibility requirements as highlighted in the analysis available in the last chapter was to 'Meet all Priority Level 1 guidelines if relevant'. In order to meet the Priority 1 guidelines certain compromises had to be taken during design. CSS and XHTML will be used in the technical development of the website but during the visual design one key element was that the website must be able to adjust to larger fonts. Creating the necessary space for the page to transform and adjust to the increased font size ensured this. The majority of accessibility considerations are adopted during the coding and development of the website itself.

5.4 Conclusion

The design planning detailed in the above chapter describes the steps undertaken in order to produce a final design ready for technical development. The technical design details how the navigational structure and database was designed. Without storyboarding, hierarchy navigation diagram, ERD and other design planning stages the website/database would have numerous flaws. Lack of data integrity and poor usability are just some of the problems the final website would suffer from if the design planning was not undertaken. The next step is to produce the actual website with XHTML, CSS and PHP coding and the MySQL Database.

6 IMPLEMENTATION

6.1 Introduction

This chapter highlights how the website and database were developed into a fully functional system. It details the coding involved via XHTML, CSS and PHP plus the construction of the MySQL Database.

Also included is the discussion of any problems that were encountered during the implementation phase. Furthermore the chapter details how the website will be maintained and the various security methods in place.

6.2 Website Design

As discussed in the previous chapter, there was one design chosen for development. In order for the website to be functional, accessible and usable it was developed in XHTML Strict and with Cascading Style Sheets (CSS). The code was implemented using valid XHTML and CSS where possible, because for example, some areas that included interactivity via PHP/MySQL there were some issues with validating the code. Nevertheless, the homepage for example is fully validated strict XHTML.

The implementation of the XHTML website code went through various stages of development and improvement. The first stage was to produce the structure of the website. As decided in the requirements analysis and design chapters, a fixed layout with the navigation on the left and banner at the top was to be produced. Thus in order to convert the design image produced in Adobe Photoshop CS2, the design underwent XHTML coding.

Initial XHTML and CSS coding allowed the website to be produced with a blank canvas ready for images and styling. Figure 2.3 shows the website after the initial coding and the first stage of coding complete.
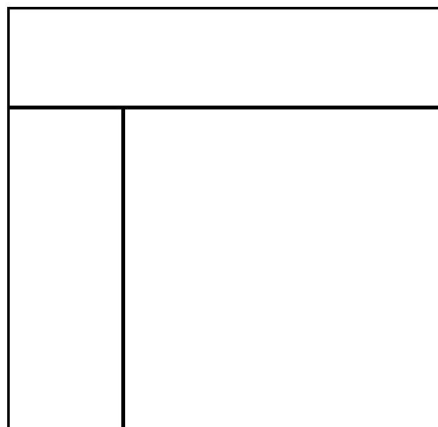
Figure 2.3 – Design structure after initial coding

The website is coded using the div tag rather than tables. There have been various discussions in the web design industry about 'tables vs. divs' in terms of layout and it seems generally agreed that tables should not be used for layout (W3C, 2000). The divs are structured in sections, one to act as a wrapper to contain everything, one that contains the header, one as the menu, content, padding, search and finally another to contain the videos. Figure 2.4 shows the final structure of the valid XHTML coding.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
<title>uni vid</title>
<link rel="stylesheet" type="text/css" href="video.css"/>
</head>

<body>
<div id="wrapper">
<div id="header">
<img src="header.jpg" alt="Header" />
</div>
<div id="leftmenu">
<ul id="navmenu">
<li><a title="Homepage" href="index.php" >home</a></li>
        <li><a title="Sign Up" href="register.php" >sign up</a></li>
        <li><a title="Login" href="login.php" >login</a></li>
        <li><a title="View Videos" href="videos.php" >videos!</a></li>
        <li><a title="About Uni Vid" href="about.php" >about</a></li>
        <li><a title="Help" href="help.php" >help</a></li>
        <li id="friend"><a title="Tell A Friend" href="friend.php" >tell a friend</a></li>
        <li><a title="Link To Us" href="link2us.php" >link 2 us</a></li>
        <li><a title="Contact Us" href="contactus.php" >contact</a></li>
   </ul>
</div>
<div id="middlecontent">
<div id="formpadding">
<h1> popular videos </h1>
<div id="search">
<form id="form" action="search.php" method="get">
  <p><input type="text" id="result" />
  <input type="submit" id="Submit" value="Search" /></p>
</form>
</div>
<div id="popularcentre">
POPULAR VIDEOS HERE
</div>
</div>
</div>
</div>
</body>
</html>
```

Figure 2.4 – Finished XHTML coding

Separating the various sections into divs allows greater control over styling and positioning. Subsequently the next stage of the website design development was to apply Cascading Style Sheets (CSS) to the XHTML. In order to separate style from content, an external CSS was applied.

```
*{margin:0; padding:0;}

body{
font-family: 'Arial Rounded MT Bold', Verdana, Arial, Helvetica, sans-serif;
    color:#FFFFFF;
    padding-bottom:10px;
    background-image:
url('background.png');
background-repeat: repeat;}

#wrapper {
width: 808px;
margin: 5px auto 5px auto;
 text-align: left;
background-color:#d15600;
        min-height:100%;
  height:auto !important;
  height:100%;
      overflow:hidden;
      border: 3px solid #fff;
}

#header {
border-bottom:3px solid #fff;
margin:0; padding:0;
width: 808px;
height:182px;
}

#leftmenu {
    float: left;
    min-height: 590px;
    height:auto !important;
    height: 590px;
    width: 180px;
    }

#middlecontent {
float: left;
border-left: 3px solid #fff;
min-height: 590px;
height:auto !important;
height: 590px;
width: 625px;
font-size: 1.3em;
padding-bottom:10px;
    }
```

Figure 2.5 – Selection of CSS code

Figure 2.5 shows a small selection of the CSS coding used to style the website. The code above specifically styles the banner/header, the menu and the middle content. The use of 'min-height', 'height:auto !important;' and 'height' is because Internet Explorer 6 (IE6) has issues with resizing layouts. So when for example a user was to increase the font size then in IE6 the layout would not increase in size to accommodate the changes. Thus with the code in place above IE6 will now resize the layout as required. Figure 2.6 shows the final design after the completion of the XHTML and CSS coding.

Figure 2.6 – Final design after XHTML and CSS coding

6.3 Interactivity

6.3.1 MySQL Database

A MySQL database was produced inline with the ERD developed during the design stages. The appropriate primary and foreign keys were all added as required. Appendix J shows the structure of the MySQL database.

The key elements that are not shown in the ERD are the data types. All primary and foreign keys are stored as integers and are auto increment, which means that when a new row of data is added the primary key for that row will be a new automatic number based of the current number of rows. Fields such as the usernames, first names, email addresses etc are all stored as variable character fields. Storing the information as variable character field means that the full length of the data can be stored, rather than limiting the size of the data to the maximum size of column in the case of 'char' type (mssqlcity.com, 2005).

Other data types used in the MySQL database include date and datetime. These are self-explanatory as they just store the current date or the date plus time on the server respectively.

Finally, the other significant data type is the field that stores the actual video clip. The video clip is stored within the MySQL database as a 'blob' data type. Blob stands for binary large object and is subsequently used to store binary data or strings (mysql.com, 2008). This is why the 'blob' type has been used for this project because it can store pure binary data that is unchanged by the database.

6.3.2 Registration System

It was decided in the requirements analysis that only register users could upload and view videos on the website, thus a registration system was developed. The registration system works in two ways. The first step sees the user fill out a form and then press the 'Register!' submit button. The PHP code then does some security checking (explained further in this chapter) before inserting the values into the database.

```
$createuser = mysql_query("INSERT INTO users (userid, username,
firstname, surname, email, password, datejoined) VALUES ( NULL,
'$UserRegNoSpaceCharacters', '$FNameNoSpaceCharacters',
'$SNameNoSpaceCharacters', '$EmailRegCheckNoSpace',
'$PasswordRegCheckNoSpaceCharacters', '$date')") or die(mysql_error());
```

Figure 2.7 – SQL code for registering a new user with the database

The figure above shows the SQL code that inserts the new user and the appropriate values into the database. This SQL code is executed at the end of the script after all security processing has taken place.

6.3.3 Login System

Once a user has successfully registered they may now login with the username and password they used during registration. The user will fill out the login form presented to them with their username and password before pressing the 'Submit' button. If the username and password are correct they are successfully logged in. Now they can view and upload videos. However, if the username and password do not match with the values in the database then they are redirected and presented with a 'Wrong Username or Password' message.

```php
$Username = $_POST['username'];
$Password = $_POST['passwordguess'];

include 'database.php';

$query = "SELECT userid, username, password FROM users WHERE
username = '$Username' AND password = '$Password'";
$result = mysql_query($query);

$row = mysql_fetch_array($result);

$UserID = $row["userid"];

if (mysql_num_rows($result) != 1) {
  header("Location: wrongpassword.php");

} else {
    session_start();
  $_SESSION['username'] = "$Username";
    $_SESSION['userid'] = "$UserID";
    $_SESSION['Authorised'] = "Y";
  include "userindex.php";
}
```

Figure 2.8 – SQL & PHP code for logging the user in

Figure 2.8 shows the SQL code in performing the above actions. First of all the POST values are assigned a variable name. Next a query is performed to check whether the values stored in the newly assigned variables match those in the database. If all is correct then session is started which confirms the user is authorised to view/upload videos. The session also stores the user's username and userid, which will be used for identification purposes during uploading and posting comments.

6.3.4 Upload System

The upload system works similar to that of the registration system. The user fills out the upload form and selects a WMV video file they would like to upload before pressing the 'Upload' button.

After the PHP script performs security checking, an SQL query inserts the values into the database. As discussed earlier in this chapter the video file is stored as a blob. The size of the file, its type and file name are all stored within the database.

```
if(isset($_POST['upload']) && $_FILES['userfile']['size'] > 0 && $_FILES['userfile']['size'] <= 1688207)
{

        $fileName = $_FILES['userfile']['name'];
        $tmpName  = $_FILES['userfile']['tmp_name'];
        $fileSize = $_FILES['userfile']['size'];
        $fileType = $_FILES['userfile']['type'];

        $fp = fopen($tmpName, 'r');
        $content = fread($fp, $fileSize);
        $content = addslashes($content);
        fclose($fp);
```

Figure 2.9 – PHP code for checking file size and assigning variable names

The figure above is the first major selection of PHP code executed after the user presses the 'Upload' button. First of all the PHP checks to see whether the size of the file uploaded is greater than 0 and equal or less than approx 1.5mb. The PHP code then assigns variable names to the filename, the temporary name for the server, file size and file type. It then checks to see whether the file can be opened and reads the length of the file in bytes.

If the file is within these boundaries the rest of the PHP script is performed such as security checking and eventually inserting the values into the database. Figure 3.0 shows the SQL query for inserting the values into the database.

```
$videouploadsuccess = mysql_query("INSERT INTO video (videoid, videoname, videotitle,
type, size, content, videodesc, tagone, tagtwo, tagthree, tagfour, dateuploaded, useridv,
categoryidv) VALUES ( NULL, '$fileName', '$Title', '$fileType', '$fileSize', '$content', '$Desc',
'$Tag1NoSpaceCharacters', '$Tag2NoSpaceCharacters', '$Tag3NoSpaceCharacters',
'$Tag4NoSpaceCharacters', '$date', '$UserID', '$Cat')") or die(mysql_error());
```

Figure 3.0 – SQL code for uploading a video

6.3.5   Viewing videos

The main system for selecting a video works by using the GET method. First of all the user is presented with the various categories of video. Once the user clicks on the category of video they would like to view, the PHP code uses the category id placed in the URL and selects all videos that have the same category id. Then a list of videos are presented on screen and the user can select the one they would like to watch. Again using the GET method via the URL, the PHP uses the videoid selected from the list to identify the correct video to play. Figure 3.1 shows how the action is performed in the SQL and PHP code when selecting a category (similar code when selecting a video).

```
$catid = $_GET['id'];

$query = mysql_query("SELECT * FROM video WHERE categoryidv='$catid'")
or die(mysql_error());

while($row = mysql_fetch_array($query)){
echo '<a href="viewvideos.php?id='.$row['videoid'].'">'.$row['videotitle'].'</a>';
echo '<br>';
```

Figure 3.1 – SQL & PHP code when selecting a video category

Subsequently, once a user has selected a video they are able to view the video plus are presented with information regarding the video, comments and the option to post comments themselves. The PHP and SQL code for viewing a video works in two parts. The first is via an external PHP file named 'videotype.php' here the file selects the chosen video (using it's id) and then tells the browser that the file is an WMV (Windows Media Video file) and then echo's the content, which is stored as a blob. This converts back the file from a blob and into a WMV.

```
<?
$videoid = $_GET['videoid'];
include 'database.php';
$result=mysql_query("SELECT * FROM video WHERE videoid = $videoid")
or die("Can't Perform Query");
$row=mysql_fetch_object($result);
Header( "Content-type: video/x-ms-wmv");
echo $row->content;
?>
```

Figure 3.2 – SQL & PHP code for viewing a video

The second part works by echoing out the 'videotype.php' file into an application that can play back the newly formed WMV files from the echoed blob. So in this case the application is the Windows Media Player. Though because the browsers Firefox and Internet Explorer handle the media player differently they have separate code for each. Nevertheless, the user can now view, pause and stop the video as required during the usability requirements analysis.

```
<object classid="clsid:6bf52a52-394a-11d3-b153-00c04f79faa6" type="application/x-oleobject" width="425" height="318" id="videocontrols">
 <param name="url" value="<?php While($row=mysql_fetch_object($result)) { echo "videotype.php?videoid=$videoid"; } ?>" />
 <param name="src" value="<?php echo "videotype.php?videoid=$videoid"; ?>" />
 <param name="autostart" value="true" />
 <param name="showcontrols" value="true" />
 <param name="uimode" value="mini" /></object>
 <!--[if !IE]><!-->
  </object><object type="video/x-ms-wmv" data="<?php echo "videotype.php?videoid=$videoid"; ?>" width="425" height="318" id="Player2">
  <param name="src" value="<?php echo "videotype.php?videoid=$videoid"; ?>" />
  <param name="autostart" value="true" />
  <param name="showcontrols" value="true" />
  <param name="uimode" value="mini" />
 </object>
 <!--<![endif]-->
```

Figure 3.3 – SQL & PHP code for viewing a video

The information about the video that is presented on screen is obtained by using a select statement to grad the data from the database. The select statement takes all of the information from the video and users table. It then uses an inner join so the username of the user can be identified from it's userid. This happens because due to database normalisation only the userid is stored when uploading or making comments on a video. Thus in order to identify the user properly, the userid stored in the video table is used to obtain the username from the users table.

```
$result=mysql_query("SELECT video.*, users.* FROM users INNER JOIN
video WHERE video.videoid = '$videoid' AND
users.userid = video.useridv") or die("Can't Perform Query");
```

Figure 3.4 – SQL & PHP code for viewing information about the video

6.3.6 Comments

Entering comments works much the same way as registering or uploading. The logged in user when viewing a video can fill out a small text box and submit comments. After some security checking has taken place the SQL code in figure 3.5 is performed. A comment id is created, plus the comment text, the date+time, the userid of the person posting the comment and the videoid of the video the comment is about, are all inserted into the database. The date and time function takes the current date plus time from the server. Subsequently, using a select statement the comments are then presented on screen, ordered by most recent first. Again by using an inner join the username of user is identified by the userid stored in the comments table.

```
$date = date("Y-m-d H:i:s");

$commentsuccess = mysql_query("INSERT INTO comments
(comid, commenttext, datetimecom, usercommentid, videocommentid)
VALUES ( NULL, '$ComPara', '$date', '$userid', '$videoid')")
or die(mysql_error());
```

Figure 3.5 – SQL & PHP code for viewing information about the video

The comments are paginated by using a PHP script studied and modified from an external website (referenced in code). The code limits the number of comments to three and then counts the number of rows in the database. When a user clicks on the next button the script calculates its current row position and selects the next three rows from the comments table.

6.3.7 Search

Search engines are a vast and complex subject and searching on the Internet is the key element of the user finding the information they want. Thus it was decided in the requirements analysis that a search option on the website should be included.

The search option on the website for this projects is performed using a select statement. The user first fills out a small text box and by using the GET method the text entered into the URL. Next the PHP and SQL obtain the entered string from the URL and then search the database for it. The search is performed by using the LIKE and OR statements. The query searches for the string in each row and if none exist it looks in the next row and so on. By using % sign at the beginning and end of the string entered by the user, the query will search for videos that contain the whole of that string. If a match is found the results are echoed out.

```php
$searchresult = $_GET['result'];

include 'database.php';

$query = mysql_query("SELECT * FROM video WHERE videotitle LIKE '%$searchresult%'
OR videodesc LIKE '%$searchresult%' OR tagone LIKE '%$searchresult%'
OR tagtwo LIKE '%$searchresult%' OR tagthree LIKE '%$searchresult%'
OR tagfour LIKE '%$searchresult%'") or die(mysql_error());

while($row = mysql_fetch_array($query)){
echo '<a href="viewvideos.php?id='.$row['videoid'].'">'.$row['videotitle'].'</a>';
echo '</br>';
}
```

Figure 3.6 – SQL & PHP code when searching for videos

6.4   Maintainability - CMS

Any website that has dynamic content such as video sharing websites; need an efficient method of maintaining the data and information on the site. Thus as stated in the requirements analysis a content management system (CMS) was implemented. The CMS allows the admin to manage videos, users, comments and the web page content. The admin is able to add, edit or delete under the selected option. In order to perform these takes the PHP and SQL code uses insert, update and delete statements.
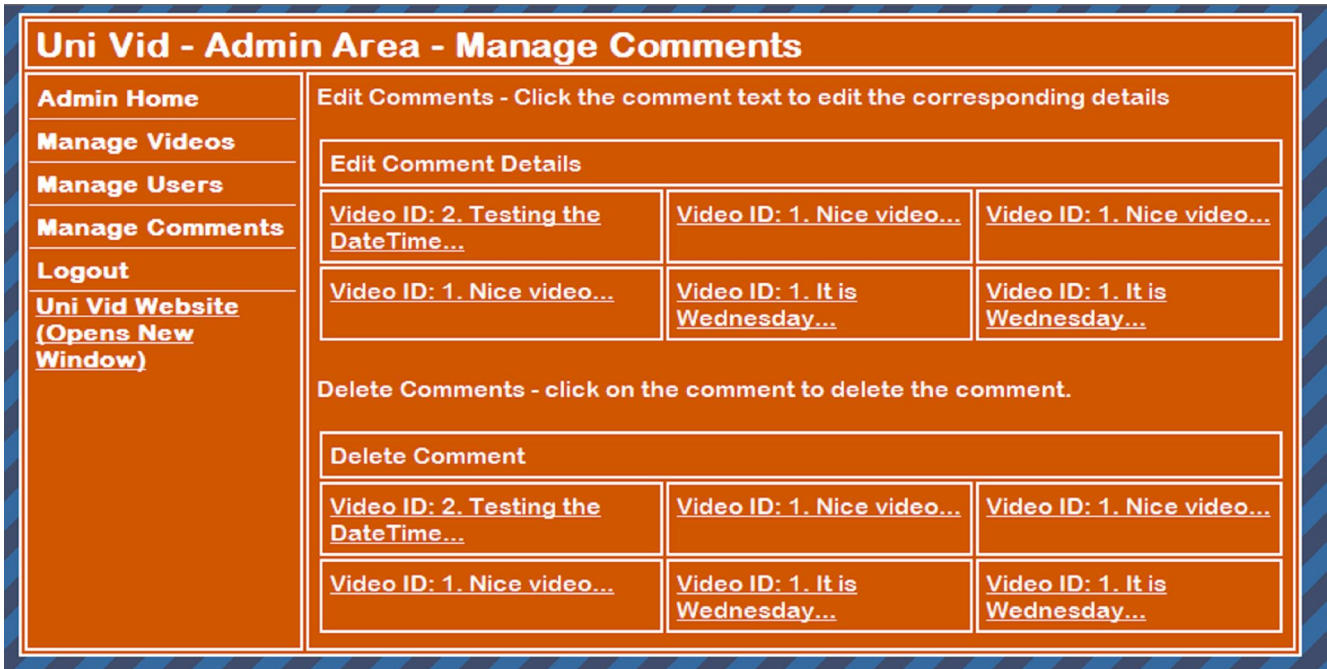
Figure 3.7 – Content Management System for Admin

The admin first selects which video they would like to delete (see figure 3.7) and then is presented with a confirmation message asking them whether they are sure they want to delete the video. If the admin selects 'Yes' and they are sure they want to delete the video then the code below is performed.

```
$videoname = $_GET['id'];

include 'database.php';

mysql_query("DELETE FROM video WHERE videoid = '$videoname'")
or die(mysql_error());
```

Figure 3.8 – SQL and PHP code for deleting a video

```
$updatevideo = mysql_query("UPDATE video SET videotitle='$Title', videodesc='$Desc',
tagone='$Tag1NoSpaceCharacters', tagtwo='$Tag2NoSpaceCharacters',
tagthree='$Tag3NoSpaceCharacters', tagfour='$Tag4NoSpaceCharacters'
WHERE videoid='$videopost'") or die(mysql_error());
```

Figure 3.9 – SQL code for updating the video's details

When the admin wants to update the details of the videos, they first select the desired video (see figure 3.7). They are then presented with the values of the video and the ability to edit them in a text form. Once the admin has finished updating the details of the video they click on the 'Edit Video' button and the new values are posted and the SQL code seen in figure 3.9 is performed.

6.5 Security & Validation

To ensure that the website was secure a number of security and validation methods were put in place. SQL injection is where user input is used to maliciously manipulate an SQL query to perform a different action. For example a hacker could manipulate an SQL query to get around the login system without a valid username and password (SecuriTeam, 2002). Thus in order to make the website for the project secure against SQL injection a number of different checks have been implemented.

MySQL and PHP specifically developed a piece of code to try and prevent SQL injection. The 'mysql_real_escape_string' code was implemented in the website to try and do so. The code 'escapes' special characters in a string that may be used maliciously. The next stage of security processing is to remove any space using 'str_replace'. Then finally the code 'preg_replace' removes all possibly malicious characters. So for example is the user entered this string as a first name:

(*James   /" " ''"   "/*) then the code below would remove/replace it with: *James*

```
$FName = mysql_real_escape_string($_POST['firstname']);
$FNameNoSpace = str_replace(' ', '', $FName);
$FNameNoSpaceCharacters = preg_replace("/[^a-zA-Z0-9]/", "", $FNameNoSpace);
```

Figure 4.0 – MySQL and PHP code for preventing SQL injection

The next step is to make sure that the string is not now empty after the above actions have taken place. So in order to perform this check the PHP code uses the 'empty' function (see figure 4.1). Subsequently if the string is empty then an error message is stored in an array. Then further down the script there are checks to see whether the array contains any error messages, if it does then the values are not inserted into the database and the user is presented with the appropriate message.

```
if (empty($FNameNoSpaceCharacters)) {
    $errormessage[] = 'Your First Name is empty, please enter your First Name.';
    }
```

Figure 4.1 –PHP to check whether the string is empty

There are further validation checks in place such as seeing whether the two passwords and email addresses entered are the same. This essentially compares the two values to see whether they are the same. Validation is also performed on the email addresses entered to see whether it is a valid University e-mail address. This check uses the 'eregi' function in PHP to confirm that the string is a valid University e-mail address by comparing the string with a set parameter. The final validation check also in place is to see whether a username already exists in the database. This operation compares the entered username with the values in the database and if the username already exists then it shows an error message.

6.6 Conclusion

The above chapter highlights exactly how the website was implemented and operates. The website began with no interactivity, just static XHTML code. Development of the interactivity allowed the website to meet the requirements as set earlier in the project.

With interactivity comes the responsibility to perform validation and security checks. Without these checks the website could easily be hijacked and used to performed malicious actions. However, security and validation checks have been put in place, thus the website should stop any efforts to compromise the true goal of viewing and sharing videos.

7 TESTING

7.1 Introduction

In order to understand whether the product functions as stated in the requirement analysis, testing was undertaken. The testing was done throughout the project development and the reasons behind this are highlighted in this chapter.

7.2 Test Strategy

It was decided at the beginning of the project that the chosen methodology would be the waterfall model (See Introduction). The key advantage of using the waterfall model is that testing is performed continuously throughout the project's development. However, this does not mean that the final testing of the product found below is meaningless. Final testing is crucial in order to find and fix any possible bugs or errors not picked up earlier in the development. In order to perform final testing of the product website a test plan and test log were devised.

7.2.1 Test Plan and Test Log

As the development of product has been ongoing, the code that makes up the website is known. Subsequently, white box testing is the chosen test strategy for this project. White box testing helps effectively test the website as the knowledge of internal coding is a prerequisite of this method. Thus the tester will already know the most effective methods and areas to test (Parekh, 2005). A test plan and test log allow for the documentation of the final testing and correct any outstanding problems.

Test No	Test Desc	Test steps	Test data used	Expected Result	Date of Test	Actual Results	Action Taken
1	Testing user & admin login	Enter no data on sign in page	None	"Wrong username or password" message	21:02:08	"Wrong username or password" message	None
2	Testing user & admin login with invalid data	Enter invalid username or password	Username: jamesu123 Password: abc123	"Wrong username or password" message	21:02:08	"Wrong username or password" message	None
3	Testing signup validation	Enter no data on signup page	None	Messages to ask user to enter data.	21:02:08	Messages to ask user to enter data.	None
4	Testing signup validation for taken username	Enter a username already taken	Jamesu2002	"JamesU2002 already exists" message	21:02:08	"Signup successful"	Correct signup code to show "already exists message"
5	Testing signup validation for taken username	Enter a username already taken	Jamesu2002	"JamesU2002 already exists" message	22:02:08	"JamesU2002 already exists" message	None

Test No	Test Desc	Test steps	Test data used	Expected Result	Date of Test	Actual Results	Action Taken
6	Testing login	Enter valid data for username	Username: jamesu123 Password: chelsea	Successful login	22:02:08	Successful login	None
7	Clicking on a popular video shows the correct video	Click on a video in the most popular list	Popular video list	Redirects to the popular video selected.	22:02:08	Redirects to the wrong video	Change the PHP 'POST' code to select right video.
8	Clicking on a popular video shows the correct video	Click on a video in the most popular list	Popular video list	Redirects to the popular video selected.	22:02:08	Redirects to the popular video selected.	None
9	No comments been posted on a video	Click on a video with no comments	Click on a video with no comments	"No Comments for this Video. Please add some!" message	22:02:08	"No Comments for this Video. Please add some!" message	None
10	User posts comment on a video	Enter text in the comment box	Comment entered on video	Comment is successfully added to video.	22:02:08	Comment is successfully added to video.	None
11	Test upload system	Enter no data on upload page	None	Messages to ask user to enter data.	22:02:08	Messages to ask user to enter data.	None
12	User tries to upload a video larger than 2MB	Try to upload a 3MB video file	3MB video file	Upload is not successful	22:02:08	Upload is successful	Add PHP check to see if video file is too large.

Test No	Test Desc	Test steps	Test data used	Expected Result	Date of Test	Actual Results	Action Taken
13	User tries to upload a video larger than 2MB	Try to upload a 3MB video file	3MB video file	Upload is not successful	23:02:08	Upload is not successful	None
14	Upload a valid video	Upload a valid video and data	Valid video file and data	Upload is successful	23:02:08	Upload is successful	None

Further tests were undertaken such as testing the search facility and the admin area. These tests reported no problem and those areas of the website were confirmed as operational. The above test plan and test log shows clearly that the website has been successfully tested to a high standard. Any issues that did arise from the testing were fixed and a second test was undertaken on the problem area to confirm that the issue was solved.

7.3   Valid XHTML & CSS Testing

In order to make the website as accessible and usable as possible it was recommended via research and during requirements analysis that the website be valid XHTML strict and valid CSS.

The website uses XHTML coding throughout the website and the majority of areas are validated by the W3C. However, there are some areas of the website that feature interactivity that could not meet the mark-up validation. Nevertheless, the most important page, the homepage, is fully complainant XHTML strict and valid CSS.
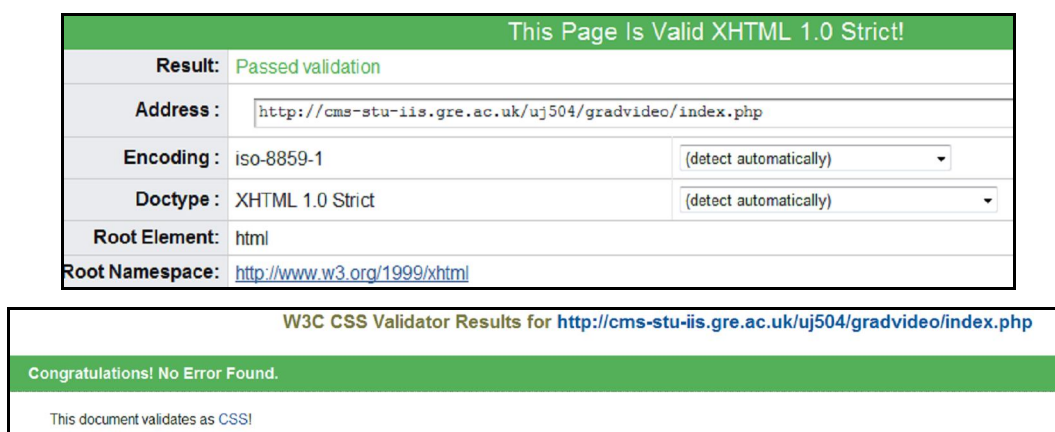
Figure 4.2 – Valid XHTML 1.0 strict & CSS confirmation message

7.4   Accessibility Testing

As stated in the literature review and the requirements analysis it was recommended that the website meet all Priority 1 guidelines as set by the W3C. Using online accessibility checkers the website for this project was able to meet the applicable Priority 1 guidelines. However, during the project development stages the online tool called Bobby or WebXact was bought by IBM and subsequently taken offline. Nevertheless, an accessibility checker on www.etre.com was used as well as the one mentioned in the literature review called WAVE.

Even though not listed in the requirements analysis the website has also been developed to meet Priority 2 guidelines. The only issue found by the Etre.com checker was a Priority 3 guideline. Despite passing the online checker if the website was to be released into the public domain then further accessibility tests would need to be undertaken.
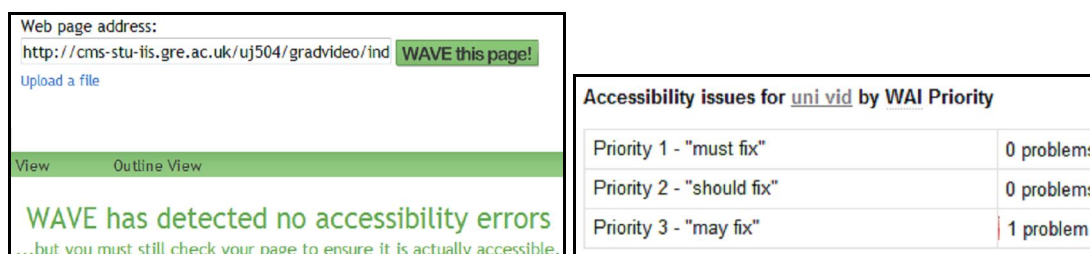
Figure 4.3 – WAVE & Etre.com accessibility checker finds no Priority 1 errors

7.5 User Testing

50 students undertook a questionnaire to obtain feedback on the finished website and the results are detailed below. The first question asked was to rate the areas of the website they most liked or disliked. The majority of the 50 students liked all areas of the website. However, there were mixed views about searching for videos, with many students stating they would like to see more details about the video rather than just the title when searching. Nevertheless, the majority of students were very favourable of the website.

The second question asked of the students was to list and any areas of the website they would improve. Amongst the suggestions were improvements of the search facility, more categories, the ability to rate videos and allow users to private message each other. Sample questionnaires and result graphs regarding the finished project website can be found in Appendix G & H.

7.6 Conclusion

Overall the testing has not only been successful but also worthwhile, as it has allowed the finding and fixing of problems on the website. Without testing it is clear that the website would not function as set out in the requirements analysis and would ultimately mean the project has been a failure. Nevertheless, the test plan and test log allowed any problems to be solved.

The accessibility testing throughout the project has also clearly helped. As discovered in the literature review it is no longer acceptable for websites to be inaccessible to any area of society. As highlighted in this chapter meeting Priority 1 & 2 guidelines has helped create a website that is accessible to as many users as possible. However, further accessibility testing and improvements could be made.

Yet there would be a certain limit to the amount of extra accessibility changes that could be made before the guidelines start to impact on the aesthetics of the website. Despite this the valid XHTML and CSS code that is used to make up the website helps create an accessible and usable website without impacting on design.

Probably the most important aspect of testing was user testing. This allowed the obtaining of feedback from the target audience on the finished website. It was clear the majority of students enjoyed visiting the website. It was suggested by the students that areas such as the search engine could be tweaked but this is down to personal preference. All requirements have been met and will be discussed further in the conclusion. The students also suggested extra functionality that could be included; this will be discussed in the next chapter, the evaluation.

8 EVALUATION

8.1 Introduction

After the completion of the project it is common practise to assess whether it was a success through an evaluation. The evaluation in this chapter will look at the website developed for this project, highlighting it's strengths, weaknesses via personal reflection and user feedback. Also the detailing of how the project could be taken forward via further work or development.

8.2 User Feedback

During the requirements analysis 50 University students were asked to fill in and return a questionnaire in order to better understand what the users would want on a video sharing website. A similar method was undertaken for the testing and evaluation phase of the project. Again 50 University students were asked to fill in and return a questionnaire but this time the questionnaire was aimed at obtaining feedback on the finished project website.

The questions continued on from the ones asked during user testing. Thus the third and penultimate question asked was whether they would suggest the website to friends and family if released to the public. 48 out of the 50 students asked said 'Yes' they would suggest the website to friends or family if released to the public. This is a very encouraging result and shows the website has pleased it's target audience.

The final question asked of the students was whether they believed the website could be as popular as YouTube. The results were mixed with 'Yes' and 'No' options both receiving 16 votes each and the 'Maybe' option receiving 18 votes. This result clearly shows that YouTube has a dominance over the market as the students did not seem convinced whether a new video sharing website could overtake it.

Sample questionnaires and result graphs regarding the finished project website can be found in Appendix G & H.

8.3 Strengths

The main strengths of the website is the fact that it has met all of the requirements as outlined earlier in the project report. However, there are some areas of the website that really stand out. The ability to view videos on the website is the first outstanding strength. The key to any video sharing website is to let users view videos and on this website they can do so. The videos are stored in a database and are subsequently selected for viewing when required by the user. This method was technically challenging and is certainly a positive aspect of the website.

Just as technically challenging was the ability to allow users to upload videos for others to view. This feature of the website took the longest to develop but was key in order for the website to be successful and meet the requirements. The user can upload a WMV video file and attach relevant information such as the title, description and search tags about the video.

Further strengths include the facility to post comments on videos. The students used for the questionnaires were particularly happy with this feature as they all felt it helped create a community within the website. Though the search facility could be refined, the fact it is included helps users easily find the videos they want. This helps increase usability as stated by Jakob Nielsen.

In terms of security the layers of checks and validation are certainly a strength of the website. The layers of security implemented would stop potential hackers if released to the public. Also the validation checks put in place when signing up or uploading will help increase usability and a better user experience. The validation stops users entering empty data into the database and also stops user's trying to register a username that is already taken.

Other strengths of the website includes it's design. The colour scheme and layout was one that appealed to the target market, students, and was the design chosen by them in the questionnaire results during the requirements analysis. The design is appealing to the eye but also accessible, functional and has a high level of usability. The above all equate to a strong argument for the positive side of the finished website.

8.4 Weaknesses

However, despite there being numerous strengths, there are also a number of weaknesses that could be improved on. The first weakness was one found during the early stages of the project. It was first highlighted in the literature review that to use a highly compatible video format such as Flash Video, which is installed on about 98% of PCs, would require the extra installation of a script or software on the server to allow uploading/converting.

This just was not feasible and thus the Windows Media Video format was adopted. The weakness here is the fact that it only works on the Windows operating system though there is some limited support for the Apple Mac OS. If released to the public the website would already have a limited support for only Windows machines and would most certainly anger the Mac and Linux community.

As the website only uses the Windows Media Video format for viewing videos, it also means that there is only one file type allowed for uploading. Again the WMV format is the only accepted video format for uploading. If a user wanted to upload a perfectly valid QuickTime or RealVideo the system would stop them.

Other weaknesses as highlighted by the students during the questionnaires were the search facility. The students suggested including more details than just the title when searching. This was a compromise in terms of loading times and fitting a larger list of videos on the screen. Nevertheless, the students highlighted it as an issue and thus is a weakness.

The final weakness is the lack of pagination on areas other than the comments. Pagination has been included on the comments because it is based around a simple select query whilst other areas of the website including the admin section have different queries that would need a different structure of coding to create pagination. The lack of pagination is a weakness of the website and if released to the public would require it.

8.5   Further work

The video sharing website developed for this project is fully complete in accordance with the requirements. However, there are still possible further developments that could take place.

The first in terms of security is password encryption. At present the passwords are stored as plain text, though not a high security risk it could have potential implications if a hacker tried to compromise the site. The most popular method of password encryption in PHP is by using md5. md5 takes the user entered string (in this case the password during registration) and calculates a hash for it. The hash turns it into 32-character hexadecimal number but when the user logs in with the string they entered during registration it still allows them because the hash is based around the original string.

Further developments could include the ability to allow other video formats during uploading and converting them into FlashVideo. As already stated Flash is highly compatible and by using this on the website would make it far more accessible to users on other operating systems. Storing the videos, as separate files on the server rather than within the database could also be a possible change as over time the database could slow down with all the videos stored in it. However, this change is subjective and not essential.

Functionality of the website could also be extended. The extra functionality could include the ability to rate videos, add favourite videos and private messaging. This would help increase the community feel of the website and as discovered during the literature review is a key element of video sharing websites.

8.6 Conclusion

The process of obtaining user feedback and the evaluation of the strengths and weaknesses is vital in any project. The user feedback helped list what the target market thought of the website and also helped list possible extra developments. The strengths and weaknesses helped critically evaluate the website. These activities all help decide whether the project met the objectives and requirements. This essentially helps determine if the project was a success or failure. The final stage of the project is to conclude and ultimately decide whether the project was a success.

9 CONCLUSION

9.1 Introduction

The final chapter of any good project is the conclusion. The conclusion in this chapter summaries the project process and a critical review of the project objectives. This chapter will also discuss how any problems were overcome before finally concluding the entire project.

9.2 Project Summary

During the spring of 2007 an early project subject area, title and summary were required. After much deliberation and careful thought the area of the video sharing websites was chosen. Websites such as YouTube were constantly in the news and this area of the Internet seemed the perfect choice for the project. The popularity, and advancements in technology meant the project would be an interesting and challenging area.

Early research and development was undertaken during the summer months of 2007. This helped grasp an early appreciation of the subject area. As required by the project proposal (see Appendix A) objectives were drawn up to highlight goals for the project. From the objectives a project plan was constructed to help set deadlines and milestones for the different areas of the project i.e. research, website development etc. The project plan helped enormously in keeping the objectives on track and on time. Without a plan the project would most certainly have failed.

The different research areas included current video sharing websites, usability, accessibility and video technologies. Each one of these research areas was critical in the development and success of the project.

Once the research was complete, the knowledge gained from it was used for the development of the website. Functional and non-functional requirement lists were produced to detail how the website should operate. The design and development stages were the most time consuming. The PHP coding and construction of the MySQL database was challenging but research, problem solving and patience helped complete the website.

The website was completed in advance of the deadline, leaving enough time for testing and the evaluation. The completed website underwent vast testing from the users and white box testing. Any problems were overcome and an evaluation of the user feedback plus the strengths and weaknesses were analysed.

9.3 Critical review of objectives & requirements

The objectives of the project were outlined at the beginning. The 7 objectives can be split into three sections; research, design/development and the evaluation/conclusion. Each objective was critical in the success of the project. The first objective was to research current video sharing websites, in order to better understand the requirements of such a website. Out of all the research areas this was the most crucial. This area aided in the requirements analysis stage and subsequently made an impact on how the website functions.

The second objective and third objective related to usability and accessibility respectively. These areas were very similar and there was a vast amount of material available about them. However, there was a clear lack of material relating directly to usability/accessibility and video sharing websites. This area clearly needs further studies and research as the majority of current material relates to static content websites. Nevertheless, the research was vital in making the website accessible and usable to as many users as possible.

The final research area was regarding video technologies. As this is a critical review it can be suggested that this area was slightly meaningless. This is because the result was already pre-determined as there was only ever going to be on choice of video formats used on the website. The reasons behind this have been discussed in the main body of the report. However, if installing extra software or scripts on the server were feasible then this area of research would in fact be vital.

The design and development objectives were the most demanding and time consuming but also the most satisfying. Seeing the website progress through the various stages from prototypes to the finished functional website was rewarding. The coding and construction of the website was tough. The upload functionality was the most difficult area to complete. This functionality took the longest to complete but was also the most essential as it meant the website could accurately be called a video sharing website.

However, that is to not say there were no problems or issues. These will be further discussed in the next section of this chapter. Yet despite the problems, the finished website functions as first envisaged and has met all of the requirements.

9.4 Problem Solving

As previously mentioned, a number of issues arose during the project. The first real issue was with the server the website would be located on. The IIS server originally did not allow uploads but after discussion with the project supervisor uploads were enabled. This delayed the development of the upload functionality but as the project plan and the waterfall methodology were in place the delay had minimal impact. A slight change of the project plan and working on the development of other areas of the website meant that project stayed on track.

Further problem areas occurred during the development of the website. Taking note of any error message and debugging the code overcame coding and database issues. If the problem still remained then research and advice helped overcome obstacles.

9.5 Conclusion

Overall, the project was a success; it meets all objectives and requirements. The website allows users to view and upload videos plus comment and search for them. The website can be easily maintained by the admin with the content management system put in place.

However, the evaluation shows that there were areas of weakness that could be improved on. The evaluation also highlights possible areas of extra development that could potentially increase the popularity and security of the website. Nevertheless, the project has been challenging but also exciting and inspiring. The help from the project supervisor and lecturers was also vital. It has taken hard work and dedication to complete the project and now it is complete, is something to be proud of.

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APPENDIX A -   Project Proposal

Overview

It has become increasingly popular in recent years for people to share their social life with millions of other people on the Internet. Social Networking and Video Sharing websites have allowed people to express, create and communicate all of their inner most thoughts.

The inspiration of the project comes from this popularity and also the fact there are no specific video sharing websites aimed at University students.

The research for the project will be aimed towards comparing and evaluating other video sharing websites. Further research areas will include usability, accessibility and the technologies behind such a website.

The aim of the project is to design, develop and implement a video sharing website designed for University Students. The website will have content management qualities allowing the website to be maintained via an Intranet.

In order to evaluate whether the project has been successful a questionnaire will be created and given to University students to answer. The questionnaire will allow feedback to be given on the website and allow the analysis of the results.

1. Objectives

Objective 1 – Research current video sharing websites

- Visit current Video Sharing Websites.
- Critical Analysis of current Video Sharing Websites.
- Compare and Contrast current Video Sharing Websites.
- **Deliverable** – Chapter on Video Sharing Websites

Objective 2 – Research how usability affects Video Sharing Websites

- Research usability reports, articles and guidelines.
- Analyse usability guidelines.
- State how usability guidelines will be applied to the project.
- **Deliverable –** Chapter on usability

Objective 3 – Research how accessibility affects Video Sharing Websites

- Research accessibility reports, articles and guidelines.
- Analyse accessibility considerations and guidelines.
- State how accessibility will be considered and applied to the project.
- **Deliverable** – Chapter on accessibility

Objective 4 – Research the video technologies used on a Video Sharing Websites

- Research what video technologies are used/available for such a project.
- Critical Analysis of these video technologies used/available.
- Compare and Contrast these video technologies used/available.
- **Deliverable** – Chapter on video technologies

Objective 5 – Design, Develop, Implement and Test a Video Sharing Website

- Design the website which incorporates the findings from the research.
- **Deliverable –** Prototype website designs and storyboards
- Develop the website to allow users to register, upload videos, remove their own videos, post comments and contact the website administrators.
- Develop a backend content management system, allowing staff to edit and remove videos, comments and users. Allow staff to reply to user questions and comments.
- **Deliverable** – Completed Website
- Develop a MySQL database to store the above information, allowing the website to function.
- **Deliverable –** Completed Database and ERD
- Test the Video Sharing website for bugs and errors, making appropriate changes.
- **Deliverable –** Test Plan and Test Log
- Implement the working Video Sharing website on the web server.

Objective 6 – Research the video technologies used on a Video Sharing Websites

- Evaluate the finished website to see whether requirements have been met.
- Obtain Feedback from University students via a questionnaire.
- Input results into graphs and charts.
- **Deliverable** – Evaluation Chapter

Objective 7 – Research the video technologies used on a Video Sharing Websites

- Analysis of student feedback from questionnaires.
- Review of the met objectives.
- Statement on recommendations for improvements.
- Analyse possible further work that could develop the website.
- **Deliverable** – Conclusion Chapter

2. Relevance to Programme and courses

My programme of study - BSc (Hons) Multimedia and Internet Technology, has given me the knowledge and skills to develop a video sharing website. The degree as stated in it's title, focuses on both Multimedia and Internet technologies.

The degree programme includes a number of courses which are relevant and will help contribute to the project.

Course	Key Languages and Skills
Visual Studies and Web Media	XHTML, CSS, JavaScript, Web Accessibility.
Web Technologies	XHTML, CSS, PHP, SQL, Databases, JavaScript, XML, Testing, Usability, Web Accessibility.
Information Systems Development	Project Management. Legal, Social and Ethical Issues. Key Methodologies, UML.
Multimedia Production II	Video Formats.
Design for Interaction	Usability, User interface design, Human Computer Interaction
Digital Creativity & Multimedia Futures	Research into future multimedia and Internet developments. Stimulation of a Creative thought process.

3. Legal and Ethical Issues

Copyright:

It is currently planned not to use copyright material on the website. However, if the situation changes and copyright material such as photos and videos are required then action would be taken. Action such as contacting the copyright owner and asking for permission before using the material.

Accessibility:

Accessibility is a key issue of this project and the utmost action will take place in order to meet the current guidelines on the developed website. The W3C Accessibility guidelines will be followed as best possible and constant testing with the use of Bobby (online accessibility test for websites) will allow the website to be developed without discrimination.

4. Resources

Hardware:

Computer – University of Greenwich labs and Personal Computer

Software:

Macromedia Dreamweaver

Adobe Photoshop CS2

Microsoft Word

Microsoft Project

Internet Explorer

Mozilla Firefox

5. Initial References

Journal articles:

Adriana J. Berlanga, Peter B. Sloep, Francis Brouns, Peter van Rosmalen, Marlies E. Bitter-Rijpkema & Rob Koper (2007) *Functionality For Learning Networks: Lessons Learned From Social Web Applications* Open University of the Netherlands

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Xu Cheng, Cameron Dale, Jiangchuan Liu (2007) *Understanding the Characteristics of Internet Short - Video Sharing: YouTube as a Case Study* School of Computing Science, Simon Fraser University, Burnaby, BC, Canada

Books:

Andy Budd, Cameron Moll, Simon Collison (2006) *CSS Mastery: Advanced Web Standards Solutions* APress, US

Powers, David (2006) *PHP Solutions: Dynamic Web Design Made Easy* APress, US

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Websites:

PHP.net

http://www.php.net/

MySQL.com

http://www.mysql.com/

World Wide Web Consortium

http://www.w3.org/

6. Critical Success Factor

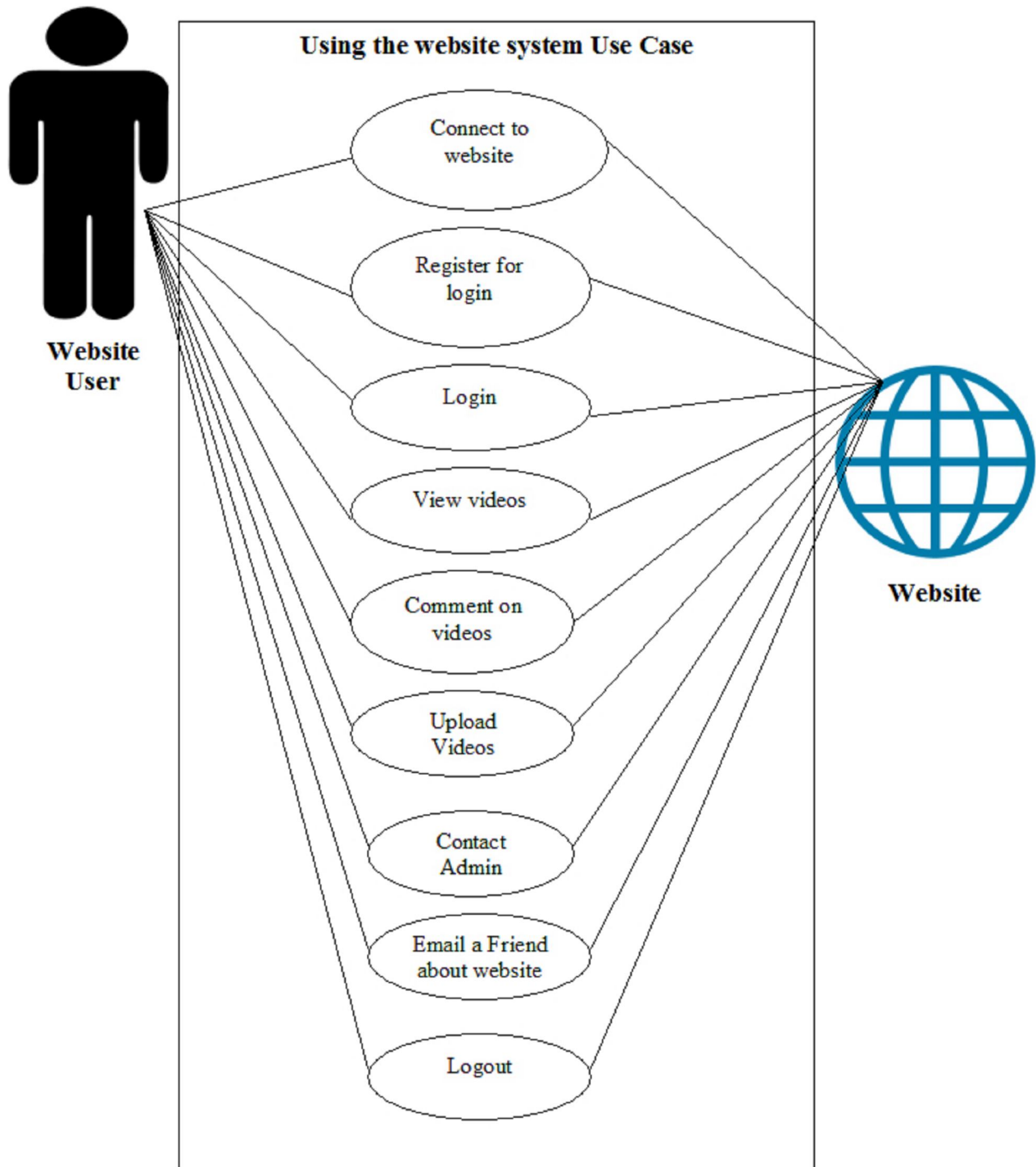|	Factors	Likelihood	Impact	Action Required
1	Being Absent	Low	High	If I were to fall sick then immediate changes would have to be made to the Project Plan. Workload would have to be ordered in terms of priority.
2	No Access to Computer	Low	High	If it were not possible to access a Computer then immediate action would have to be undertaken to find one.
3	No Access to the Internet	Medium	Medium	If for whatever reason it is not possible to access the Internet the project can still function. During the period without the Internet then work can take place on reports and other written material.
4	Website Problems	Medium	Low	If there are coding or other such problems with the website then debugging and further testing will take place.
5	Not meeting Project Plan	Medium	High	If the project is failing to meet the Project Plan deadlines then work will be prioritised and lesser urgent items will be put back and.
6	Quality Assurance Issues	Low	High	If the quality of the Project is at risk then work levels must increase to correct the problems with quality.
7	Research and study of new technical languages, guidelines, software etc.	Low	Medium	If there were problems with studying new technical languages, guidelines, software etc then action would take place. Further research via books, journals, articles and the Internet should help rectify this problem.
8	Supervisor Absent	Low/ Medium	Medium	If the Supervisor is absent when required for discussion then rearrangements would be made to visit at a suitable time. If the Supervisor is absent for an extended period of time then the Project Coordinator would be contacted.

APPENDIX B - Project Plan

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ID	Task Name	Duration	Start	Finish
1	James Underwood - Project	138 days	Thu 04/10/07	Mon 14/04/08
2	Initiating	7 days	Thu 04/10/07	Mon 15/10/07
3	Produce a Project Plan/GANTT Chart	1 day	Thu 04/10/07	Thu 04/10/07
4	Produce a CPN Diagram	1 day	Fri 05/10/07	Fri 05/10/07
5	Project Proposal	7 days	Thu 04/10/07	Mon 15/10/07
6	Produce first draft	1 day	Thu 04/10/07	Thu 04/10/07
7	Submit first draft & Agree changes	1 day	Wed 10/10/07	Wed 10/10/07
8	Modify first draft	1 day	Thu 11/10/07	Thu 11/10/07
9	Submit final Project Proposal	0 days	Mon 15/10/07	Mon 15/10/07
10	Research - Objectives 1,2,3,4	27 days	Thu 04/10/07	Fri 09/11/07
11	Visit current Video Sharing Websites	7 days	Thu 04/10/07	Fri 12/10/07
12	Critical Analysis of current Video Sharing Websites	7 days	Thu 04/10/07	Fri 12/10/07
13	Compare and Contrast current Video Sharing Websites	7 days	Wed 24/10/07	Thu 01/11/07
14	Research usability reports, articles and guidelines	7 days	Thu 04/10/07	Fri 12/10/07
15	Analyse usability guidelines	5 days	Mon 15/10/07	Fri 19/10/07
16	State how usability guidelines will be applied to the project	5 days	Mon 22/10/07	Fri 26/10/07
17	Analyse accessibility considerations and guidelines	5 days	Mon 29/10/07	Fri 02/11/07
18	State how accessibility will be considered and applied to the project	5 days	Mon 05/11/07	Fri 09/11/07
19	Research video technologies	7 days	Thu 04/10/07	Fri 12/10/07
20	Critical Analysis of video technologies	7 days	Mon 15/10/07	Tue 23/10/07
21	Compare and Contrast video technologies	7 days	Wed 24/10/07	Thu 01/11/07
22	Design - Objective 5	16 days	Thu 04/10/07	Thu 25/10/07
23	Produce early website designs	14 days	Thu 04/10/07	Tue 23/10/07
24	Obtain feedback on website designs	1 day	Wed 24/10/07	Wed 24/10/07
25	Choose final design for development	1 day	Thu 25/10/07	Thu 25/10/07
26	Development - Objective 5	69 days	Thu 01/11/07	Tue 05/02/08
27	Code website X+HTML & CSS	25 days	Thu 01/11/07	Wed 05/12/07
28	Develop a MySQL database	25 days	Thu 01/11/07	Wed 05/12/07
29	Code User-end PHP elements of website	44 days	Thu 06/12/07	Tue 05/02/08
30	Allow users to register	44 days	Thu 06/12/07	Tue 05/02/08
31	Allow users to upload videos	44 days	Thu 06/12/07	Tue 05/02/08
32	Allow users to remove own videos	44 days	Thu 06/12/07	Tue 05/02/08
33	Allow users to post comments	44 days	Thu 06/12/07	Tue 05/02/08
34	Allow users to contact administrators	44 days	Thu 06/12/07	Tue 05/02/08
35	Code Staff-end PHP elements of website	42 days	Thu 06/12/07	Fri 01/02/08
36	Allow staff to remove videos	42 days	Thu 06/12/07	Fri 01/02/08
37	Allow staff to edit & remove users	42 days	Thu 06/12/07	Fri 01/02/08
38	Allow staff to edit & remove comments	42 days	Thu 06/12/07	Fri 01/02/08
39	Allow staff to reply to users questions	42 days	Thu 06/12/07	Fri 01/02/08
40	Implement - Objective 5	1 day	Mon 04/02/08	Mon 04/02/08
41	Upload website to servers	1 day	Mon 04/02/08	Mon 04/02/08
42	Testing - Objective 5	7 days	Tue 05/02/08	Wed 13/02/08
43	Produce a Test Plan	1 day	Tue 05/02/08	Tue 05/02/08
44	Record testing in Test Log	3 days	Wed 06/02/08	Fri 08/02/08
45	Make appropriate changes	3 days	Mon 11/02/08	Wed 13/02/08
46	Evaluate - Objective 6	9 days	Wed 13/02/08	Mon 25/02/08
47	Evaluate the finished website	5 days	Wed 13/02/08	Tue 19/02/08
48	Obtain Feedback from University students via a questionnaire	5 days	Wed 13/02/08	Tue 19/02/08
49	Input results into graphs and charts	2 days	Fri 22/02/08	Mon 25/02/08
50	Conclusion - Objective 7	7 days	Tue 26/02/08	Wed 05/03/08
51	Analysis of student feedback from questionnaires	1 day	Tue 26/02/08	Tue 26/02/08
52	Review of the next objectives	7 days	Tue 26/02/08	Wed 05/03/08
53	Statement on recommendations for improvements	7 days	Tue 26/02/08	Wed 05/03/08
54	Analyse possible further work	7 days	Tue 26/02/08	Wed 05/03/08
55	Initial Report	18 days	Wed 31/10/07	Mon 26/11/07
56	Produce first draft	10 days	Wed 31/10/07	Tue 13/11/07
57	Submit first draft & Agree changes	1 day	Wed 14/11/07	Wed 14/11/07
58	Modify first draft	3 days	Thu 15/11/07	Mon 19/11/07
59	Submit second draft & Agree changes	1 day	Tue 20/11/07	Tue 20/11/07
60	Modify second draft	2 days	Wed 21/11/07	Thu 22/11/07
61	Submit final Initial Report	0 days	Mon 26/11/07	Mon 26/11/07
62	Interim Report	21 days	Mon 07/01/08	Mon 04/02/08
63	Produce first draft	12 days	Mon 07/01/08	Tue 22/01/08
64	Submit first draft & Agree changes	1 day	Wed 23/01/08	Wed 23/01/08
65	Modify first draft	4 days	Thu 24/01/08	Tue 29/01/08
66	Submit second draft & Agree changes	1 day	Wed 30/01/08	Wed 30/01/08
67	Modify second draft	2 days	Thu 31/01/08	Fri 01/02/08
68	Submit final Interim Report	0 days	Mon 04/02/08	Mon 04/02/08
69	Final Report	35 days	Wed 23/01/08	Wed 11/03/08
70	Produce first draft	20 days	Wed 23/01/08	Tue 19/02/08

Legend: Task · Split · Progress · Milestone · Summary · Project Summary · External Tasks · External Milestone · Deadline

ID		Task Name	Duration	Start	Finish
71		Submit first draft & Agree changes	1 day	Wed 20/02/08	Wed 20/02/08
72		Modify first draft	5 days	Thu 21/02/08	Wed 27/02/08
73		Submit second draft & Agree changes	1 day	Thu 28/02/08	Thu 28/02/08
74		Modify second draft	5 days	Wed 05/03/08	Tue 11/03/08
75		Submit Final Report	0 days	Tue 11/03/08	Tue 11/03/08
76		Demonstration	1 day	Mon 14/04/08	Mon 14/04/08
77		Demonstrate Product	1 day	Mon 14/04/08	Mon 14/04/08
78		Project Complete	0 days	Mon 14/04/08	Mon 14/04/08

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APPENDIX C - Content Analysis Table of Video Sharing Websites

Content Analysis of Video Sharing Websites

Video Sharing Website:	Navigation Position	Free Viewing	Registration Required to Upload	Upload Video Max File Size	Upload Video Max Length	Upload Video File Types	Video Categories	Most Popular/Recent Videos	Able to Comment on Videos	Able to Rate Videos	Video Codec Used
YouTube	Top, Left & Right	Yes	Yes	100MB or 1GB with Installed Application	10 minutes	WMV, AVI, MOV, & MPG	Yes	Yes	Yes – if Users allows	Yes	Flash
Google Video	Top & Right	Yes	Yes	100MB or unlimited with Installed Application	Not stated	AVI, MPEG, MOV, RealVideo, WMV	Yes	Yes	Yes – Users allows	Yes	Flash
Daily Motion	Top & Right	Yes	Yes	150MB	20 minutes	MP4, MOV, WMV, WMV & AVI	No - videos separated into Channels	Yes	Yes – if Users allows	Yes	Flash

Information and Analysis researched from: http://www.youtube.com/; http://video.google.co.uk; http://www.dailymotion.com

APPENDIX D -   UML – Use Case

Using the website system Use Case

Website User

Connect to website

Register for login

Login

View videos

Comment on videos

Upload Videos

Contact Admin

Email a Friend about website

Logout

Website

APPENDIX E -   Sample Requirements Questionnaire

Video Sharing Websites Questionnaire

1. Which video sharing website do you visit most often?

☑ YouTube ☐ GoogleVideo ☐ DailyMotion

Other:_____

2. How did you hear about your favoured video sharing website?

☑ Internet ☐ Magazine ☐ Newspaper ☐ Friend/Family

Other:_____

3. Why do you visit your favoured video sharing website?

☑ Widest choice ☐ Easiest to use ☐ Highest quality video

Other:_____

4. Please tick the following features of a video sharing website which you think are most important.

☐ Rate Videos ☑ Comment on Videos ☑ Search for Videos
☐ Choice of videos ☐ Quality of Videos

5. Are there any other features you believe are important in a video sharing website? If so, please state below:

The removal of Spam or fake videos quickly. A list of the most popular videos and categories of videos.

6. From the three designs shown below, please tick the one you like the most:

1. [ ]

2. [ ]

3. [✓]

Please state why you like one of the designs above:

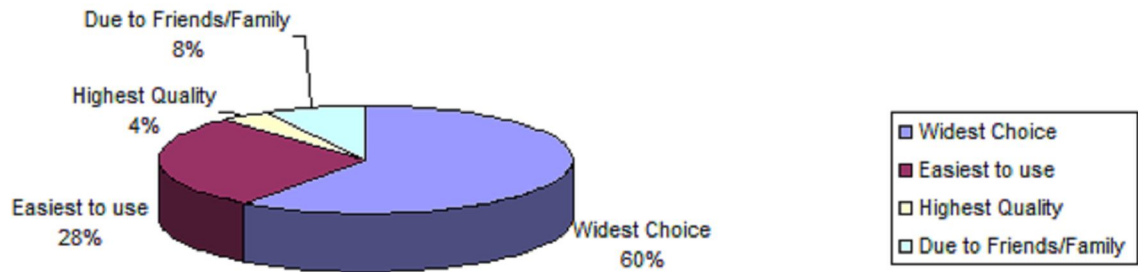_Nice fresh colours, clean, looks easy to use. I like the banner at the top._

Thank you for taking the time to answer this questionnaire
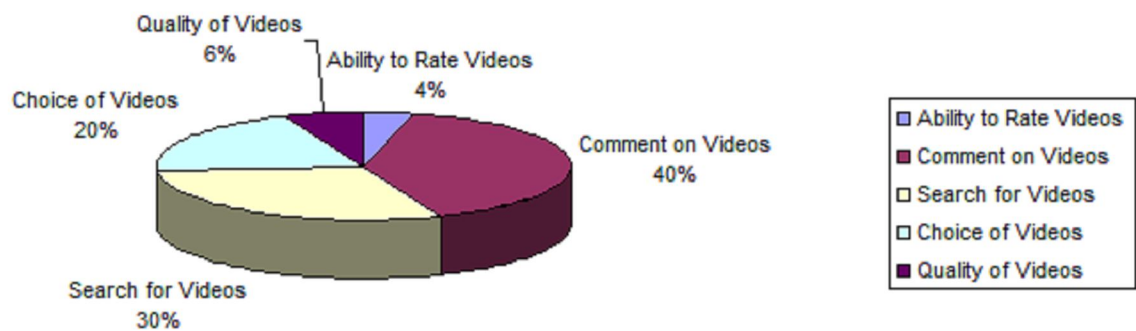
Regards,
James Underwood

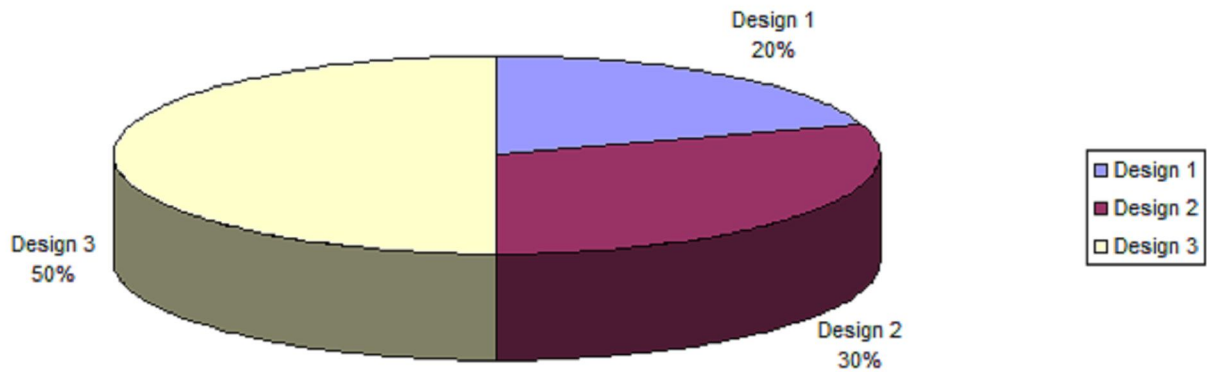# APPENDIX F - Questionnaire Requirements Results

1. Which video sharing website do you visit most often?

- Daily Motion 4%
- Google Video 2%
- YouTube 94%

Legend:
- YouTube
- Google Video
- Daily Motion

2. How did you hear about your favoured video sharing website?

- Friend/Family 14%
- Advert 2%
- Newspaper 20%
- Magazine 4%
- Internet 60%

Legend:
- Internet
- Magazine
- Newspaper
- Friend/Family
- Advert

3. Why do you visit your favoured video sharing website?

Due to Friends/Family
8%

Highest Quality
4%

Easiest to use
28%

Widest Choice
60%

- Widest Choice
- Easiest to use
- Highest Quality
- Due to Friends/Family

4. Please tick the following features of a video sharing website which you think are most important.

Quality of Videos
6%

Ability to Rate Videos
4%

Choice of Videos
20%

Comment on Videos
40%

Search for Videos
30%

- Ability to Rate Videos
- Comment on Videos
- Search for Videos
- Choice of Videos
- Quality of Videos

Design 1
20%

Design 3
50%

Design 2
30%

Design 1
Design 2
Design 3

5. Are there any other features you believe are important in a video sharing website? If so, please state below:

Results included:

Contact Admin

Categories

Removal of offensive videos

List of the most popular videos

Help section

Video Sharing Website Feedback Questionnaire

1. After testing the new University student specific video sharing website, please rate from 1-5 (1 being the best and 5 being the worst) which part of the website you liked or disliked the most:

[1] Design [1] Ease of use [2] Viewing videos [3] Searching videos
[2] Commenting on videos

2. If you could improve the website at all please state how and where:

Improve the search to include a preview of the video. Let users private message each other so we can chat.

3. Would you visit the website and suggest it to friends if released to the public?

Yes ☑   No ☐   Maybe ☐

4. Do you think the website could be as popular as the likes of YouTube?

Yes ☐   No ☐   Maybe ☑

Thank you for taking the time to answer this questionnaire

Regards,
James Underwood

APPENDIX H -   Questionnaire Testing Results

1. After testing the new University student specific video sharing website, please rate from 1-5 (1 being the best and 5 being the worst) which part of the website you liked or disliked the most:

Results included:

Design – Liked

Ease of use – Liked

Viewing videos – Liked

Searching Videos – Mixed

Commenting on Videos – Liked

2. If you could improve the website at all please state how and where:

Results included:

Improve search engine, have more categories, allow users to contact each other with private messages, rating system for videos.

3. Would you visit the website and suggest it to friends if released to the public?

No 0%
Maybe 4%
Yes 96%

Yes
No
Maybe

4. Do you think the website could be as popular as the likes of YouTube?

Maybe
36%

Yes
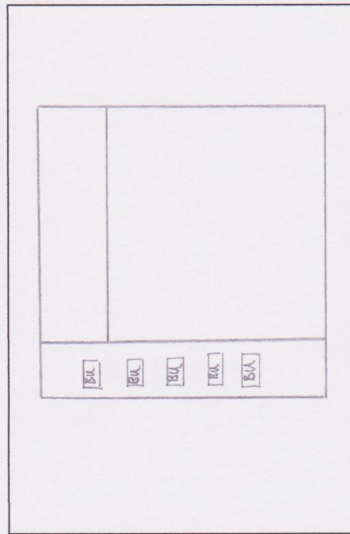32%

No
32%
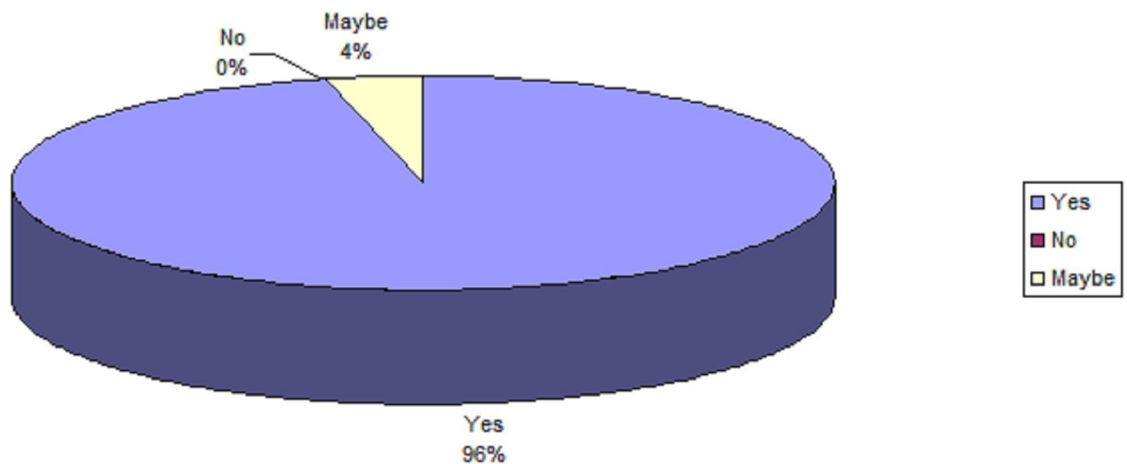
Yes
No
Maybe
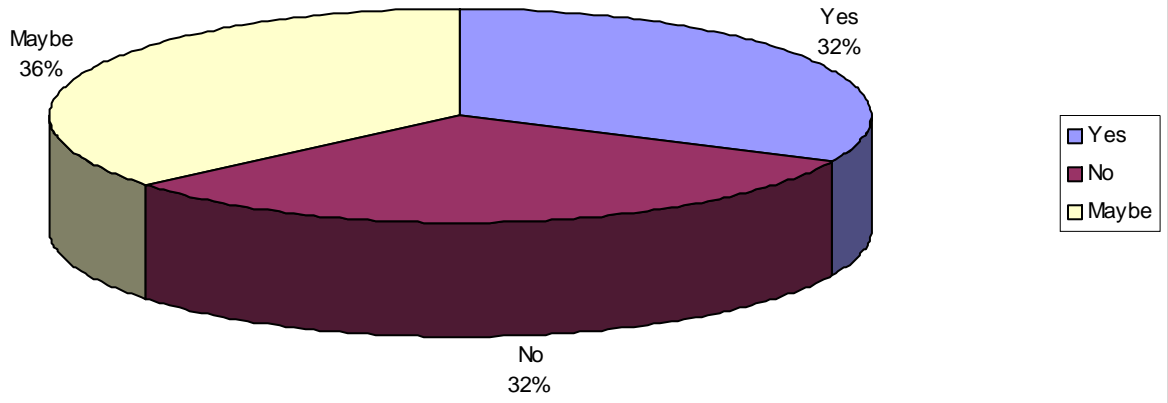
APPENDIX I -   Storyboard
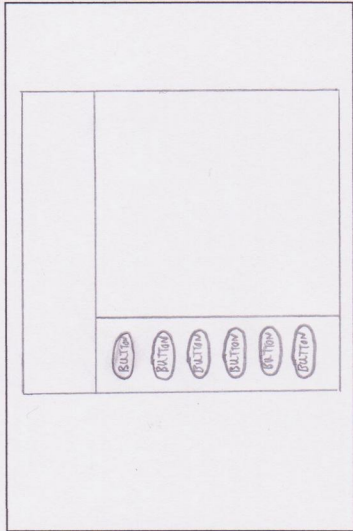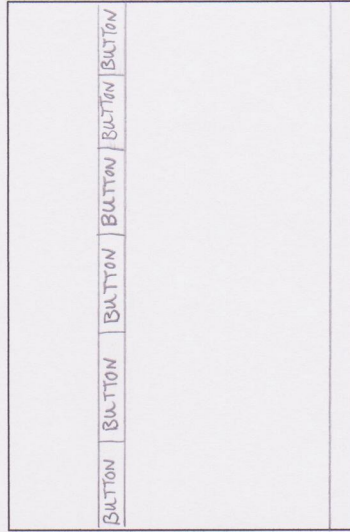
Design 1: FIXED SIZE -
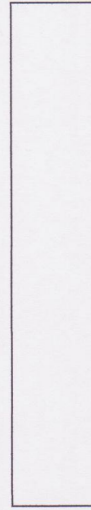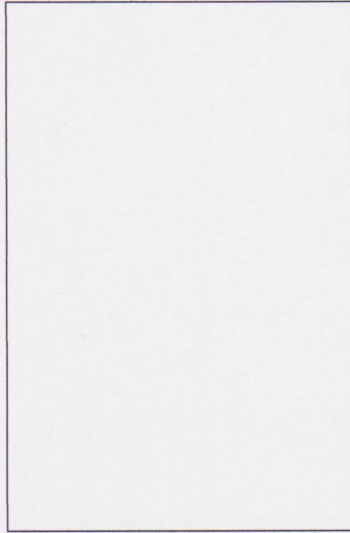ROUNDED NAVIGATION LEFT
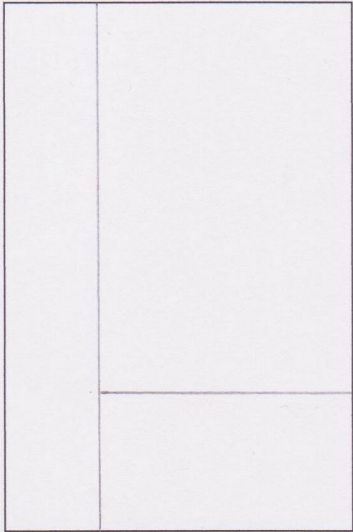
Design 2: LIQUID LAYOUT -
NAVIGATON LEFT
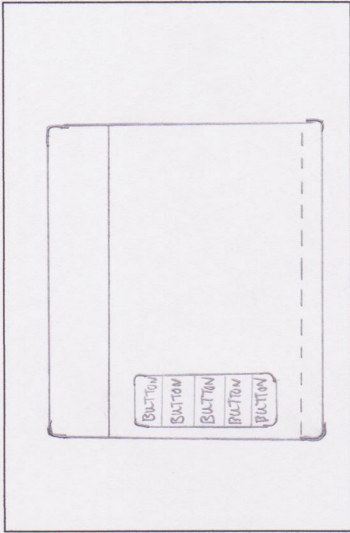
Design 3: FIXED SIZE -
FLOATING NAVIGATION LEFT

Design 4: FIXED SIZE
NAVIGATION LEFT, SQUARE BUTTONS

Design 5: LIQUID LAYOUT
NAVIGATION TOP/BOTTOM

BUTTON BUTTON BUTTON BUTTON BUTTON

APPENDIX J -   Entity Relationship Diagram

video

1

videoid
videoname
videotitle
type
size
content
videodesc
tagone
tagtwo
tagthree
tagfour
dateuploaded
useridv
categoryidv

users

1

userid
username
firstname
surname
email
password
datejoined

category

categoryid
categoryname

comments

comid
commenttext
usercommentid
videocommentid

videolog

logid
videoidlog

admin

adminid
adminusername
adminfirstname
adminsurname
adminemail
adminpassword
adminprivallegelevel

webpagetext

pageid
webpagename
webpagetext
datelastedit

Relationships: Key – PK (Primary Key), FK (Foreign Key)

PK videoid – FK videocommentid
PK videoid – FK videoidlog
PK userid – FK useridv
PK userid – FK usercommentid
PK categoryid – FK categoryidv