HONOURS PROJECT REPORT

School of Rock Art: Guided Tours

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	Category	Min	Max	Chosen
1	Requirements Analysis and Design	0	20	15
2	Theoretical Analysis	0	25	0
3	Experiment Design and Execution	0	20	15
4	System Development and Implementation	0	15	10
5	Results Findings and Conclusion	10	20	10
6	Aim Formulation and Background Work	10	15	10
7	Quality of Report Writing and Presentation	10		10
8	Adherence to Project Proposal and Quality of Deliverables	10		10
9	Overall General Project Evaluation	0	10	0
Total		**80**		**80**

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Abstract

The School of Rock Art is a website that was designed to be an educational tool based on rock art. The rock art was provided by the Archaeology Department of the University of Cape Town. The website has three components, namely the Cave Navigation, Story Telling and Guided Tours. This report discusses the design and implementation of the guided tours component of the website. The site includes features that allow the users to create a guided tour and view a guided tour. The tours that will be designed will be used to educate learners using rock art data that exists on the website. It further discusses the results of the evaluation done.

Acknowledgements

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Chapter 1

Introduction

1.1 Problem Outline

The preservation of rock art in South Africa remains an important issue within communities that deal with the preservation of cultural history. The Archaeology Department at the University of Cape Town is one such body of academics. A large database of images existed and was kept in the department, but was not put to any use. Like many who are interested in preserving rock art, the Archaeology Department was attempting to find new ways to make the database useful and ensure that someone was using it, as opposed to having the data lie dormant within the department. The Archaeology Department specifically wanted the data to be used within educational environments. The idea would be to use the data to educate scholars about rock art and to educate them using rock art. The data would also need to be usable and useful to academics in providing this information to scholars and using the data for their own research.

1.2 Proposed Solution

A proposed solution would be to provide the department with a website that makes use of the data for educational purposes. The website allows the user to view the data locally and only retrieve the data that is needed at that time. The proposed website designed was entitled 'The School of Rock Art'. The point of the title was to focus the user's attention on the educational aspect of the design. The website has three main components. These are outlined below.

- Guided Tours: Developed by Marco Lawrence, this component is discussed in this report.

- Cave Navigation: Developed by Kaitlyn Crawford, this component would allow users to navigate 3D models of the cave scans that were taken by the Archaeology Department.

- Story Telling: Developed by Joanne Marston, this component would allow users to read stories written by bushmen as well designing the look-and-feel of each of the stories.

Each of these components made use of the data provided by the department so as to provide an educational website that could be used by scholars and academics alike. This

report outlines the design and evaluation of the Guided Tours component of the website. The design of the guided tours component focussed on the following research question:

1.2.1   Research Question

Is it possible to build a usable and useful guided pathway system to promote learning?

1.2.2   Overview of Methodolgy

The website made use of a user-centred design. The iterations of the system were evaluated by users and this motivated the design of the next iteration. The final system was evaluated by users and the findings were recorded and outlined in this report. Figure 1.1 illustrates the components of the system and how they interact with the rock art data on the simba server.
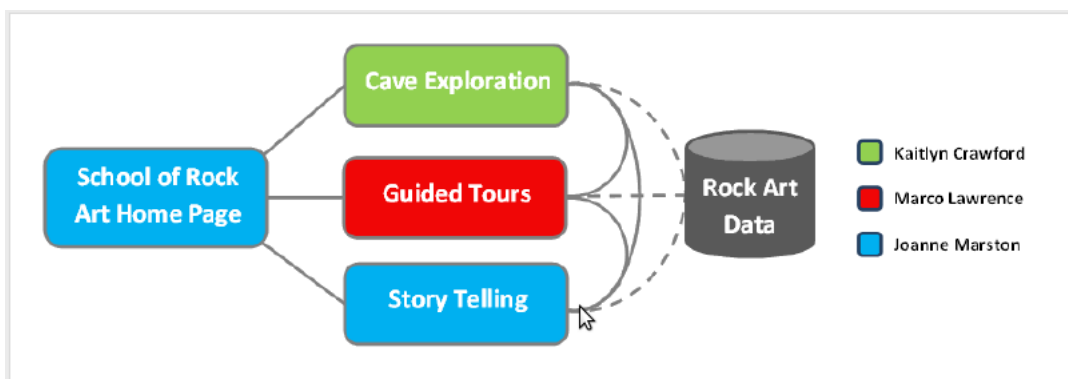
Figure 1.1: Overview of Final System

1.3   Report Outline

Chapter 2 discusses the background work done on systems resembling guided tours. Following on from that is the design chapter which outlines the various iterations that made up the initial work of the guided tour component. The evaluation chapter discusses the findings of the evaluation done on the final iteration of the guided tour component. The report ends with a conclusion chapter followed by a final chapter on future work regarding the guided tour component.

Chapter 2

Background

2.1 Introduction

The preservation of rock art, as well as cultural heritage, is an ongoing problem. Coupled with the enormous effort of ensuring the safety and preservation of these ancient artworks is the need to make the public aware of the importance of preserving such heritage sites. Most of the sites are not made public for the express purpose of protecting them. Organizations such as Trust for South African Rock Art (TARA) work tirelessly to ensure the protection of these sites (Parkington, 2007). However, recent technological developments have made it possible to document these sites in ways that were not available before. Pictographs, for example, are symbols or paintings representing ideas and are usually found in rock art. Over the years, pictographs have proven to be an extremely useful tool for documenting and recording these heritage sites. Now that methods exist for documenting these sites, it is important that effort is made to make practical use thereof. For this reason, it has been decided that the records containing these rock art images would be formulated into an interactive guided tour website that will allow users to take a trip through a virtual rendering of the data and learn about the history and heritage found on the walls. The predominant audience for this sort of interactive tool includes, but is not limited to, school children in grades 6-10.

2.2 Educational Tours

At the Nairobi International Rock Art conference in 2004, both Deacon (2007) and Tacon (2007) agreed on the fact that visitors to rock art sites need to be presented with information on the art in an interesting manner that allows them to appreciate the value of the art and stimulate interest. Deacon (2007) stated that an important tool for rock art preservation is public awareness. Tacon (2007) laments, however, that this comes with a slight caveat in terms of increased threats of vandalism and removal of rock art pieces. Essentially, educating the public and making them aware of the importance of these historical pieces seems to be the next step in the preservation of rock art. According to Deacon (2007), one common step employed to educate the public on the rock art is the use of trained tour guides. This way, the public gets to experience the rock art first hand while simultaneously being given an explanation of the intricacies of the history behind the shapes. This fulfils that enriching experience that Deacon (2007) aimed for, as well as raises the awareness needed to ensure the preservation and protection of rock art.

2.2.1   Virtual Guided Tours

For a similar reason, guided tours that are implemented on computer systems may be thought of as an important learning tool for school children especially those interested in rock art (Shipman, Marshall, Furuta, Brenner, Hsieh & Kumar 1996). This is in line with the view of Shipman et al. (1996), who stated that exploration is a valuable tool in learning. These guided tours then provide a system for learners to create a learning environment in which they may develop the knowledge-based skills that these information resources provide them with (Shipman et al. 1996). The guided tours will allow learners
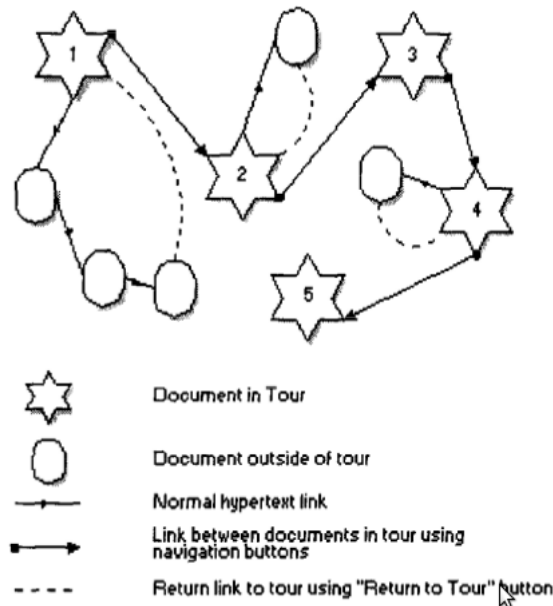

Figure 2.1: Example of a tour

to experience the ancient rock art first hand, allowing them to learn from the exploratory experience. The aim of these guided tours is to allow learners to be able to navigate the information in a structured manner (refer to Figure 2.1 found in (Nicol, Smeaton & Slater 1995)). This is in line with the premise of digital libraries. Digital libraries are collections of information stored digitally and are thus accessible from a computer. According to Crane & Wulfman (2003), these libraries will allow users to explore and question information that they would not otherwise have been exposed to. This is important since Furuta, Shipman III, Marshall, Brenner & Hsieh (1997) noted that learners found it difficult to navigate new systems in an unstructured manner. They would hesitate initially and express confusion at the unfamiliar information resource. For this reason, it became apparent that a mechanism for structured navigation of a system would be important.

2.3   Guided Tours: Research into Computer Systems

It was noted by Nicol et al. (1995) that computer systems involving education required a massive investment in time and human resources. However, there are merits to the undertaking since there is an educational need to provide users with an experience to learn through predefined routes and be allowed to return to a previous page of information

(Nicol et al. 1995). Nielsen (1990) noted that guided tours allow the users to be introduced to the notion of hypertext systems as opposed to aimlessly sifting through the information with no sense of navigation. The research into implementing guided paths thus shows that authors should essentially create a pre-defined path for users to use to navigate the system, while allowing for the possibility of digression and catering for this by providing the user with the ability to return to where they left off (Nicol et al. 1995). The emphasis on this technique is to ensure that users do not become disorientated in their traversal of the system.

2.3.1 Methods for Implementing Guided Paths

One method used to implement guided paths is to allow a point in the system where users are always able to go back to the last accessed portion of the system. Another technique is to provide a layout of the tour for users to navigate themselves if they choose to digress from the predefined tour (Nielsen 1990). It is important to provide an explanation of the navigation tools provided to the user so that they know exactly where they are heading in the system and thus alleviate the confusion that may ensue as a result of a user digressing (Nielsen 1990). Furthermore, providing the user with a guided tour of a virtual system presents its own challenges, according to Li, Lien, Chiu & Yu (1999). Besides the computational efficiency required to build such a system, it
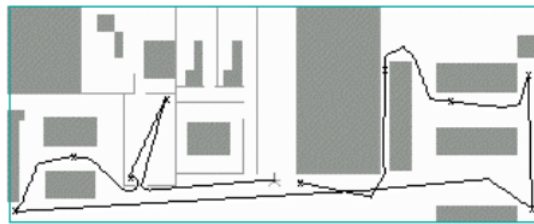

Figure 2.2: Example of a tour

is important to try to create a system that generates optimal paths with user-defined locations (Li et al. 1999). They further noted that the problem of finding an optimal traversal could very well become the NP-Complete travelling salesperson problem (See Figure 2.2 found in (Li et al. 1999)). The approach used by the team was to plan a tour path first and then to generate the camera path for the virtual system based on this tour path (Li et al. 1999). Essentially, this makes the tour a function of time and thus the system becomes a 4D problem. Various approaches may be used to tackle the problem of virtual tours of systems. These include decomposing higher dimension problems into lower dimensions in order to make navigation easier (Li et al. 1999). For example, according to Angelidis (2004), if the problem space is 6D, then there are 6 possible dimensions for movement that a user may perceive. This sort of space is important for representing rigid movement (Angelidis 2004). These 6D space problems may be decoupled into two 3D spaces according to Li et al. (1999). This means that the original space may be computed as two separate 3D spaces in order to produce the visualization that the user is expecting. Another method involves the greedy approach for optimal path sequencing in the automatic generation of a tour path (Li et al. 1999). These approaches therefore provide a means of traversal for users to navigate a system and allow them to experience the virtual reality with a particular emphasis on the educational merits of the system for presenting users with information on rock art.

2.4 Research into systems implementing guided paths

Further research into guided tours includes the Walden's Paths project. Shipman et al. (1996) and Furuta et al. (1997) provided an implementation of a guided path by means of a path server prototype named Walden's Paths. Shipman et al. (1996) defined a guided path as an ordered list of information pages that is independent of the general Web structure. Thus, a path is a particular traversal of this list (Furuta et al. 1997). Walden's Paths provides a user typically an educator in a classroom setting with the capabilities of creating directed paths over the information space by providing an ordering of the information for the purpose. The Walden's Paths server allows a user to present the information of the source document without the constraints of the underlying structure of the source document or information space (Shipman et al. 1996). The Walden's Paths creation also allows the user to provide context of the information by annotating the information being presented. It was also noted by Zellweger (1989) that any path defining mechanism should provide a user with the ability to navigate in both the forward and back direction along a path as well as allow the user to branch off in a new direction while maintaining the ability to navigate back to where they left off. Zellweger (1989) outlined the path mechanism called Scripted Documents, which makes use of paths as its sole linking system for the information being provided. This mechanism provided paths with active entities called scripts, which have path specification scripts embedded in the path. This method proved useful for providing a means of creating sequential paths. The script entries are stored separately from the documents in a simple database. The navigational support for maintaining tours is much stronger for this guided path system than it is for the guided paths mechanism in NoteCards, an idea management system . Halasz, Moran & Trigg (1987) discussed this system and its method of providing branching paths with nodal entries. However, these nodes did not provide enough information to allow the user to navigate through the tour.

2.5 Summary

According to the research done by Zellweger (1989), Furuta et al. (1997) and Shipman et al. (1996), guided paths systems need to be able to provide the user with the following capabilities:

- Creating and editing paths that are independent of the underlying structure of the source information space

- Navigational support

- Visualization of the paths

- Playback control of the path

- Path storage

- Interaction as opposed to just participation

With these objectives in mind, an implementation of a guided tour system for rock art will need to cover at least these aspects of guided paths in order to allow the educational experience of the user to be enriched. Furthermore, the users will need to be able to

recognize features of the unfamiliar system in order to know how to navigate through the information space (Furuta et al. 1997). Future considerations may include implementing a virtual tour guide such as the one researched by Li et al. (1999).

Chapter 3

Design and Implementation

This chapter focuses on the design and implementation of the Guided Tour component of the School of Rock Art (SORA) website. The design and implementation had a strong focus on the research question and aimed to provide a website that was both usable and useful. This chapter begins with a discussion of the technologies used to create the website. A detailed description of the iterative approach taken to design the School of Rock Art website is provided as well as a discussion of the results of each of the iterations. The chapter closes with a detailed description of the final design.

3.1   Tools and Technologies

Jquery

This is a multi-browser JavaScript library that was used to provide most of the functionality of the client-side scripting required by the School of Rock Art website. JQuery was chosen as it simplifies the client-side scripting required by the School of Rock Art website. It also allows developers to create plug-ins on top of the JavaScript library that provide greater functionality to the website.

HTML5 and Browser Support

The final design of the website was tested on the following browsers:

- Google Chrome (recommended)
- Mozilla Firefox

The School of Rock Art website was designed to work on Google Chrome as it had improved JavaScript and HTML5 support. Google Chrome is also available for a wide range of platforms, such as Windows and Mac and it supported the features required to make the website run smoothly and provide the functionality it was designed for.

PHP

PHP: Hypertext Preprocessor is the lightweight server-side scripting language used to create the dynamic Web pages needed for the School of Rock Art website. It is perfectly suited to Web development and could be embedded directly into the HTML code. It is also compatible with most servers used today and runs on various platforms such as Windows and Linux.

Apache
> An Apache Web server was used to do the testing of the initial iterations required. The Apache Web server is used on the Linux platform. It is also the server used to host the final School of Rock Art website for testing. The server holds the data and scripts required by the website.

3.2   Design Principles

The School of Rock Art website made use of a User Centred Design approach and, as such, required the input of users in the design process. The following list of design principles were used in the design process that led to the implementation of the final iteration of the website.

Aesthetic and Minimalist Design
> The website has a minimalist design that provides the user with an uncluttered workspace (Nielsen 2005). Every page and dialog window that the user interacts with provides enough detail for the user to be able to complete the action without giving too much irrelevant information. This allows the user to get the task done without having to sift through unimportant information.

Visibility
> The layout of the website was key to its usefulness and usability. Each page provides ample links to make navigation easy and accessible to the average user. The home page makes use of the popular Above the Fold/Below the Fold principle which means that all the important information is provided to the user up-front without the need to do any unnecessary clicking and scrolling (Neilson 2010). The home page has a menu of all the navigation links needed to navigate the site as well as descriptive links that explicitly describe where the user will be led to when they click on the link (Nielsen 2005). This way, even a novice user will have no confusion as to where they will be led to when they click on a button.

Affordance
> Buttons were designed in such a way that users knew immediately that they were allowed to click them. Each slide panel had buttons which made use of the affordance principle. Scroll bars allowed the user to click on the scroll bar and scroll through the content in the direction that the scroll bar was indicating.

Constraint
> Each tour had arrow buttons that afforded clicking when visible and afforded discontinued use when they disappeared from view. In this way, a user knew when to click the button and when not to. An invisible arrow key in a particular direction implied that a particular tour had reached its stopping point - either it was at the start of the tour, or it was at the end of the tour. In this way users understood that they had to choose a particular direction based on which button was available. When a particular dialog was meant to be focussed on, the rest of the page would be greyed out so that the user knew to focus on the current dialog being displayed. This constrained the use of the lower page and meant the user was forced to focus on the current item being displayed (Nielsen 2005). Text area inputs within the form were constrained where the users were allowed to enter values such as tour information and content within the website.

3.3   Design Process

Since the School of Rock Art website used a User Centred Design approach, understanding the users was crucial. For this reason, prototypes were designed and presented to users for evaluation. This included client meetings for requirements gathering, a focus group to help guide the design process, quick and dirty heuristic evaluations and an evaluation of the final design. All data gathered from each process was used to motivate the next iteration.

3.3.1   Client Meetings

The client was the Archaeology Department. They had a large database of unused data and thus required a system that would be useable and useful. The aim was to provide a website that would allow users such as scholars and researchers to make use of the data that the department had on hand. The focus for this usage would be to provide an educational tool that makes use of the data. For this reason, there would be two clear categories that any user could be a part of, namely, either that of a scholar or that of an educator. Scholars would generally only be interested in viewing a guided tour whereas educators would be interested in creating and editing guided tours. Thus, the features of the Guided Tour component of the School of Rock Art website would include:

Take a guided tour
> Users would be able to view and navigate through grouped content in a tour. This includes being able to navigate forward and backward within the tour, being able to jump to a particular stop on the tour and being able to take the tour with automatic navigation - this means users can view the tour without having to click on navigation links.

Create a guided tour
> Selected users, such as educators, would need to be able to create a guided tour that included the following content:
> - Details of the tour such as name of tour, name of creator etc.
> - Images
> - Descriptions/Annotations of the content

Edit existing tours
> Users with knowledge of the existing tour would be allowed to select an existing tour and edit the contents thereof. This feature would not be as prominent as the main features so as to avoid unintended editing of a tour by a user who is not meant to be editing the tour, such as scholars. This component would have to integrate with the other components of the School of Rock Art website. A link would be provided at appropriate stops in the tour for users to be allowed to navigate to the appropriate component where it was deemed necessary.

3.3.2   Use Cases

Use Case Name
> Enter a guided tour.

Actor

    User

Description

    A user entering the website will be allowed to enter a guided tour by choosing the one they are looking for from a list of available tours.

Basic Flow

    A user will enter the page Enter Guided Tours. The list of available tours will appear. The user will then choose an appropriate tour. The user will now view a page containing the tour.

Use Case Name Create a guided tour.

Actor

    User

Description

    A user will be able to enter the website and open a page entitled Create a Guided Tour which will allow them to produce a new guided tour that can be stored on the server for later use.

Basic Flow

    The user enters the Create a Guided Tour page. The user enters the form data needed to create a tour. The user submits the form. The user is presented with the Enter Guided Tours page.

3.4 Iteration 1

3.4.1 Design

The first iteration was motivated by the requirements that were gathered at the client meeting. The following are screen shots to show the original concept that was designed based on the details of the client meeting. The Home page (see Figure 3.1) featured links to the other components of the School of Rock Art website, namely the cave navigation component and the storytelling component. A horizontal menu for the links to the guided tour website were displayed along the top of the page. The basic layout was meant to be filled with eye-catching features so that the user could be interested in the content.
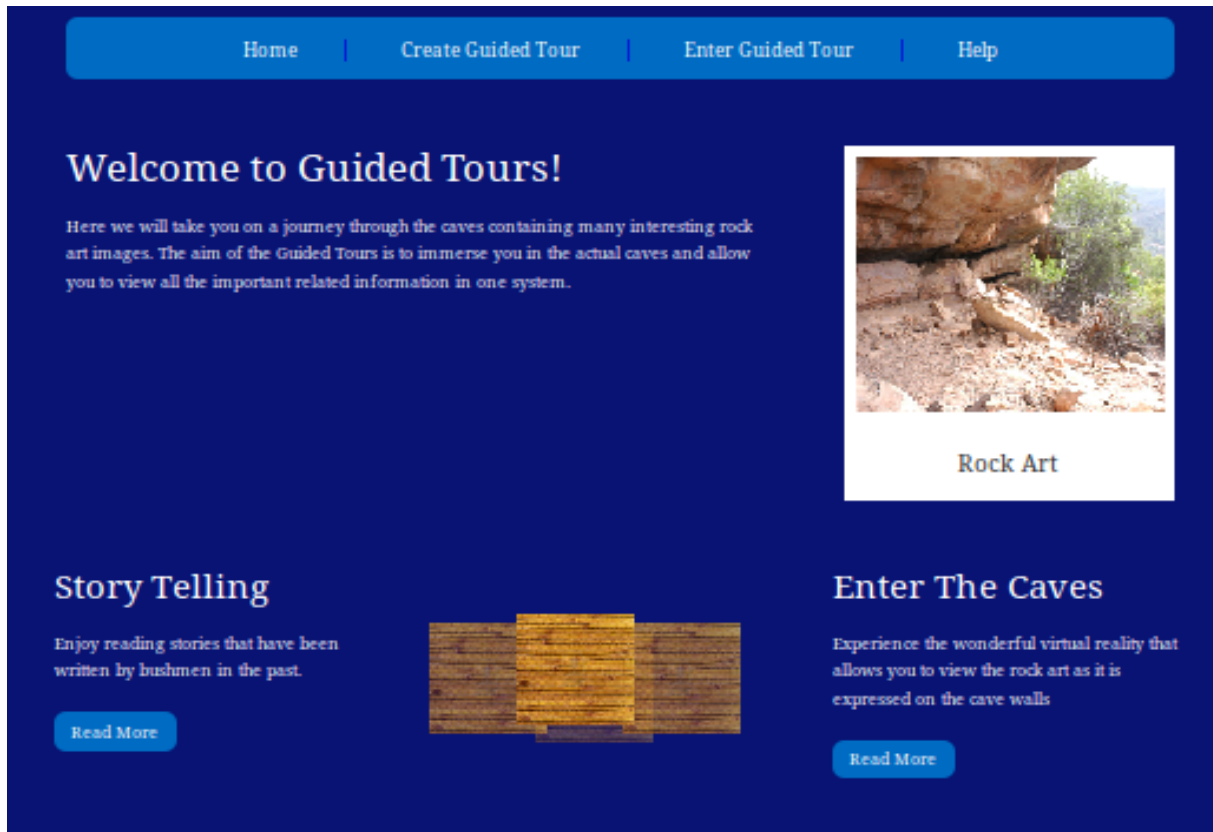
Figure 3.1: Iteration 1: Home Page

The next page the user may be met with would be the Create Guided Tours page (See Figure 3.2). The page would display a simple list for the users to upload the content they required for a particular tour. The form was meant to be recognizable and easy to use.

Figure 3.2: Iteration 1: Create Guided Tour Page

The users would be able to view a tour as is depicted by Figure 3.3. The layout was meant to provide easily accessible navigation buttons (these were labelled as Prev and Next) above the tour window. Below the tour window, the user is provided with indicator labels describing the current page. These labels told the user where they were on a tour.

Figure 3.3: Iteration 1: Tour Page

3.4.2   Focus Groups: Expert Panel

The focus group consisted of 5 postgraduate computer science students. 4 MSc students and 1 PHD students who had previously designed similar systems. The focus group took the form of an informal interview and allowed the students to provide feedback on the proposed components of the School of Rock Art website after being given a high level description of what would be needed to design the website. Their feedback included:

- Meeting with the client to gather the appropriate requirements.

- Research and compare previous websites that are similar to the one that was being designed.

- Get enough user input to determine which features would be best.

- Design the website in such a way that the user knows exactly where they will go to when they click on a navigation link.

- Ensure that all constraints are taken into account, such as Internet connectivity and data usage.

Feedback from the focus group was taken into account during the design of this prototype.

3.4.3 Focus Group: Users

Users were gathered to test the prototype that was designed soon after the focus group. This ensured that user input would be procured early enough to effectively aid the design process. First year students were found and asked to partake in the evaluation of the prototype voluntarily. These students were of particular interest to the study as they were the available students more closely resembling high school scholars - the target scholar audience for the website. They were presented with screenshots of the low fidelity prototype that had been designed and asked to comment on the design and to comment on what they would like to see in the website. Feedback from this evaluation included:

Home Page
> Users wanted the links on the page to prominently display navigation links to the rest of the Guided Tour component as opposed to the navigation links to the other components in the website. The scroll bar along the top of the page was not as easily noticeable as the links on the rest of the page. The home page had a carousel preview of the existing tours but most of the users found this to be distracting and not very useful as there already was a link to the existing tours.

Help Page
> Users felt it would be appropriate to provide a guided tour of the system and a guided tour that explained how to create guided tours. They felt that this would be a novel approach to the help function as opposed to the textual descriptions that were currently provided on the Help page.

Guided Tours
> Users felt that the window displaying content with navigation arrows was much more intuitive than content that moved in various directions and came into view from various angles. The users felt that the simpler design would be less of an irritation when it came to navigation as they would want an intuitive back and forth navigation with the content being displayed.

The feedback provided was then taken into account in the design process. The final iteration was then motivated by all of the feedback that was provided by the users and experts respectively. The iterative process meant that overlapping iterations were used to obtain the final design.

3.5 Iteration 2

3.5.1 Design

The second iteration was refined by the feedback received during the focus group evaluations. The following screen shots depict the designs that made up the second iteration. The Home page (see Figure 3.4)had some significant changes made to it since the first iteration. Feedback from the focus group was taken into account and appropriate elements were removed and redesigned. This included changing the layout of the menu and removing the redundant carousel.
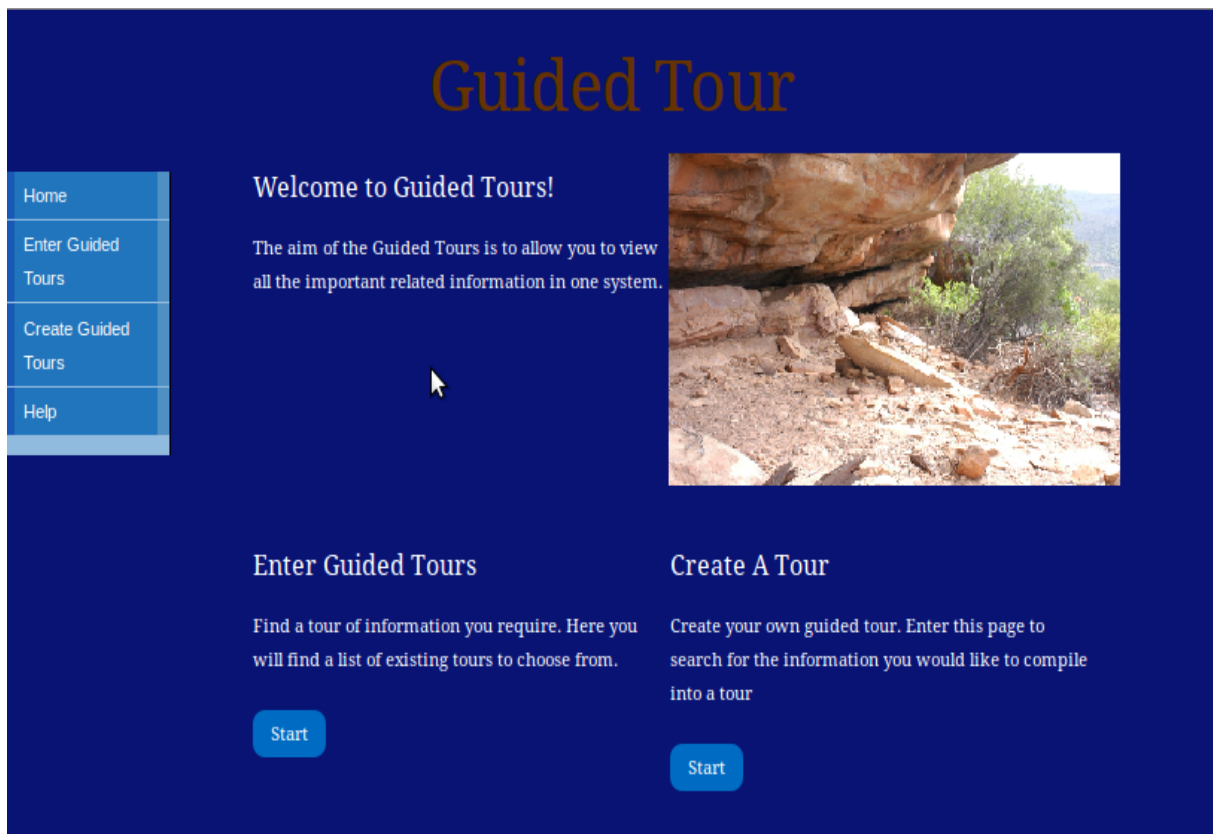
Figure 3.4: Iteration 2: Home Page

The page containing the actual guided tour underwent some major changes (See Figure 3.5). The page now contained a static gallery of the content of the tour being taken. When a user wanted to start the tour, one of the images would be clicked and the user would be presented with a tour view as depicted in Figure 3.6. The user still had indicator labels to explain which stop the tour was at at that point but now the tour was made to feel removed from the website so that the user could be focus on the tour and be sure that they are no longer just looking at a Web page.
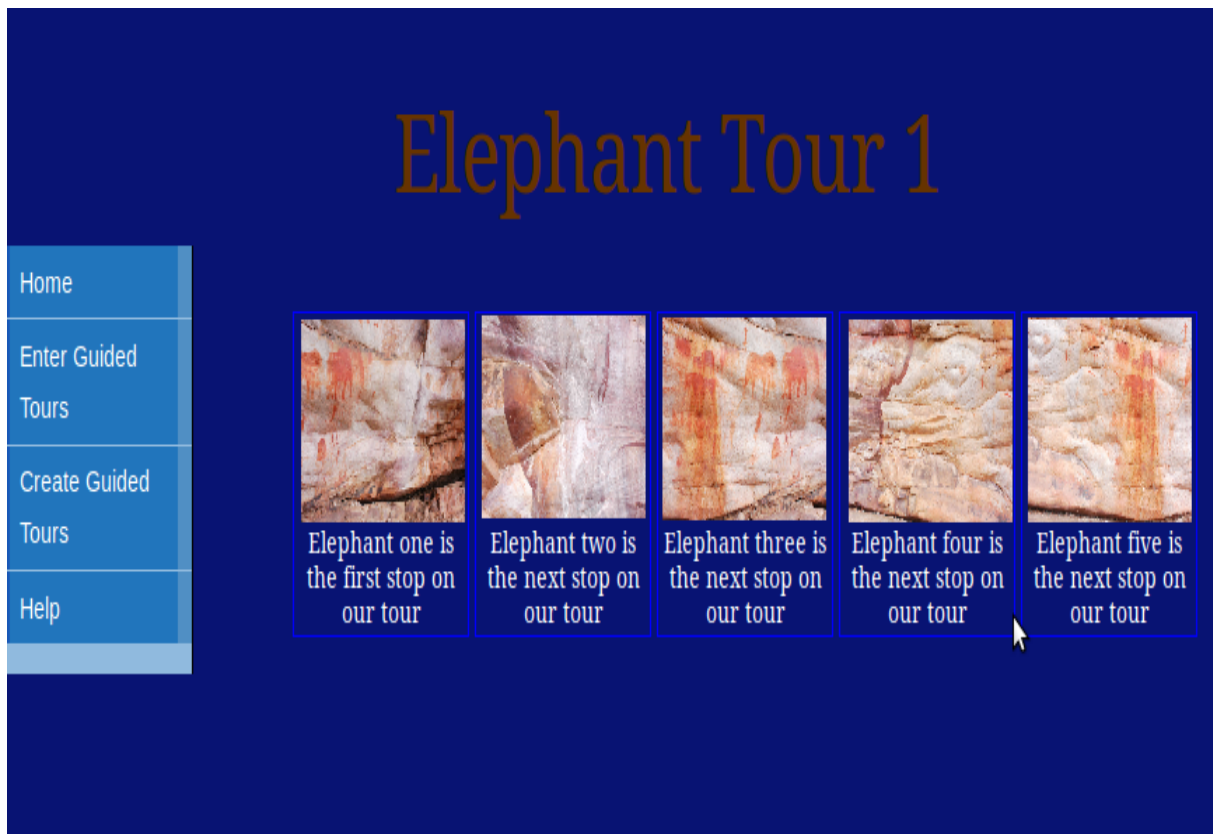
Figure 3.5: Iteration 2: Tour Page (initial view)

Figure 3.6: Iteration 2: Tour Page (tour view)

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3.6   Heuristic Evaluation

A heuristic evaluation was conducted on the second iteration. The users were found among the students in the honours laboratory. The heuristic evaluation was a method of usability analysis where the users were presented with the prototype and asked to pass comment on the design (Nielsen & Molich 1990).

Once presented with the prototype, users were asked to explore the guided tours website and pass comments on the design of the website. The suggestions included:

- The colour of the website would have to change to a simpler colour as the blue was too distracting and not very appealing.

- The tour items were not intuitively part of a tour by being in a list of images on the page. They appeared to static and it was not intuitive enough that the users would have to click on the images to start the tour. Navigation was not as visible on the page.

The features in the rest of the website presented no further problems to the users. The suggestions that were given motivated the design of the final system.

3.7   Iteration 3

3.7.1   Design

The two main features of the Guided Tours component were the ability to choose and enter a guided tour and the ability to create a guided tour. The option to edit a tour exists but is not displayed as prominently as not all users would need to edit a tour. This section of the chapter contains detailed descriptions of the final design of the guided tour component of the School of Rock Art website. Below is an overview of the workflow of the final system.

Home Page

    The home page of the guided tour system presents the user with a side pane menu list of navigation links for the Guided Tours component of the website (see Figure 3.8). The menu was built into the side of the page in order to allow the content to have as much free space as is needed to fill the screen from top to bottom and minimize the amount of scrolling the user would have to do. All pages of the guided tour component have the same menu bar to provide consistency throughout the website. The page also consists of more detailed descriptions of the two key navigation links for first time users to have an explicit explanation of where each link will lead them. The simple home page was designed to be as uncluttered as possible so that users could focus on the key features and be able to navigate to these freely and easily.
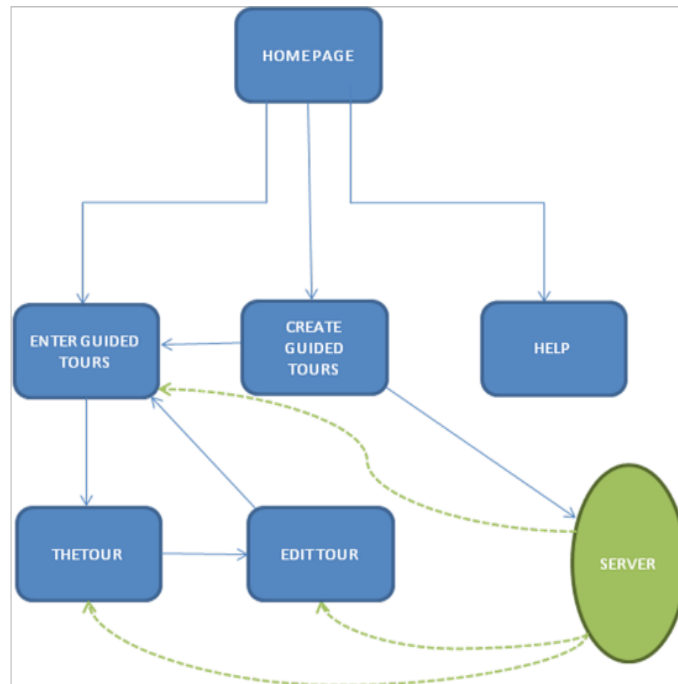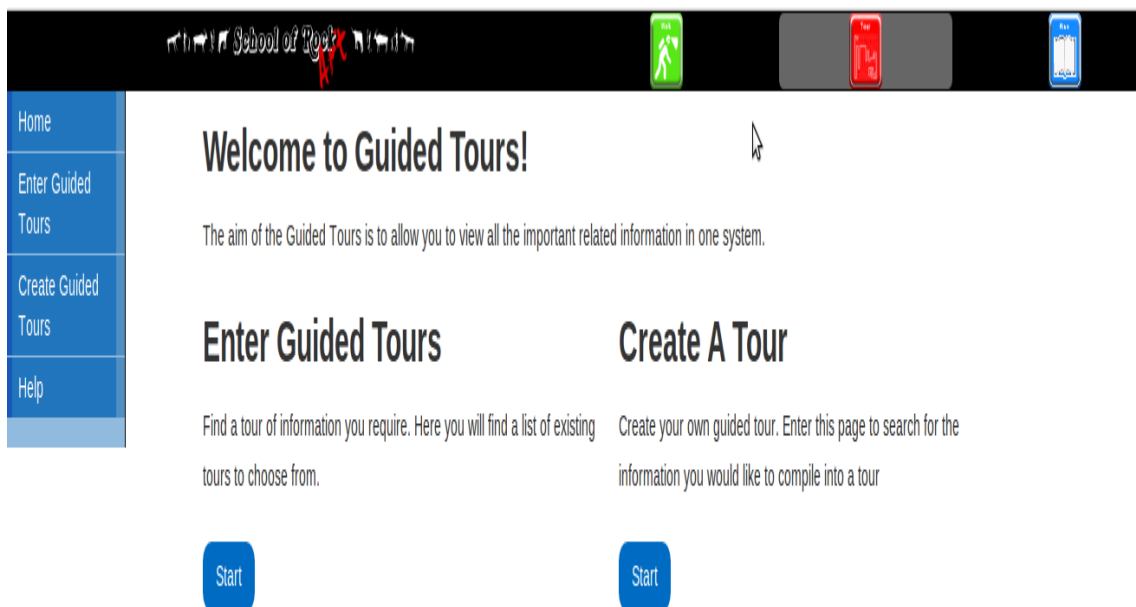
Figure 3.7: Workflow for Guided Tours website

Figure 3.8: Iteration 3: Home Page

Enter Guided Tours

This page contains a dynamic list of all available tours that have been created and
stored on the server for use (see Figure 3.9). The tours are all stored on the server
and each tour has the same format. Each tour has data that is stored on the site
and each tour is stored as an XML file that contains the information needed to

recreate the tour. When a user opens this page, a HTTP call is made to the server to execute the php file that is used to display all the files of the folder that contains the tours. This list of names of the files is then listed on the page along with a preview of the first image on the tour. The image is used as a placeholder for a link to the tour page.
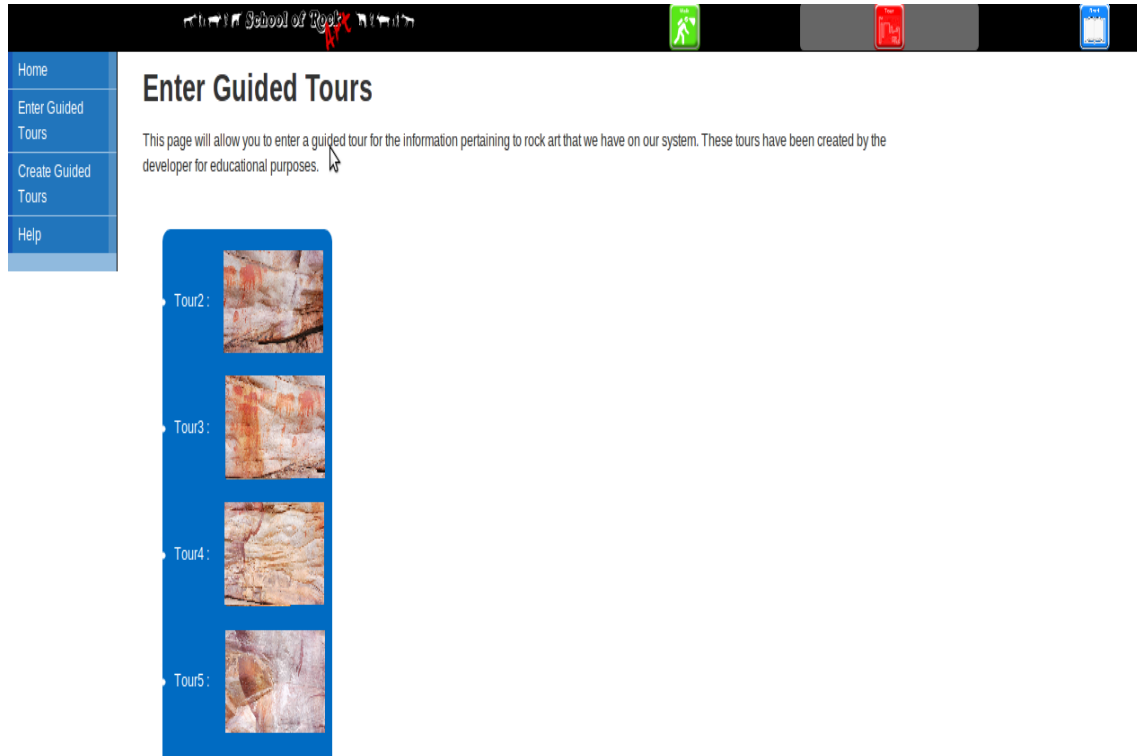

Figure 3.9: Iteration 3: Enter Guided Tour Page

Create a Guided Tour

This page consists of a simple form that allows users to create a tour (see Figure 3.10). The form allows users to enter information that is needed to create a tour according to the specified format. Once a tour is created, a php script on the server is executed to store the content of the form in the XML template and stores the XML file in a folder on the server. Each tour has tags for the data and information pertaining to the tour itself such as the name of the tour, creator of the tour and the background color as chosen by the user to customize the tour with a unique color. This information makes up the unique data for each tour that is required to create the tour.

Figure 3.10: Iteration 3: Create a Guided Tour Page

The creation process has three steps. The first step includes users entering information regarding the tour. This includes:

- The name of the tour: This name is used as the unique tour id.

- The creator of the tour: This name tells users who the creator is.

- The background colour: This information is used to create user specified pages with a unique background colour as opposed to a static colour for each tour.

- Content of Tour: The next step allows users to choose the content of the tour. In this step users are allowed to choose images from a specified images folder stored on the server. A drop down menu provides a list of all the images available for the user to choose from. Based on the choice the user makes, the appropriate images are retrieved and displayed on the current page. The final step involves the user providing detailed descriptions of the images that have been chosen. Once the user is satisfied with the choices that were made for the content, the user submits the form and is taken to the Enter Guided Tours page.

When the form is submitted, an HTTP call is made to the server and a php file is executed to retrieve the data inserted in the form. This data is then stored in the appropriate XML format of the tour in an XML file on the server.

The Tour

This page contains a single div element in which the tour will be displayed (see Figure 3.11). The div element is coloured according to the colour chosen by the user. The page has a small welcome message at the top to tell the user that they are about to embark on a tour that relates to the information given in the title. The page then makes an HTTP call to the server and executes a php file that loads the information from the XML file for the particular tour being called. At the bottom of the div element is a small edit button that takes the user to the editing page. The tour consists of a set of panels that each contains the content that was specified by the user. Each panel can be navigated using either the tabs at the bottom of the

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panel or the arrows on either side of the panel. A button is provided that allows the user to start the tour and stop the tour so as to avoid manual navigation of the tour. At any given point the user may jump to a particular point in the tour or the user may allow the tour to continue to the end.
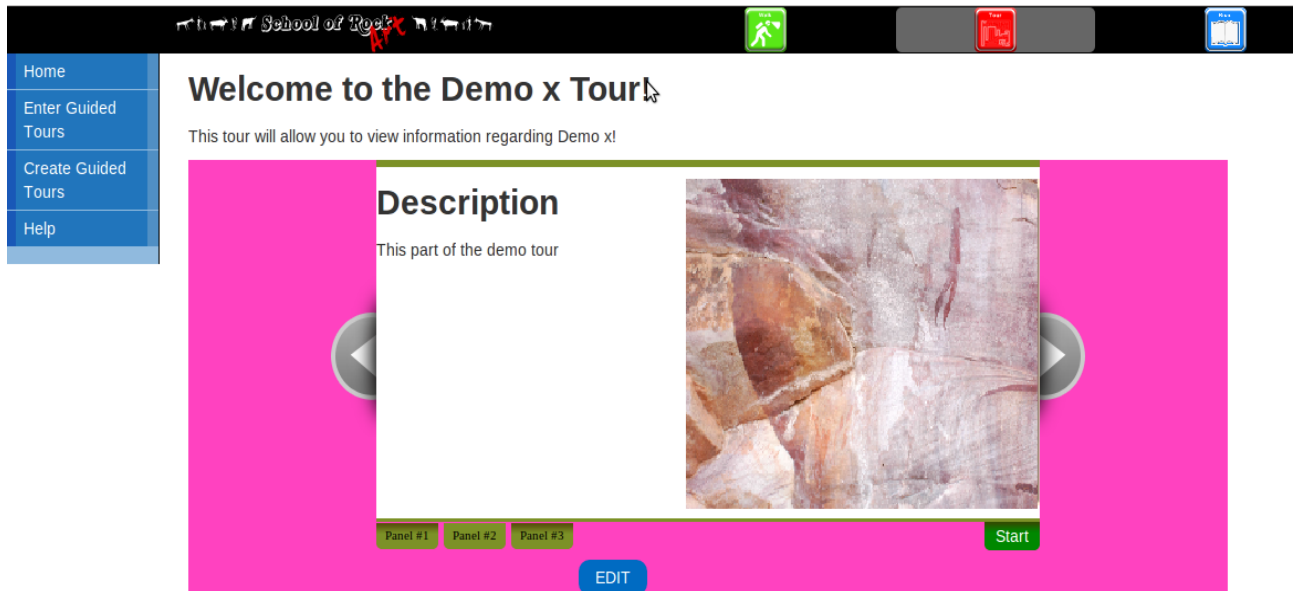

Figure 3.11: Iteration 3: Tour Page

Edit Page

This page contains an HTTP call to the server to provide the contents of an existing tour. The user would have clicked an edit button on one of the tours in order to provide this page with the correct information. Once a user clicks on this button, they will be directed to the edit page that loads the content of the tour into the form needed to create a tour (see Figure 3.12). The user will then decide which aspects of the tour needs to be changed and enter this data much like when creating a tour. This data will then be stored in the XML file as is done when creating a tour.

Figure 3.12: Iteration 3: Edit Page

This final system was presented to users for evaluation. The results of this evaluation will be presented in the next chapter.

Chapter 4

Evaluation

The final system was evaluated by a group of UCT students by means of a questionnaire (See Appendix A). A discussion of the previous iterations of the system can be found in the design chapter. This chapter will focus on the evaluation of the final system and a discussion of the results as pertaining to the research question.

4.1 Methodology

The type of user centred evaluation chosen was a summative evaluation. A summative evaluation is a more formal evaluation that is conducted to document the usability characteristics of the website being evaluated (Scholtz 2004). These evaluations typically involve a number of users. This summative evaluation process provided a means for establishing whether the final system designed answers the research question. The sample of users was gathered using posters which allowed them to set up an evaluation timeslot. The following is an outline of the methodology used.

4.1.1 Aim

The aim of this evaluation is to determine whether or not it is possible to design a website that is both useful and usable for educational purposes by evaluating user's responses after interacting with the website.

4.1.2 Sample Group

Before any testing was done on users, ethical clearance was obtained from the University of Cape Town, which gave permission to do user testing. Once this ethical clearance was received, the third iteration of the website was tested by a group of 24 UCT students. The website was uploaded to the simba server and the testing was done in the mac lab in the computer science building so as to make use of a quiet uninterrupted space in which users could focus on exploring the website.

The sample of 24 students consisted of 10 female students and 14 male students who were at various levels of study from various faculties. Only 7 of these students were first year students whereas the bulk of the sample was made up of third year students (10 third year students). The sample was a representative spread of students from various faculties across UCT. The main audience that the website was developed for was students so a larger spread of first year students were targeted. However, due to the time of year,

most of these students were busy with academic obligations and exam preparation so the sample grew to accept students from other levels of study.

4.1.3 Procedure

Each voluntary user was given a time slot in which to arrive for the evaluation and upon arrival they were instructed to sit at any of the computers within the laboratory. Each user received an explanation of the background of the website and was clearly informed of the confidentiality of their responses. Before being allowed to partake in the questionnaire, each user had to accept a consent form, which explained that their responses would be kept confidential and would not be used outside of its intended purpose within the scope of the evaluation.

Each user would have a set of tasks to complete without any time constraints. Once the user completed the tasks, they would fill out a form that is used to evaluate the system. Each evaluation question was answered on a scale of:

- Strongly Disagree

- Disagree

- Neutral

- Agree

- Strongly Agree

The questionnaire ended with a section where users would be allowed to give comments about their general experience using the system. These results will be discussed below.

4.2 Experimental Bias

Certain biases in evaluation were accounted for. These included:

Response bias This occurs when respondents answer in a way that they think the questioner wants to hear as opposed to what they may actually believe to be true. This was accounted for by informing users that their responses would be confidential and that all honesty would be required in order to improve the system.

Acquiescence bias This would occur when users agree to all questions regardless of whether or not they actually do. This generally occurs when a respondent is in doubt. This was accounted for posing the same question using different wording to ensure that users were indeed reading the question instead of just choosing a response on a whim.

4.3 Observations

During the evaluation, the users were observed without being interrupted. The following is a list of observations from the evaluation process:

- None of the users had any issues with getting started on the website. From the home page, navigation followed fluidly. This meant that users were familiar with the layout and that the appropriate links were visible. This implies that the design principles adhered to ensured sufficient usability of the website.

- Most of the users made use of the menu to navigate from the home page as opposed to the links on the page that contained descriptions of the link. The rest of the users took time to read the descriptions and make use of the links on the page.

- Users found navigation of the actual guided tour to be intuitive with the arrow keys on either side of the content display. However, most users noted that they had no idea why the arrows disappeared at the end/beginning of a tour. When explained that this was an indication that there was no content in the direction of the disappeared arrows, users understood the reason but gave suggestions that would improve the intuitiveness of the display. The most notable suggestion was to grey out the arrow keys instead of making them disappear.

- Most users had an issue with the language use of the website. The level of English was too verbose for the targeted demographic of users. The language use affected the usability of some of the features as some users were confused when words like annotate were used instead of describe. On a positive note, more descriptive buttons were met with much more positivity and enthusiasm, especially when the button looked familiar. This included buttons like Submit and Edit.

- Some users had one difficulty with the form used to create a guided tour. One of the options allowed them choose a background colour. However, the input required them to click on the input textbox in order to display a dropdown menu of the available colours. Since this input looked similar to the text input areas, some users thought they were required to type a hexadecimal value for the colour as opposed to choosing a colour. When asked to comment about this, all of them agreed that there should be a prompt that explains that they should click the area instead of having to figure this out on their own.

- Users were tasked to create a tour of their own based on the available rock art data. When all 24 users gave their tour the same name (namely demox as the instruction suggested) multiple files were created. This caused confusion among the users.

4.4 Findings

The results of the experiment can be found below and are indicative of the general feeling of the targeted audience. The responses received will be analysed relative to the research question posed in the research proposal.

4.4.1 Usability

Only 2 people found the website unnecessarily complex whereas 5 users did not feel comfortable using the site. 5 users also felt that they needed to learn a lot before they could use the site. This means that less than a quarter of the sample were feeling uncomfortable with using the website and its features when asked to complete tasks without any guidance.

More than 87% of users felt that the navigation of the website was intuitive and easy to use. This relates well to the 87% of users that felt confident using the site without written instructions. More than 70% of the sample users felt that the website was consistent in its controls.

4.4.2 Usefulness

More than 87% of the users felt the website was fun or pleasant to use. This is a good indicator of whether or not a user will come back to a website as users will be less inclined to come back to a website if there was nothing stimulating about the experience. About 67% of users felt that they needed to have the website. This suggests that the sample would find a use for the site and come back to use it. Among the sample of users evaluating the website, more than 87% would recommend the website to other users. This suggests that, besides finding a use for the site themselves, other users might be able to find the site useful as well. The findings thus suggest that the website that was developed has been found to be both useful and usable to a random sample of students. These findings, while not conclusive, are quite useful in terms of the purpose of the experiment. It is clear from the results that it is indeed possible to develop a guided tours website for rock art that is both usable and useful.

4.4.3 Additional Findings

The findings included further noteworthy results. The following is a list of further findings from the evaluation: Just over 40% of the users indicated that they would not want to use the website more often and that the website is boring. Just over 40% of users felt that they would need the help of a technical person to use the website. These results need to be taken into consideration to obtain an accurate understanding of the usefulness and usability of the website. The 40% of the responses that were negative may be as a result of the following factors:

Users misunderstood the tasks
A few of the users partaking in the system did not understand some of the tasks and had to ask for clarification before going forward with the evaluation.

Users with no interest in rock art
None of the users sampled were from the archaeology department or had any affiliation with or interest in rock art. These users may have missed the point of the website and felt that it bored them as they had no reason to learn about rock art. The novelty of taking a guided tour may have also been lost on the sample as the website was designed in such a way that many of the features resembled similar navigation tours that they may have seen before.

Users noted some interesting improvements on existing features and suggested some features that were not implemented:

- Users suggested adding a musical element to a tour.

- Users suggested larger thumbnails for images being described in the creation page of the website. This was because they felt that the current thumbnails were too small to see when describing the image.

- Many users commented, albeit both negatively and positively, on the simplistic design of the website on the whole. This may have aided the usability of the website to first time users but may have hindered the fun factor of the website.

The results of the evaluation have proved to be quite useful relative to the experiment. These results have been taken into consideration in the third iteration and may lead to further improvement as substantial issues have been brought to light in the evaluation. As this is a user centred design, the opinions of the user affect the final product.

Chapter 5

Conclusion

The Rock Art Website was designed to be an educational website. The guided tour component was designed to form a part of this website as a useful and usable component that allowed users to use rock art for educational purposes. The guided tours component that was developed, along with the other components of the website, was then evaluated to determine whether or not the site was useful and usable.

Based on the evaluations done on the guided tours component, users have responded positively to the site in general and have provided feedback that establishes the usefulness and usability of the guided tours component. The research question presented in the introduction of this report, namely "Is it possible to build a usable and useful guided pathway system to promote learning?" was considered in terms of the results of the evaluation. The results showed users were satisfied with the usability and usefulness of the website as shown in the results section of the evaluation chapter. The evaluation thus positively answered the research question outlined at the beginning of this report.

Chapter 6

Future Work

This chapter discusses future work that can be considered to extend the current guided tours system. These considerations include:

6.1 Login

Allowing users to create a profile and login to the site will tremendously help the guided tours website. This will enable scholars to save specific information such as Favourite Tours or Favourite Users that are registered on the site. It will also ensure that users will know exactly who created a tour and can decide whether or not they want to view a tour created by a particular user as opposed to just choosing a tour based on the title.

6.2 Chat Forum

Creating a forum that allows users to discuss their work and discuss existing tours will aid the learning experience in general as shared knowledge is the basic premise of this educational website. The forum will need to be moderated by appropriate users who have the level of expertise to ensure that the forum is effectively moderated.

6.3 Search Function

The data will need to be refined to create a search function that can be used to discover images on the website. The search function will allow users to search for any search string and the system will be able to match this string to the available keywords associated with each picture. Currently, the meta data associated with each of the images isn't standard, making a search function difficult to develop.

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Appendix A

Questionnaire

School of Rock Art user evaluation Survey

<u>Confidentiality and Privacy</u>

If you consent to participate in this evaluation, your personal information will be kept confidential. Any information you choose to provide will be kept private between you and the researcher.

The record kept of your survey responses does not contain any identifying information about you unless a specific question asks for it. Answering any of the questions is optional, but please answer as many questions as possible to guarantee the validity of the results of the study.

<u>Statement of Consent</u>

"I acknowledge that I have read the above explanation of this evaluation. I understand that the collected data from this survey will be analyzed and used to evaluate the mentioned website. I also understand that the researcher will not disclose my personal information. By selecting the option 'Next' below I agree to participate in this evaluation"

There are 25 questions in this survey

About you

1 [1.1]

What is your main field of study (Faculty)?

Please write your answer here:

2 [1.2]

What academic qualification are you currently registered for?

Please choose **only one** of the following:

- ◯ Bachelors
- ◯ Honours
- ◯ Masters
- ◯ PhD
- ◯ Other

3 [1.3]

What is your year of study of the current degree?

Please choose **only one** of the following:

- ◯ First
- ◯ Second
- ◯ Third
- ◯ Fourth

- ○ Fifth
- ○ Other

Guided Tour

Please complete the tasks below and then return to answer the questions

    Task 1 - Navigation
1. Navigate to "Enter Guided Tours"
2. Choose a Guided Tour (Tour1Demo).
3. Navigate through the guided tour.
  3a. Start the Tour
  3b. Stop the Tour on the 3rd slide in the tour.
  3c. Use the arrows to navigate the tour.
4. Navigate to the Home page.

Task 2 - Editing
5. Navigate to "Create Guided Tours".
6. Complete the form with the following information
    Creator of Tour: Anonymous
    Title of Tour: Demo$x$
    Background Colour: Choose a color. (eg Green)
    Click Insert Pictures: click on an image and click on Insert. Do this step 3 times.
    Click Annotate! Add descriptions in the textboxs provided. (eg. "This is part of the demo tour")
    Click Submit to save the list
    Click Complete to Enter Guided Tours
8. Click on your tour (It should be under "Demox" on the list)
9. Navigate the tour (As with Task 1)
10. Open tour Tour1.
11. Click 'EDIT'
12. Edit the contents available.
13. Save your changes and preview the tour you edited.
10. Close the Page.
11. Explore the site and Enter different tours.

4 [2.1]Usability

Please choose the appropriate response for each item:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I thought the website was easy to use	○	○	○	○	○
I found the website unnecessarily complex	○	○	○	○	○
I think that I would need the support of a technical person to be able to use this website effectively	○	○	○	○	○
I found the various functions in this website were well integrated	○	○	○	○	○
I felt that the website navigation was consistent and intuitive	○	○	○	○	○
I needed to learn a lot of things before I could get going with this website	○	○	○	○	○
I felt very confident using the system	○	○	○	○	○

5 [2.2]Ease of Use

Please choose the appropriate response for each item:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I can use it without written instructions	○	○	○	○	○
I don't notice any inconsistencies as I use it	○	○	○	○	○
I can recover from mistakes quickly and	○	○	○	○	○

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
easily					
I can navigate through the site easily	○	○	○	○	○
The controls were easy to use	○	○	○	○	○
The controls were intuitive	○	○	○	○	○

6 [2.3]Satisfaction

Please choose the appropriate response for each item:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
It is fun to use	○	○	○	○	○
I like using the interface of this system	○	○	○	○	○
I found the system boring	○	○	○	○	○
I would suggest this to my friends	○	○	○	○	○
I want to spend more time using it	○	○	○	○	○
It is wonderful	○	○	○	○	○
I feel I need to have it	○	○	○	○	○
It is pleasant to use	○	○	○	○	○

7 [2.4]

In your opinion, which feature(s) was the most useful?

Please write your answer here:

8 [2.5]In your opinion, which features(s) was the least useful?

Please write your answer here:

9 [2.6]What features do you think could be improved on or added?

Please write your answer here:

10 [2.7]Any other comments?

Please write your answer here: