

Final Report

*Digital Repatriation of Sierra Leone Heritage Cultural Objects
using a Mobile First and API approach*

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Abstract

Mobile devices have become ubiquitous in recent years, making it essential that a website can be viewed on screens of all resolutions clearly, without losing functionality. This means some old websites need to be updated so they are responsive to the smaller resolutions required by mobile devices. The Sierra Leone Heritage site is one example of this, and is the focus of this project. During this project, we will analyse what is wrong with the Sierra Leone Heritage website and identify features that must be changed in order to make it responsive for mobile devices. Throughout the report going through the process of creating a new website from a mobile first approach; utilizing information from an API (Application Program Interface). This API will be providing the website with functions to retrieve information used to show on the website. The report will also be outlining any professional considerations and ethical problems that may arise, and then demonstrate that a plan has been devised that provides for the entire scope of the project that will include a brief solution to the problem.

Statement of Originality

This report is submitted as part requirement for the degree of Computer Science at the University of Sussex. It is the product of my own labour except where indicated in the text. The report may be freely copied and distributed provided the source is acknowledged.

Signed: Ben Wilson

Date: 17/04/16

Table of Contents

1.0 Introduction	5
1.1 Problem area and statement/Background.....	5
1.2 Course relevance.....	5
1.2.1 Introduction to Multimedia & Design Application.....	6
1.2.2 Web computing.....	6
1.2.3 Human Computer Interaction.....	6
1.2.4 Web technologies.....	6
1.3 Primary and secondary objectives.....	6
2.0 Professional Considerations.....	8
2.1 Section 1: Public Interest.....	8
2.2 Section 2: Professional Competence and Integrity.....	9
3.0 Requirements.....	10
3.1 Requirements Gathering.....	11
3.1.1 User Testing the Current Sierra Leone Website.....	11
3.1.2 Existing Solutions/Examples.....	12
3.2 Requirements Analysis.....	15
3.2.1 User Research Analysis	15
3.2.2 Existing Solutions/Examples Analysis.....	15
3.2.3 What's Bad about the Current Sierra Leone Website.....	15
3.3 Web Technologies.....	16
3.3.1 Front end Framework	16
3.4 Requirements specification.....	19
3.4.1 Functional Requirements	19
3.4.2 Non-functional Requirements.....	20
3.4.3 Possible Requirements.....	21
4.0 Initial Design.....	23
4.1 Bootstrap Templates.....	23

4.1.1 Bootstrap Desktop View.....	23
4.1.2 Bootstrap Dynamic View/mobile View.....	24
4.1.3 Toggable Navigation Menu.....	26
4.2 Branding.....	27
4.3 Initial Designs Views.....	28
4.3.1 Initial Design for the Home page.....	28
5.0 Design and Implementation.....	34
5.1 Implementing Through Bootstrap.....	34
5.1.1 Making Initial Design Changes.....	34
5.1.2 Creating a Universal Fluid Grid Layout for Static Content.....	36
5.2 Implementing the use of an API.....	39
5.2.1 Getting to grips with the API.....	39
5.2.2 Creating Dynamic Content for the Video Gallery.....	40
5.2.3 The Quick Search Function.....	43
5.2.4 Browse Collections Function.....	45
5.2.5 Search Collections Function.....	47
5.3 Implementing Facebook.....	49
5.4 HCI and Usability insurance.....	50
6.0 Testing.....	51
6.1 Black Box Testing.....	51
6.2 Acceptance Testing.....	51
6.3 Performance	51
6.4 Corrections.....	52
7.0 Evaluation & Conclusion.....	53
7.1 Project Success	53
7.2 Possible Improvements	53
7.3 Further Work	54
8.0 Appendix.....	55
9.0 References.....	70

1.0 Introduction

This report will give the reasoning behind the choices made in this project. In addition, it will explain the primary and secondary objectives of the project and evaluate how it was executed.

1.1 Problem area Statement/Background

The problem: The Sierra Leone heritage website^[1] is a non-responsive website when not viewed from a PC. It becomes unusable on mobile devices since the default website's responsiveness does not translate to smaller screen resolutions. Certain resources have been acquired, in particular, an API^[2] (Application Program Interface) to redevelop the front end of the website to make it responsive on all views especially on mobile devices.

With the rise of mobile devices, mobile compatibility is almost mandatory for any modern website. However, the website must still be able to be viewed on a desktop or large resolution displays without looking deformed or awkward for the user to look at. The statistics for mobile marketing show that there are more global mobile users than desktop users, a trend that any web developer needs to be mindful of. Figure 1 displays this trend^[3].

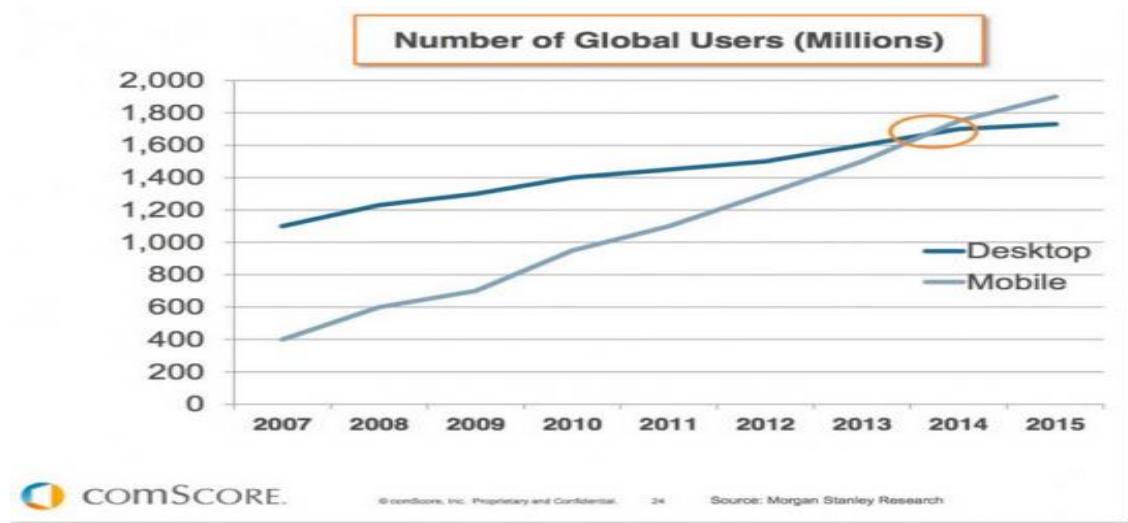


Figure 1 A graph to show the increase of mobile users compared to desktop users over the year of 2007-2015

1.2 Course Relevance

Many of the skills learnt throughout the Computer Science degree have relevance to this project. Throughout this project numerous methods and skills which have been acquired to help complete the task that was set out.

1.2.1 Introduction to Multimedia & Design Applications

Multimedia is a huge aspect of web design since the web is a platform that contains many aspects of Multimedia. First year students learn about basic web design containing CSS (Cascading style sheets) and HTML5 and the use of JavaScript to create an animation. These skills learnt in the first year have been extremely useful in the development of this project. The design application module helped with general multimedia aspects to do with colour and contrast in digital media content thus allowing me to create multimedia in the project.

1.2.2 Web Computing

Web computing taught me about various methods to approve the overall website. The module went over CSS in more detail and the addition of AJAX (Asynchronous JavaScript and XML). AJAX has become highly useful allowing me to update specific elements of a web page without having to load the rest of the data, which will be used heavily in this project since it speeds up the website.

1.2.3 Human Computer Interaction

HCI (Human Computer Interaction) has helped overall with the project with aspects of user interaction. HCI focuses on the way the user will use a product or a service. This module has taught me a lot about user testing and how to avoid certain issues that users might have when designing a website. The testing procedures learnt in this module can also be used for testing the project to help eliminate annoyances and issues in the final product. Since my product is heavily user based this has been very helpful and has had a big impact on the design choices and functionality of the website.

1.2.4 Web Technologies

In addition to the technologies mentioned above various other techniques such as the use of PHP and how it interacts with a Database. Although the use of PHP will not be directly involved the manipulation of JSON objects is a must. A JSON object will indirectly access a database through a PHP framework to receive specific data for usage. To access these JSON objects through an API which is connected through this PHP framework.

1.3 Primary and Secondary Objectives

The primary objective for this project is to re-create a fully functional copy of the Sierra Leone heritage website that can be viewed on any modern device. Keeping all functionality on each device with an ease of use to the user. The following objectives to achieve this are:

The Primary objectives for this project are:

- Recreate the website to be responsive on all modern devices.
- Access data for the website through the given API.
- Keep all original functionality.
- Keep the same theme for the website.

Secondary to these objectives

- Complete all functionality of the API since it's incomplete.

This report will guide you through the design and planning of trying to recreate the Sierra Leone website from a mobile first approach, explaining the design choices made in detail and how the various changes are implemented stage by stage.

The report will consist of the professional implications that are involved with this type of project. To establish the requirements that need to be met by the project, user research will be gathered by looking at other websites that have a mobile friendly interface and are considered great examples of responsiveness – these will set the benchmark for this project. After establishing these requirements, initial designs can be drawn up that can be tested and further developed into an actual website. Further testing will follow, exploring complications in implementing the design. This will lead to my conclusion on the whole project and an evaluation of its overall success.

2.0 Professional Considerations

The British Computer Society has listed a set of rules and regulations that must be abided by during this project. From reading this document there are several key parts from these regulations that may pertain to my project. The following points are taken from the BSC code of conduct [4].

There are 4 sections to the British Computer Society code of conduct. The first two sections of the code of conduct apply to this project. This is because sections 3 and 4 specify relevant authority and pertain to unrelated professions, so do not apply to me in this project.

An ethical compliance form for UG and PGT projects is needed to be filled out. Since the project will involve interviewing end users while designing my project, this is very important, since without this form the project may run into legal issues. This will be signed and attached to the appendix.

2.1 Section 1: Public Interest

Section 1a. States that 'have due regard for public health, privacy, security and wellbeing of others and the environment.'

The website will regard public health regarding photosensitive epilepsy. It will accomplish this by avoiding to use fast flashing images on all content of the website. In addition, It will not use common photosensitive patterns that can cause seizures. It will also regard public health with people who are colour blind by avoiding low contrast colour and will use high contrast colours for text that is to be read. There should be no issues with privacy or security since the website will not contain anyone's personal details.

Section 1b. States that 'have due regard for the legitimate rights of Third Parties.'*

With regard to the legitimate rights of Third Parties. With the use of frameworks in my project it's important that referencing the work of these third parties properly and the way that they want users of their software to do.

I've used Twitter's Bootstrap their policy is [8]:

"Bootstrap is released under the MIT license and is copyright 2015 Twitter. Boiled down to smaller chunks, it can be described with the following conditions.

It requires you to:

- *Keep the license and copyright notice included in Bootstrap's CSS and JavaScript files when you use them in your works*

It permits you to:

- *Freely download and use Bootstrap, in whole or in part, for personal, private, company internal, or commercial purposes*
- *Use Bootstrap in packages or distributions that you create*
- *Modify the source code*

- *Grant a sublicense to modify and distribute Bootstrap to third parties not included in the license*

It forbids you to:

- *Hold the authors and license owners liable for damages as Bootstrap is provided without warranty*
- *Hold the creators or copyright holders of Bootstrap liable*
- *Redistribute any piece of Bootstrap without proper attribution*
- *Use any marks owned by Twitter in any way that might state or imply that Twitter endorses your distribution*
- *Use any marks owned by Twitter in any way that might state or imply that you created the Twitter software in question*

It does not require you to:

- *Include the source of Bootstrap itself, or of any modifications you may have made to it, in any redistribution you may assemble that includes it*
- *Submit changes that you make to Bootstrap back to the Bootstrap project (though such feedback is encouraged)*

Throughout this Project Bootstrap has a set of rules required to follow to reference their product correctly. This has been achieved this by keeping all copyright notice in my works. The project ceases to have broken any of the forbidden rules that they have set.

Section 1c. states that ‘conduct your professional activities without discrimination on the grounds of sex, sexual orientation, marital status, nationality, colour, race, ethnic origin, religion, age or disability, or of any other condition or requirement’

This project has abided by section 1c by not adding any additional content that the original website contained. There should be no materials that may cause discrimination in any way. The website is about Sierra Leone and contains information about their culture. The website is for information purposes only.

2.2 Section 2: Professional Competence and Integrity

Section 2b. ‘NOT claim any level of competence that you do not possess.’

Section 2B states that the website should not claim to use any other person's work that I can't do, which I've used a framework for. The website will not be claiming any competence of work that of various frameworks and reference their work properly.

Section 2d ‘ensure that you have the knowledge and understanding of Legislation and that you comply with such Legislation, in carrying out your professional responsibilities.’*

I have made sure that the current knowledge and understanding of the current legislation that may adversely affect the integrity of the project during this project.

Section 2g ‘reject and will not make any offer of bribery or unethical inducement’

I will not make any offer of bribery or unethical inducement since this will seriously affect my employability down the line and can stop me achieving my goal of getting a degree in BSC Computer Science.

3.0 Requirements

In this section my aim is to research similar solutions to the problem that this project is trying to solve. There are many mobile first dynamic websites on the internet that can be used for building requirements: analysing them will help turn up good ideas for how to implement this project. These ideas can then be turned into a requirements specification, that in turn will specify the needs of the project, and guidelines for how to design it.

3.1 Requirements gathering

It is very important to gather the correct data for drawing up requirements: poorly defined requirements can make for a bad product, no matter how much work goes into refining it.

The key to drawing up good requirements is to make sure the right research questions are being asked. The current website that the project is re-creating is a pain to use on a mobile device. Therefore, the research must find out why this is and try to correct what it does wrong. To do this must analyse all the aspects on where the website is considered to be frustrating and potentially unusable.

3.1.1 User Testing the Current Sierra Leone website

The choice to get people to user test the website on a mobile device was to see their interaction and observe the issues that they found with the current website in its mobile form. This was done to see what other people thought was bad. The user test consisting of carrying out tasks that someone visiting the website are most likely to do. These consisted of trying to navigate through the website or click on specific elements on the page. The raw data for the user testing can be found in the appendix as well as the consent form that each individual had to fill out. The Test plan can also be found there.

Test Procedure

The outline for this test procedure was to complete the following tasks on a mobile device while being observed. The observer would write down any information about the test that was found to be of use.

The test consisted of:

1. *Watch the Beekeeping video.*
2. *Search number 23 in the quick search and read the first 3 items that show.*
3. *Find information about Martello tower navigating through the navigation menu through sites and monuments and national monuments.*
4. *Access War horns in the glossary.*
5. *Search for only glass objects in British museum from the search collections page.*

These tests covered a wide range of interactivity that a user is most likely to do on the website. As a method of evaluation these tests can be replicated at a later date once the new site has been created, then to compare how users interact with the new website compared to how they found the old site.

Results

The results of this user test were expected. Users found the website a chore to use. This was due to user having to pinch zoom every time they have to click on a button, if they did not do this they would often click the wrong button by accident. Furthermore, if they wanted to read certain data they would have to zoom in closely otherwise they could strain their eyes. However, all the users completed all the tests relatively quickly. Another point made by

a couple of participants regarded the search collection page, and the fact that it had none of the boxes ticked instead of having them all ticked by default.

3.1.2 Existing Solutions/Examples

After evaluating users on the Sierra Leone website it was time to find some good examples of what good web design was and to analyse their good web designs, looking especially at the mobile view and analysing why it was considered good. From these good web design and classing has good interaction of websites viewed on a mobile device. A brief study was undertaken to evaluate what was good about other mobile first approached dynamic websites. A quick google search of good mobile first website brought a couple of sites to attention.

Smashing Magazine

A good example of a website that is mobile friendly and responsive to different views from different devices is Smashing Magazine^[6].

The reasons why this website is good is because it adapts the format to that which is most suitable for the reader no matter what device/screen resolution that they're viewing it on. This compared to the current Sierra Leone site where the website does not adapt to the device and still shows it how it would appear on a desktop but just on a smaller display. Whereas on the smashing magazine it dynamically changes it so different data is displayed so it's easier for the user to read dependant on what device/ window size they're viewing it on. An example of that can be found here in figure 2.

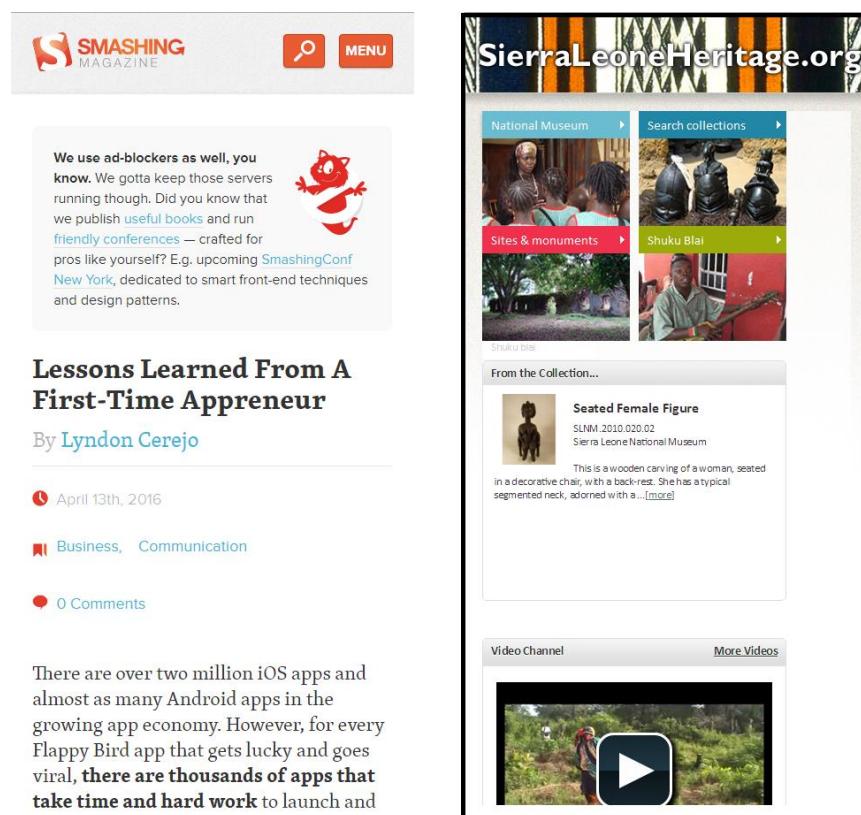


Figure 2 Smashing Magazine responsive view on the left compare to Sierra Leone responsive view on the right.

Skinny Ties

Skinny Ties website [7] goes for a similar design as Smashing Magazines. They both have a responsive layout that dynamically changes the data that is displayed when viewing on different devices. This looks like a following trend that could apply to this project.

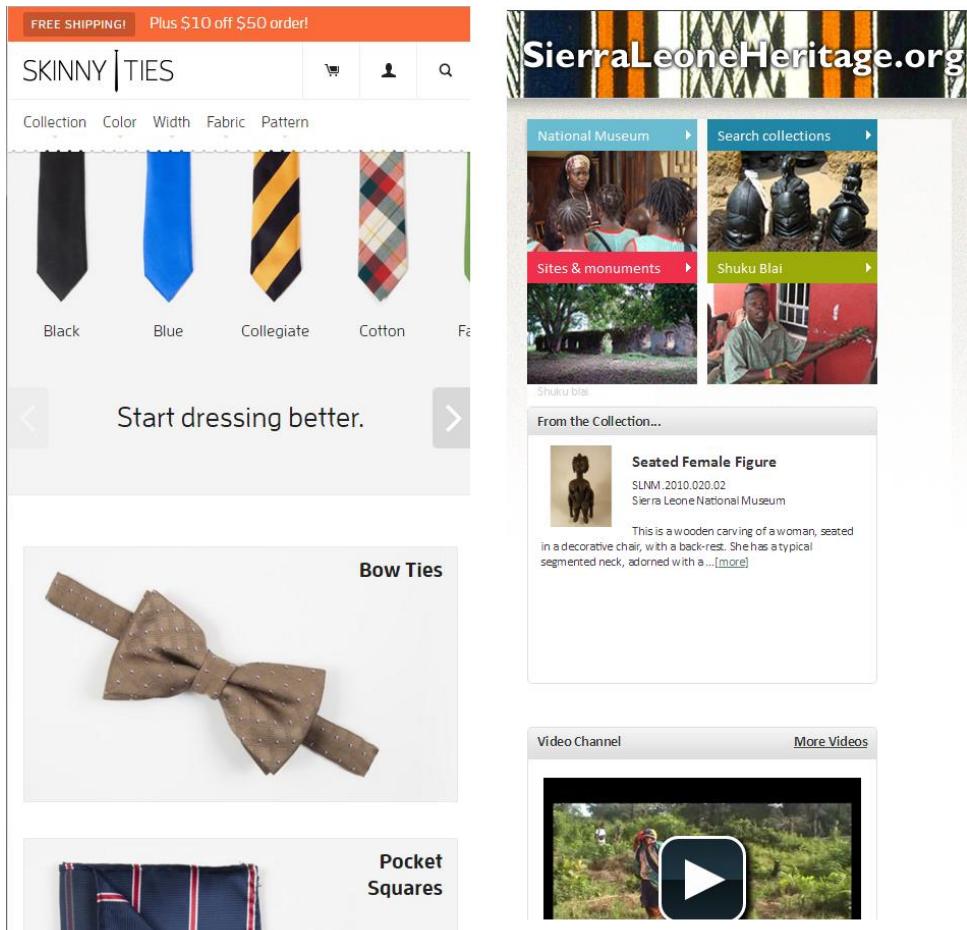


Figure 3 on the left Skinny ties responsive website, mobile view. On the right Sierra Leone current website in mobile view

The Skinny Ties website furthers develops with an automatic size changing menu. When the width of the screen decreases to a degree that will make it awkward for the user to read and use it shrinks. This menu can be accessed easily by staying in the same position relative to each responsive view. This implementation seems very effective and could be used in this project to increase usability and user interaction in a mobile form. Both forms of the website can be seen in figure 4 below.

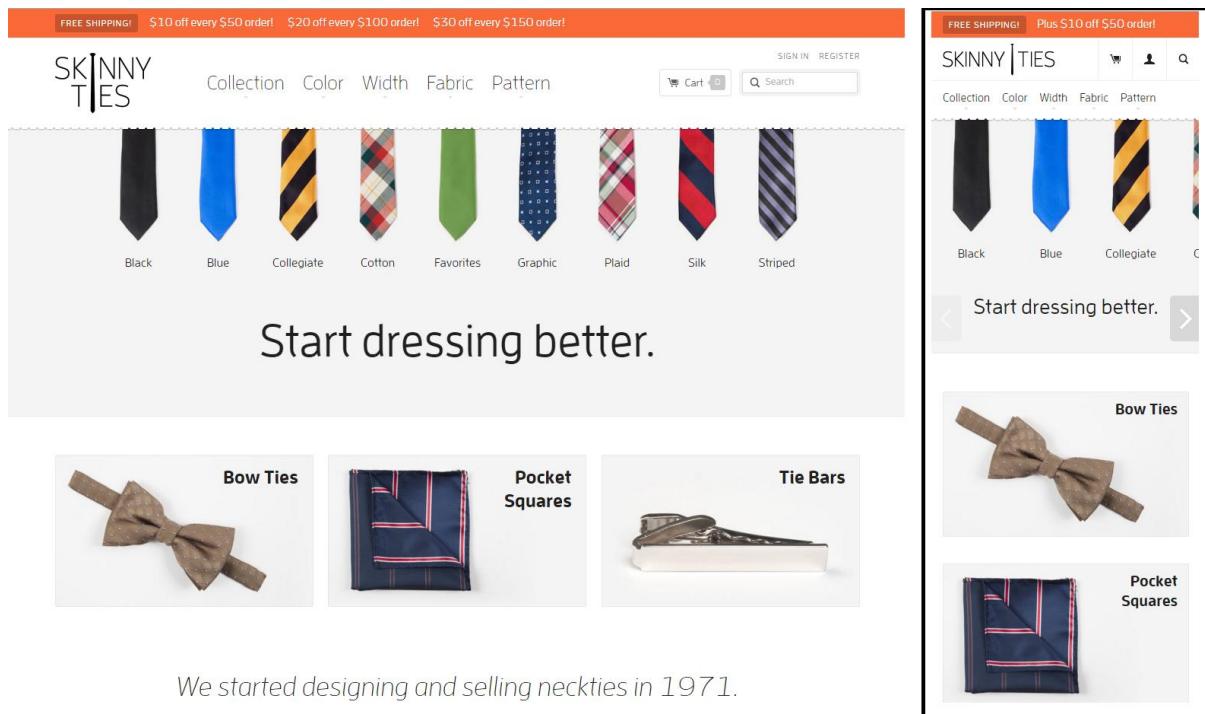


Figure 4 skinny ties desktop view on the left and mobile view on the right.

3.2 Requirements Analysis

It's essential to analyse the data that is gathered from existing products and user testing. It's important since you need the write requirements to use, wrong requirements can be costly down the line and a waste of time.

3.2.1 User Research Analysis

The data collected from the user research shows that the website needs to be more mobile friendly in the sense that the web page needs to become easier to read when on a smaller device. Furthermore, the results that were gathered suggest that the buttons need to be spread out more or easier to press, becoming larger or spaced out more to avoid the user frustratingly tap on the wrong button.

The data also suggest that the overall structure and branding of the website should be kept the same since the user did not have trouble in carrying out all the tasks set in the user tests. However, this does not mean the layout should be left unchanged, since some users struggled to access information as easily as they could have.

3.2.2 Existing Solutions/Examples Analysis

The data collected from looking at existing solutions has been enlightening. They feature menus that disappear once a certain screen size or view has been detected, allowing what free space that is left on the screen to be used to show more important data clearly rather than cramming it all in. The addition of a side menu or a burger menu will be effective when viewing on a mobile device because it will allow the user to see the data clearly on a smaller screen.

Another effective method that is used is the use of columns of data that resize depending on the resolution of the screen. For instance, you can split up the information into columns then re assign the chunks of information to be in different places for different screen sizes, layouts and devices. The most commonly noticeable one is when the website is in mobile view once chunk of data is displayed per a column making it easier to read while still being able to access the other columns of data with scrolling down. This is something that could be used for this project to make the mobile view more responsive.

3.2.3 What is bad about the current Sierra Leone Heritage Website?

From user research and researching existing solutions, it is clear that the Sierra Leone site is functional from the desktop browser. However, it does not support mobile devices. The reason this is phrased this way is because the majority of modern mobile websites adaptability change what view that the website wants you to view them in. For instance, you may notice on your mobile device that you can have the option to view the site in 'desktop view'. This renders the website how you would view the site on the desktop. Most modern website support this, but the current Sierra Leone site does not. There is no option currently to see the website in mobile view, it only has a desktop view. That is the real problem with the website: in this day and age, having no mobile website is unacceptable.

3.3 Web technologies

Briefly mentioned in the introduction, this section will go into more detail on various web technologies that may or may not be used or needed in this project.

3.3.1 Front end Framework

A front end framework in the way of this project is to be a base for the website to be built on. The typical features that a front end framework will provide are:

- An easy to use user interface.
- CSS source code to create a fluid grid layout.
- Support for browser incompatibility.
- Typography style definitions for various HTML elements.

The benefits of using one of these front end frameworks for the project is that it allows the creation of a dynamic responsive fluid grid layout that is good for all desktop or mobile devices. Furthermore, it allows the use of specific CSS elements that can be used to create a simplistic yet effective style that is easy on the eyes. Using a front end framework is time efficient, since the only other alternative is to create a fluid grid layout from scratch. On top of taking a lot of time to create, chances are it will not be as good as another pre built grid layout from a front end framework.

After hearing about 2 possible frameworks that could be possibly used for this project, taking a close look at both to see which one is more suitable.

3.3.1.1 Bootstrap

Bootstrap [8] made by Twitter [9] is the most well-known front end framework that is out there. There are many examples of Bootstrap based websites with a good layout. Many of the basic templates look suitable to build the new Sierra Leone site on. From user research a toggleable navigation menu was needed to give the website a clean look and allow an easy viewing experience for the user. Bootstrap offered this in a wide range of formats, from side menus to burger menus to drop down menus. At this point in the project, the most enticing option was a side navigation menu similar to the original Sierra Leone website.

Another huge factor in using a front end framework is how usable is it? Bootstrap claimed to be easy yet effective to use. All that was needed to setup Bootstrap was to download 2 folders a CSS folder and a JavaScript folder, then using a template from the website put the HTML file next to the two folders. Creating a fluid grid layout was also relatively simple. You would specify how wide you would want a div to be depending on the resolution of the screen. The default sizes for these windows being:

	Extra small ≤544px	Small ≥544px	Medium ≥768px	Large ≥992px	Extra large ≥1200px
Grid behavior	Horizontal at all times	Collapsed to start, horizontal above breakpoints			
Container width	None (auto)	576px	720px	940px	1140px
Class prefix	.col-xs-	.col-sm-	.col-md-	.col-lg-	.col-xl-
# of columns	12				
Gutter width	1.875rem / 30px (15px on each side of a column)				
Nestable	Yes				
Offsets	Yes				
Column ordering	Yes				

Figure 5 Bootstrap grid layout sizes

With these different grid sizes you can specify how you want items to appear on different window sizes and devices. To create a fluid section you would create a new div and in the class field of the div you would specify how wide the div should be for each window size.

```

114 <div class="row">
115   <div class="col-xs-12 col-sm-6 col-md-6 col-lg-4" id="sec1">
116     <h2>National Museum</h2>
117     <p> In the national museum section you can see all the info
118
119     <p><a class="btn btn-default" href="SierraLeoneNationalMuseu
120   </div>
121   <!--/.col-xs-6.col-lg-4-->
122   <div class="col-xs-12 col-sm-6 col-md-6 col-lg-4" id="sec2">
123     <h2>Search gallery</h2>
124     <p> You can search the contents of all the Sierra Leone mus
125     <p><a class="btn btn-default" href="SearchCollection.html"
126   </div>

```

Figure 6 creating a fluid grid layout with Bootstrap using the column system for divs.

To further Bootstraps ease of use, it was very easy to change what type of menu, toggleable or not, just by changing the class of an item in the HTML. Playing around with these features, it seemed like it would be easy to generate a solid basis for the new website.

3.3.1.2 Semantic UI

Semantic UI [10] is a development framework like Bootstrap, however it does not have all the functionality that Bootstrap does. But Semantic UI can implement Bootstrap elements itself. On the other hand, Semantic UI has a better grid layout than Bootstrap, it allows for you to create your own grid any size quickly and easily. It does this by creating a user interface grid from which you fill up items in a grid layout. It has multiple options for grids and they all

dynamically scale down when the window is resized. You do have more original functionality here but it's easier to create a mobile first site since Bootstraps columns specify how many columns per a window size.

Overall the experience of Bootstrap was found easier to use for building a site to be more mobile friendly because of its dynamic scaling. That does not mean Semantic UI was worse, just harder to implement with, whereas Bootstrap was the perfect tool for the job at hand. The addition of Bootstrap being the biggest framework for front end development also meant that there was a bigger community creating more templates that could possibly be used.

3.4 Requirements specification

The requirements specification will contain all the functional and non-functional requirements that are needed to complete the project and the proposed implementation. There will also be a section called possible requirements that will contain further objectives that will be completed if there is enough time.

3.4.1 Functional Requirements

The functional requirements of this project are the requirements that are expected to complete the product. They will include what functionality that is required to complete the project.

3.4.1.1 Basic Web Requirements

The basic web requirements for the website to run on the web.

- 1 ***The website should have the same functionality as the Sierra Leone current website.***
 - 2 Users should be able to access the same web pages as before, these consist of: browse collections, search collections, video gallery, glossary, Sierra Leone national museum, sites and monuments, Shuku Blai, Facebook community.
 - 3 The web pages that the user can access should have a similar layout to the view of the current Sierra Leone site, since it's a good layout and the user base is used to it.

1. ***The video gallery page should be interactive and frustration free***
 2. The video gallery must contain all videos and provide easy access to all videos.
 3. The videos should be able to be loaded on all modern mobile devices.

1. ***All static web content should be kept in the same format as the current Sierra Leone website***
 2. Static content should be kept in the same style for Desktop views/ large resolutions.
 3. Static content must appear clearly and cleanly on a modern mobile device.

1. ***The website should keep the same branding as the Sierra Leone website***
 2. The branding for the website should have the same theme to it as the current Sierra Leone site.
 3. The website must contain the same style footer with all the same branding names that the current website. This is needed because these show the original creators.

1. ***The website should have an accessible navigation bar that can be used to go between key web pages on the website.***
 2. The navigation bar must be accessible on all pages and be standardized between pages.

3. The navigation bar must be easily accessed.
4. The navigation bar must be reduced in size on a mobile display to take up less space.

 1. ***The website should have a webpage for the Facebook Community that dynamically adds posts from the public Facebook group to the webpage***
 2. The Facebook posts will be automatically added to this web page as soon as they post on the page and are set to public and not private.

 1. ***The website should have a search function at the top right of the page where users can search for items.***
 2. The search function must return users any results given an input of a description word or a COId of an object.
 3. This function must work similarly to the one on the current Sierra Leone heritage site.

3.4.1.2 API Requirements

1. ***The website should access all data from the database through the API given.***
2. All data from the database, i.e. each Sierra Leone objects. Should be retrieved through API calls.
3. Additional API calls should be created to retrieve data if needed.

1. ***The website should have a search function at the top of all pages to quick search items and keywords and display the results in a separate web page.***
2. The Quick search should return all results given a key phrase, word or a COId number and display the results in a results page.
3. Results should be extracted from the database through any API function.

3.4.2 Non-functional Requirements

The non-functional requirements consist of requirements that ensure that the operations of the functional requirement by putting constraints on certain interactions and are not explicitly told in the functional requirements.

1. ***The website should not make more than 1000 calls to the API in less than a minute.***
2. The website should not make any more calls than this a minute to protect the server from excessive load and unresponsiveness.

3. ***The website should be easy to use and interact with.***

4. This means that users can recall and recognise from the previous Sierra Leone site where key functionality and interactions are.
 5. The phrase easy means that the website should be able to use by all people that have been on the internet before and have basic reading skills.
1. ***The website should load specific pages within 2 seconds on an average internet connection of(2mbps)***
 2. Where additional dynamic content is needed the website needs to show that it is loading and to not stay stationary as this can cause confusion in the user.
 3. ***The Website needs to resize all content depending on the resolution of the display, as long as the display is above 400x300 pixels.***
 4. That all dynamic content should automatically adjust and show content clearly.
 5. That all static content should automatically adjust and show content clearly.
 6. ***The entire website should be no more than 10MB in size (does not include additional dynamic content such as videos).***
 7. To avoid unnecessary bandwidth usage the website should be kept to this size limit.
 8. Loading additional dynamic content will use space saving formats to reduce the use of additional data having to be loaded. This is vital if using a mobile phone with mobile internet and to avoid extra charges.
1. ***The website work with all modern web browsers***
 2. All functionality can be used across all up to date web browsers on all modern web devices that support a resolution of 400x300.
 3. All devices must have support for the latest version of JavaScript and support the latest version of Bootstrap.
1. ***The style of the website should not be intimidating***
 2. The website should contain no harsh colours and have rounded objects.
 3. The website should contain good contrast between colours to help avoid people who suffer from colour blindness.
1. ***The website should not be unresponsive on modern devices***
 2. On webpages with JavaScript function or API interaction the modern device should be responsive. An example of this would be clicking on the navigation menu when trying to load a search from the API.

3.4.3 Possible Requirements

These requirements are on the extension of the project. These are not required to complete the project but are a good basis for future work.

1. ***Fully complete the API for further use.***
2. Finish the incomplete functions of the API

- 1. Make sure new written API functions are fully functional.**
2. Additional functions to make the extraction of data faster.

4.0 Initial Design

This section of the project goes over the initial designs choices that were made. This then leads to a more developed design, which was then implemented into the final design to be used on the website. This section will contain the design processes involved to get to the final designs and explain the design choices that were made to get to this finished design.

4.1 Bootstrap Templates

One of the advantages of using Bootstrap is that there are many pre-existent web templates that can be used. To make keeping the same branding easier and overall layout it was suitable to pick the design that seemed closest to the current website, and thus required the least changes to meet these requirements.

4.1.1 Bootstrap Desktop View

One of the basic templates, the Off Canvas Template ^[11] was the closest one to fit the style of the Sierra Leone current site could find.

Figure 7 shows the off campus template from Bootstrap

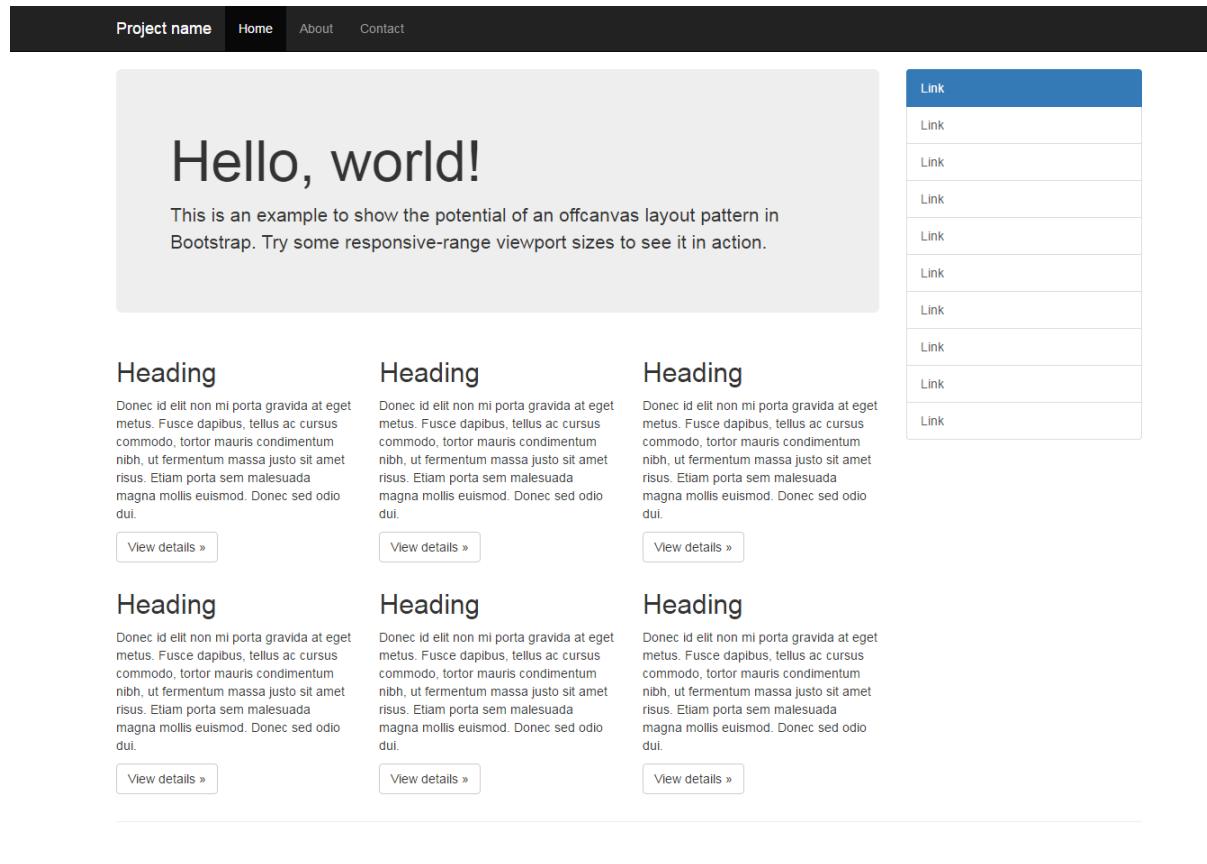


Figure 7 the off campus template from Bootstrap from a desktop view

Figure 8 shows the basic structure of the Sierra Leone heritage site.

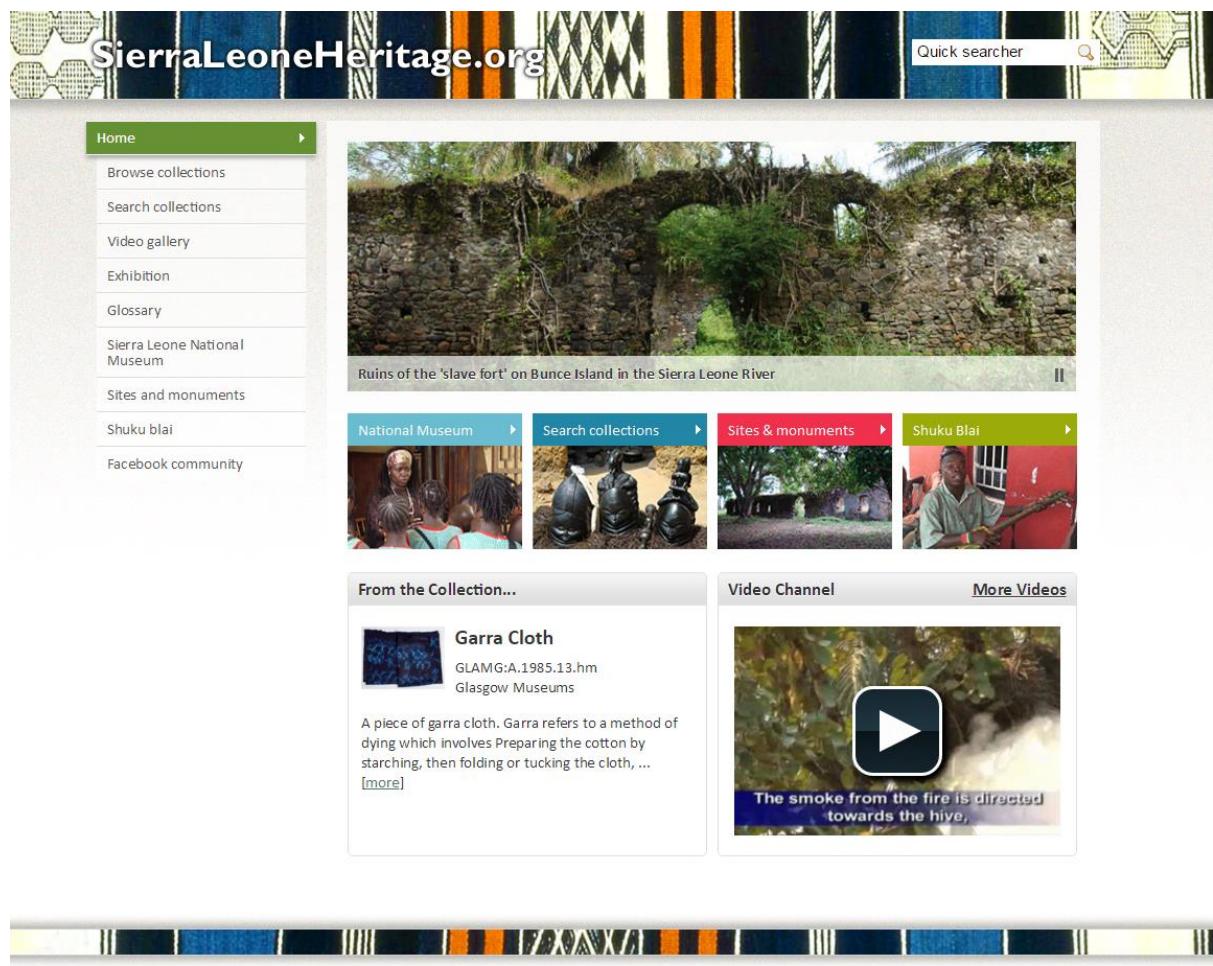


Figure 8 shows the current Sierra Leone Heritage site from a desktop view

From these two design plans the idea was to manipulate the Bootstrap template by putting the image displayed on the Sierra Leone site that is in the carousel, inside of the jumbotron on the bootstrap site. This would bring the design to look more like the Sierra Leone site.

Another key aspect that would maintain the integrity of the branding is to move the navigation bar on the Bootstrap site over to the left of the screen. Generally, the majority of sites have the navigation bar on the left of the screen, providing further backing for this decision.

The last key aspect that had to be changed over to the bootstrap templates was to add a quick search bar to the top of the web page. From this input box the users should be able to query the database from keywords or phrases.

4.1.2 Bootstrap Dynamic/mobile View

One of the whole reasons for doing this project is to make the website functional on all modern devices. Arguably one of the biggest aspects is the view of the website from a mobile/tablet view.

Figure 9 shows the bootstrap view of the template from a mobile point of view.

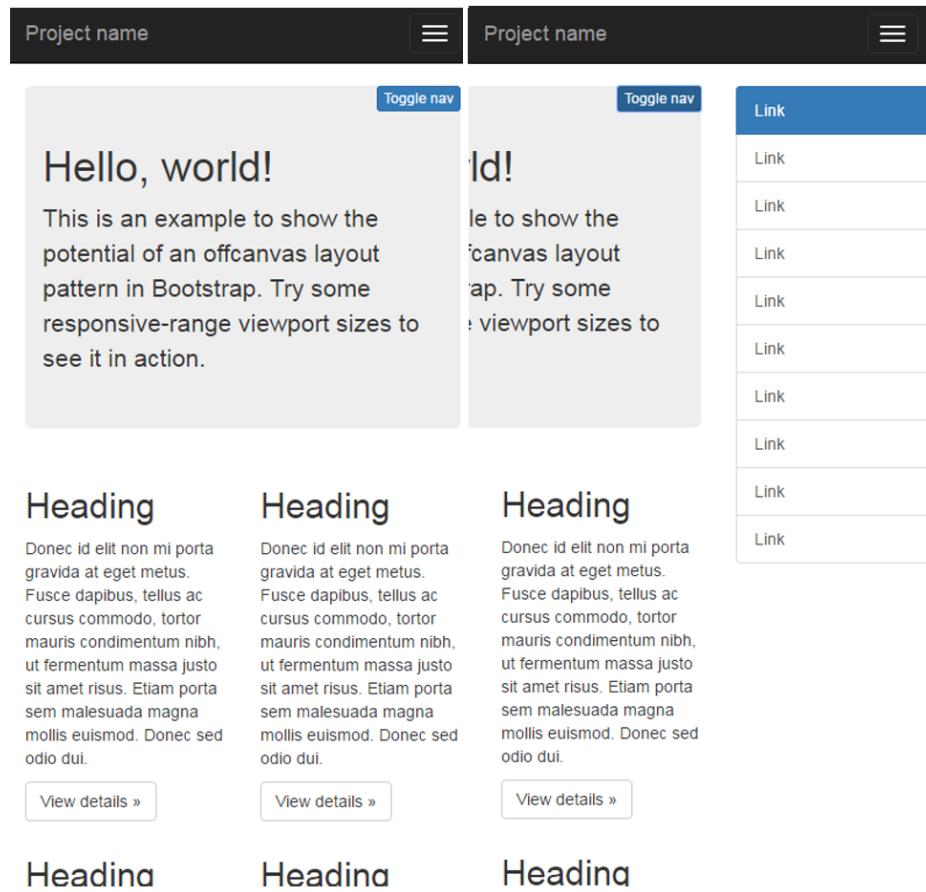


Figure 9 both images show the Bootstrap off canvas template in a mobile view. The left image shows the navigation menu not toggled, the right images shows the navigational menu toggled

Figure 10 shows the Sierra Leone view from a mobile point of view.

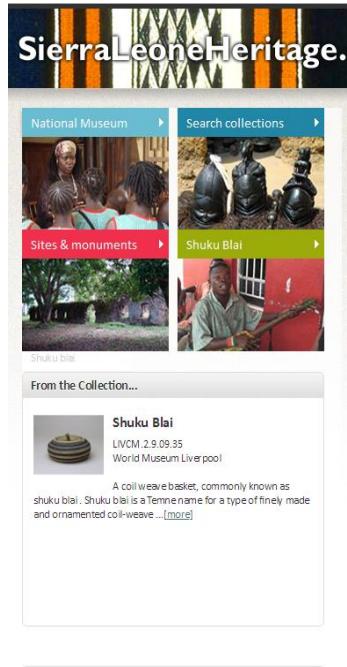


Figure 10 Sierra Leone Heritage current website from a mobile point of view

The major issue with the Sierra Leone website is that its navigation completely disappears, so there is no easy way to navigate the web page. The template selected from the Bootstrap has a collapsible navigation bar. This can be toggled to reveal or hide the navigation bar, this works wonders for mobile views.

A good features of the current Sierra Leone site is that when at a small view the content on the page changes size and position, making it easy to see data on the screen. This way of displaying data can be implemented into the Bootstrap template with its column system and resizing specific elements based off of the current window size.

4.1.3 Toggleable Navigation Menu

From looking at existing products and examples of dynamic responsive websites it was made clear that all of them contained some type of navigation that was scaled down from the desktop view. Since the current Sierra Leone website does not have a navigation menu in this view, but is good in other aspects displaying data clearly. The solution proposed is to merge a toggleable navigation bar to the current layout, giving the ability to navigate freely and to display data clearly on a mobile screen.

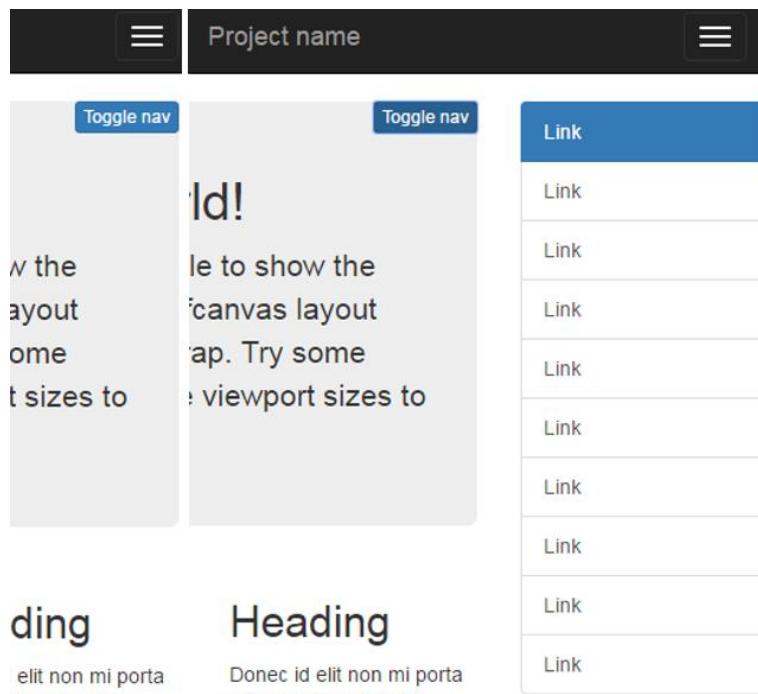


Figure 11 the toggleable navigation in the Bootstrap off canvas template from a mobile view.

Styling the navigation to match the same style and branding as the current Sierra Leone heritage site is hard to implement in Bootstrap. This is because Bootstrap doesn't give you a variety of options to change the colour. The default styling that Bootstrap uses is suitable for the purpose of this project although it would look better with the same style used in the original Sierra Leone site.

Some webpages on the current Sierra Leone site contain subpages that appear in the navigation menu once the user has clicked on the parent node. The styling changes on the navigation for these sub sections as you see in figure 12.

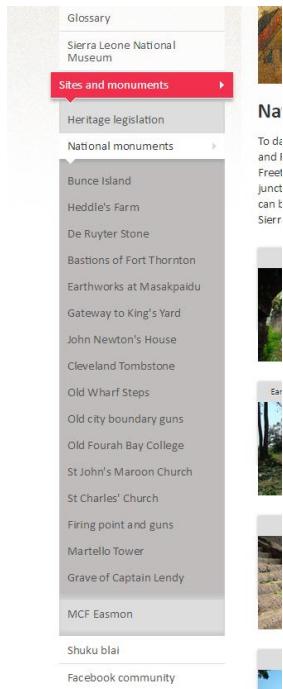


Figure 12 subsection of the navigation menu for the current Sierra Leone website.

The design plan is to have each sub section different colours and for the menu to be toggleable, to hide sections of the navigation that may have loads of sub sections. On the navigation menu, the section the user is currently browsing will have its text in bold, in order to emphasise it.

4.2 Branding

The current Sierra Leone site uses a unique branding that demonstrates the traditional colours and vibrancy of the Sierra Leone tribe. The plan to adjust the Bootstrap site is to have it have the same branding, which consists of the same colour scheme that the current website has. The design changes needed to make to achieve the same branding consist of making the banner at the top of the page, have the same background as the current Sierra Leone site.

Furthermore, another big part of the branding is to have the same structure for each page. The overall layout of the Sierra Leone current side is very good when viewed on a desktop. The design for the new site should be kept as close as possible to the current site. By layout in the sense that text, photos and all other pieces of data are relatively in the same position.

Other aspects of branding are the footer of a webpage. For all purposes of branding the footer of the new site will be near enough exactly the same as the old site keeping all icons and links to various creators of the original site. The Sierra Leone heritage site doesn't contain a specific mobile view, the design on the new website is to have elements relatively in the same place as where they are featured on the desktop site. This is so users will find it more convenient.

4.3 Initial Design Views

The first mock ups of the initial design were done on paper to get a grasp on if they work. The first initial design is of the home page. This homepage has 3 initial designs. One for desktop view two for the tablet view and four for the mobile phone.

4.3.1 Initial Designs for the Homepage

The first initial design of the homepage was made for the desktop view.

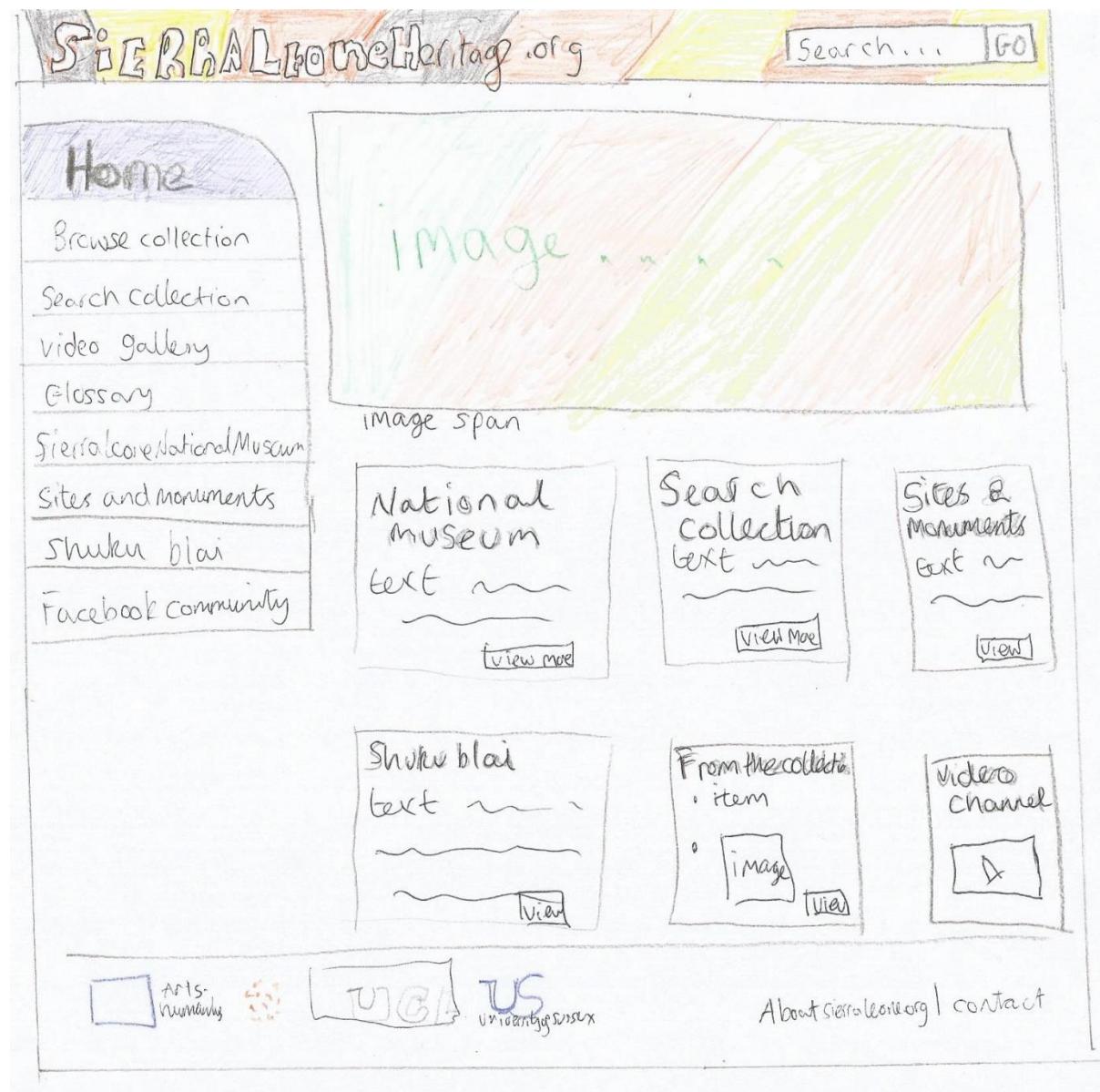


Figure 13 this shows the initial sketch of the home page implementing Bootstrap layout and features from the original Sierra Leone site.

As you can see it looks very similar to the Bootstrap site but contains elements from the original site. This design is also quite simplistic, which can be considered a good thing when talking about a website.

The next drawing is of a mobile phone view.



Figure 14 initial draft view of the home page from a mobile point of view. Notice the toggleable navigation menu is collapsed.

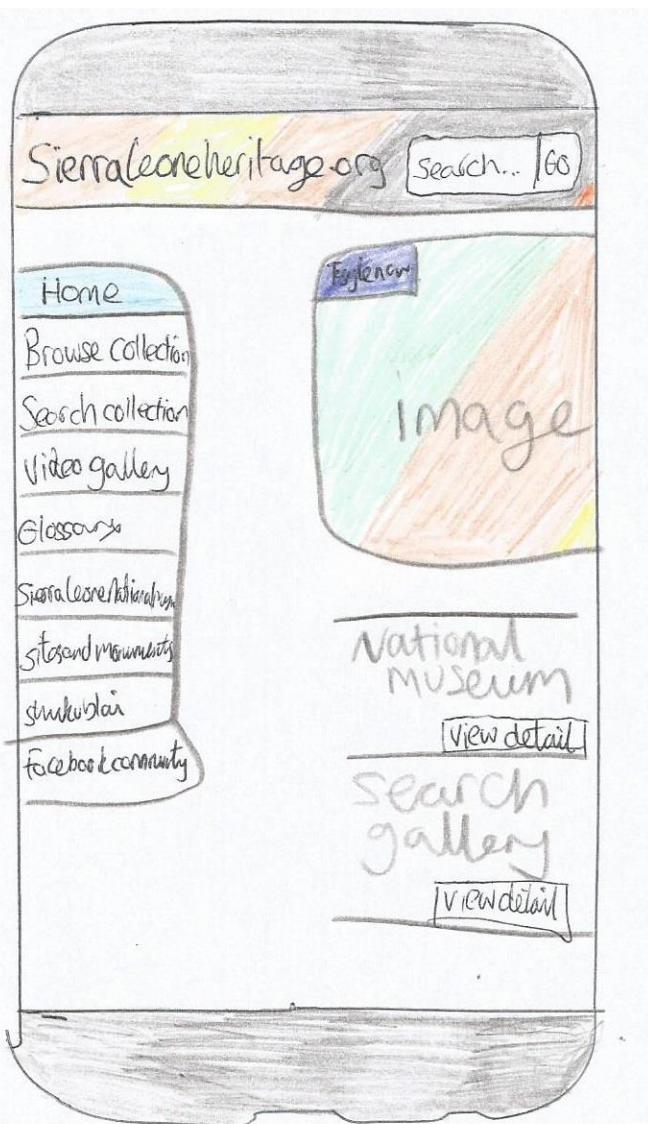


Figure 15 initial draft view of the home page from a mobile point of view. Notice the toggleable navigation menu is not collapsed.

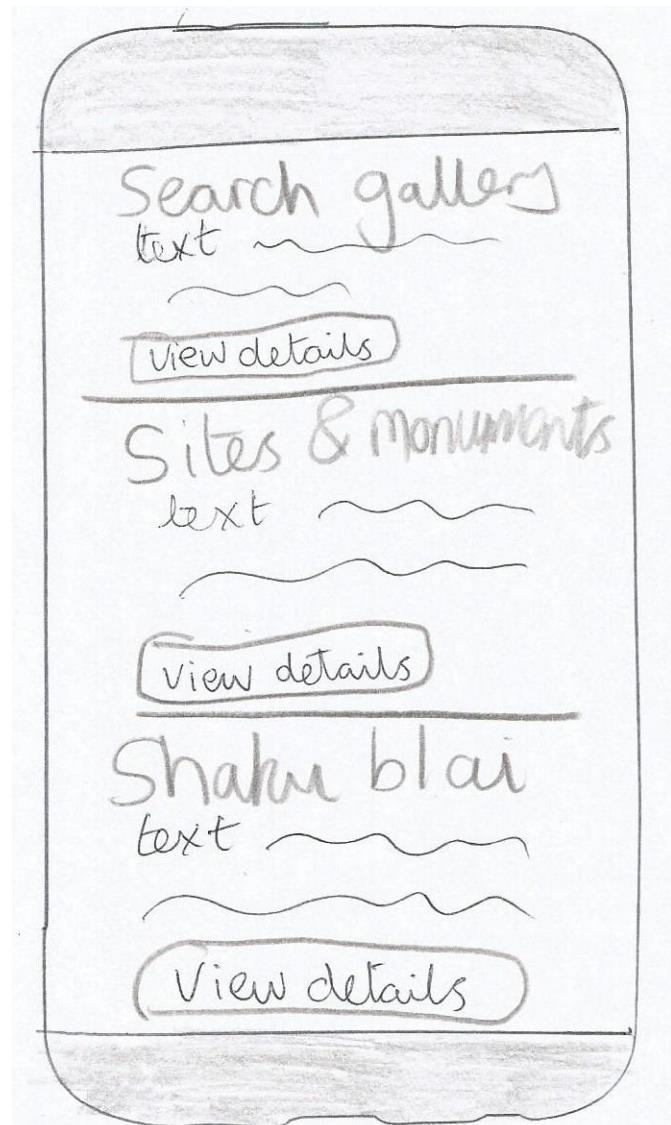


Figure 16 initial draft view of the home page from a mobile point of view. Notice the toggleable navigation menu is not collapsed. This is about halfway down the page.



Figure 17 initial draft view of the home page from a mobile point of view. Notice the toggleable navigation menu is not collapsed. This is showing the footer of the page.

This design completely changes the format of the way the data is viewed. Instead of having three columns to show the major site links on the homepage, it is now limited to one. This one has slightly increased size so it can be viewed more easily on a smaller device such a mobile phone. The navigation menu is drawn in two views. One when collapsed and the other when expanded pushing the data to the side. This should be toggleable by clicking toggle nav. This view still shows the search bar at the top for quick searching.

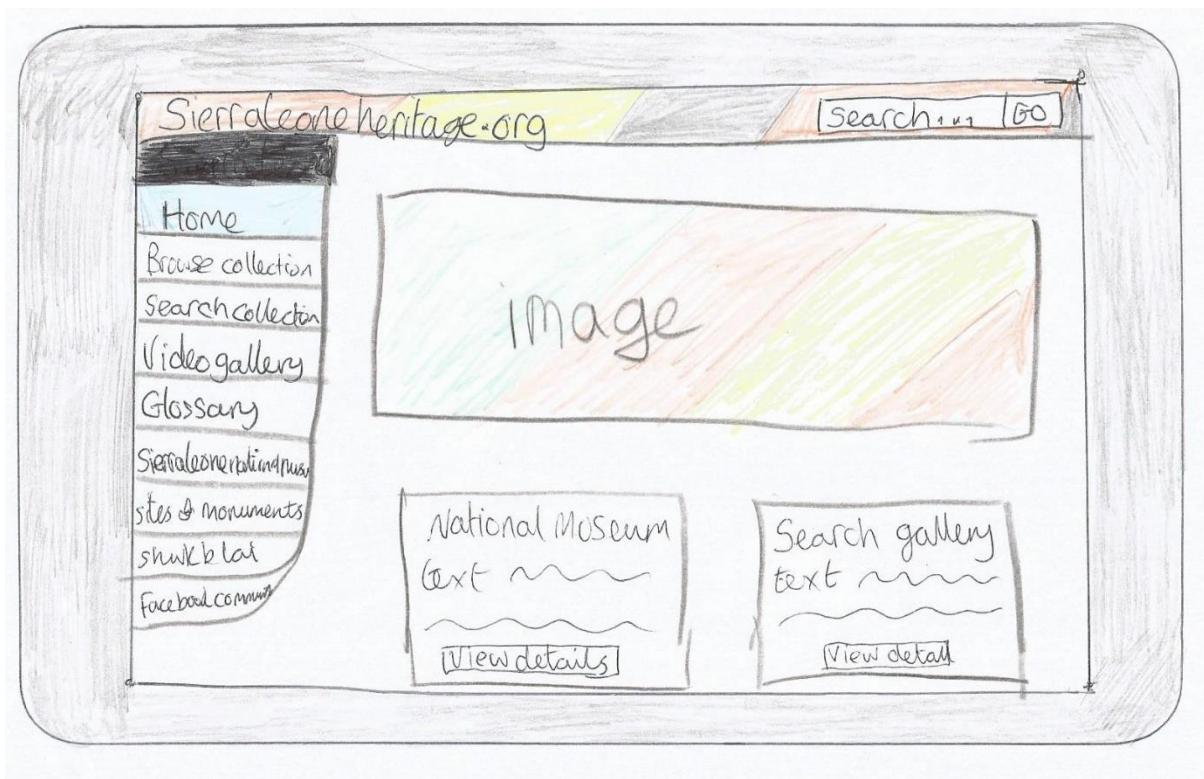


Figure 18 shows the draft sketch from a mobile point of view from the home page.

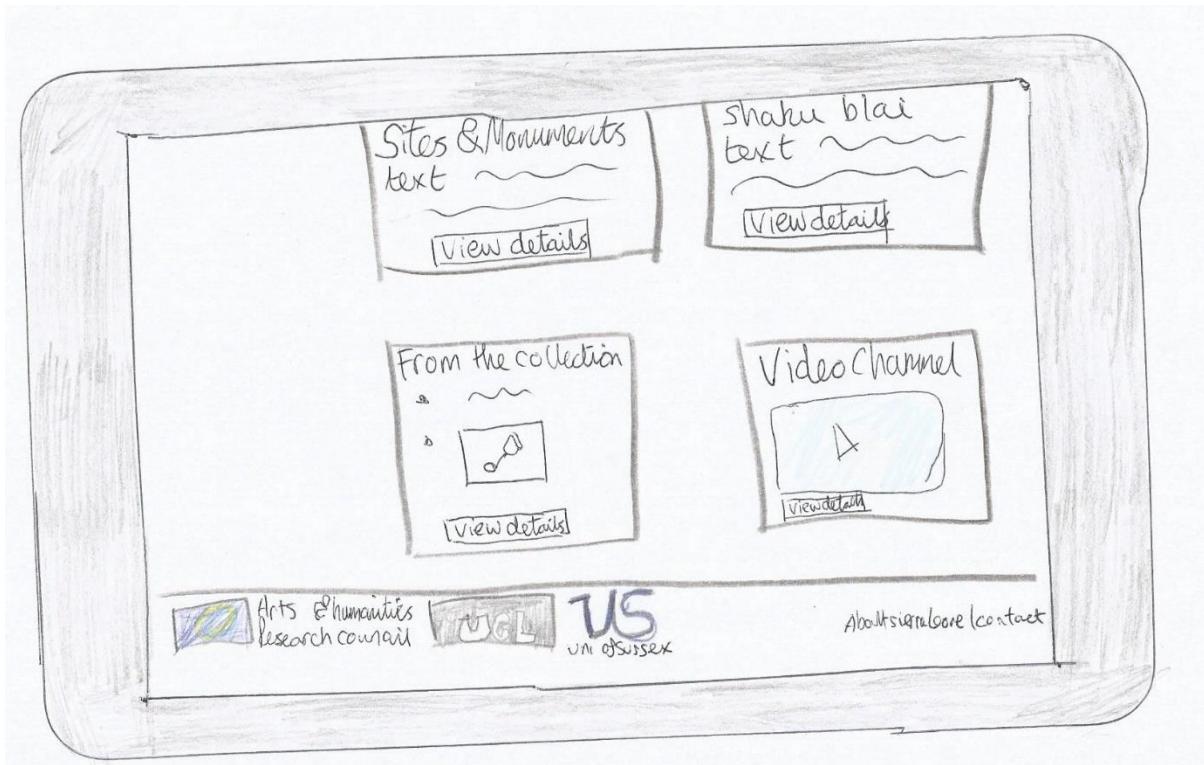


Figure 19 shows the draft sketch from a mobile point of view from the home page. This shows the bottom half of the page where the footer is.

This design is similar to the desktop view but instead of having three columns of data it now has two columns of data wide. Because a tablet screen is pretty wide it shows enough data big enough without having to have a toggleable navigation bar to see everything. This view still shows the search bar at the top of the page for quick searching.

5.0 Design and Implementation

So far throughout this project we have gone over the requirements needed to complete this product, which is a website in this case. Initial draft of designs have been created through a low fidelity prototype drawn by hand. Furthermore, the desired front end framework being Bootstrap to aid in the creation of a suitable implementation for this project. This part of the report will contain the next steps in implementing the website. The final implementation of this website can be found here: <http://users.sussex.ac.uk/~bacw20/Home.html>.

5.1 Implementing through Bootstrap

With the aid of Bootstrap in this project, the first steps were to implement the initial designs into HTML using the front end framework Bootstrap. The first steps were to implement the initial designs changes proposed in requirements that were to manipulate the Bootstrap template.

5.1.1 Making Initial Design Changes

Following up from the Low Fidelity prototype that was created of the home page. The next step was to implement the changes from the Bootstrap template to the new implementation

The proposed initial design changes mentioned were to move the navigation bar from the right of the screen to the left. This initial change in Bootstrap was incredible easy. Shown below is the element of code that creates the toggleable navigation menu.

```
76 <div class="container">
77   <div class="row row-offcanvas row-offcanvas-left">
78     <div class="col-xs-6 col-sm-3 sidebar-offcanvas" id="sidebar">
79       <div class="list-group">
80         <a href="Home.html" class="list-group-item">Home</a>
81         <a href="BrowseCollection.html" class="list-group-item">Browse collections</a>
82         <a href="SearchCollection.html" class="list-group-item">Search collections</a>
83         <a href="VideoGallery.html" class="list-group-item">Video gallery</a>
84         <a href="Glossary.html" class="list-group-item active">Glossary</a>
85         <a href="SierraLeoneNationalMuseum.html" class="list-group-item">Sierra Leone National Museum</a>
86         <a href="SitesAndMonuments.html" class="list-group-item">Sites and monuments</a>
87         <a href="ShukuBlai.html" class="list-group-item">Shuku blai</a>
88         <a href="FacebookCommunity.html" class="list-group-item">Facebook community</a>
89       </div>
90     </div><!-- .sidebar-offcanvas -->
91     <div class="col-xs-12 col-sm-9">
92       <p class="pull-left visible-xs">
93         <button type="button" class="btn btn-primary" data-toggle="offcanvas">Toggle nav</button>
94     </p>
```

Figure 20 code implementation for the navigation menu. Where there is a div class row-offcanvas-left, it used to be div class row-offcanvas-right.

To change it so the navigation menu is on the left you changed all instances of right in the div classes to left. It was required to change two of these elements. One for the button and one for the menu that slides on and off of the screen.

Another initial proposed design change was to add a search bar to the top of each page to be used to query a quick search in the database. This was implemented by creating a div with class “input-group”. This creates a type able text field in Bootstrap from which you can use to submit data through multiple ways. This search box was added to the top of the navigation bar that Bootstrap supplies at the top of the page to host the title of website. This navigation

bar always appears on the screen no matter how far you scroll down, an advantage for this project allowing users to quick search no matter where they are on a page.



Figure 21 shows the search box implemented into the navigation bar.

Although this was relatively simple it was rather frustrating getting the search bar in the top right of the screen at all resolutions. To counter this, Bootstrap has the use of offsets in their fluid grid layout. These offsets were used to make sure the search box was always in the top right of the page no matter what view it was being viewed at.

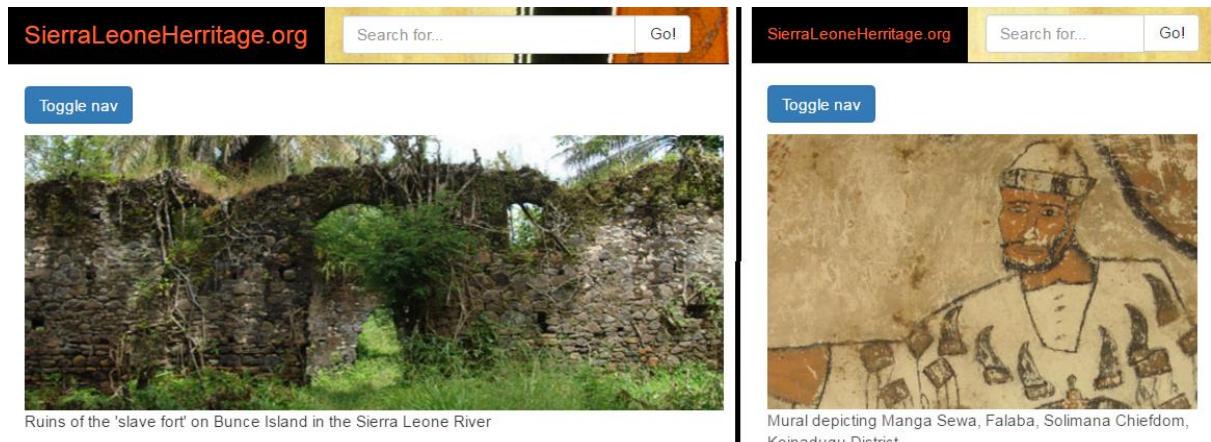


Figure 22 shows different views of the search box, the left side a tablet view the box is slightly longer and the title text is bigger. However, on the right side the box is slightly smaller and the text is slightly smaller to accord for the mobile view

Another change to the navigation bar at the top of the page was to style it properly. Keeping the theme from the original site was to screenshot the pattern for banner on the original Sierra Leone heritage site then to edit it in Photoshop to get a continuous pattern wider than most modern monitors all the way up to the resolution of 4K. Then it was a case of using CSS and adding a background image to the navigation bar. There was one issue with this and that was that the contrast of title of the webpage was horrible and harsh on the eyes to see on some parts of the background pattern. To combat this issue it was a simple procedure to add a black background behind the title to improve the contrast.

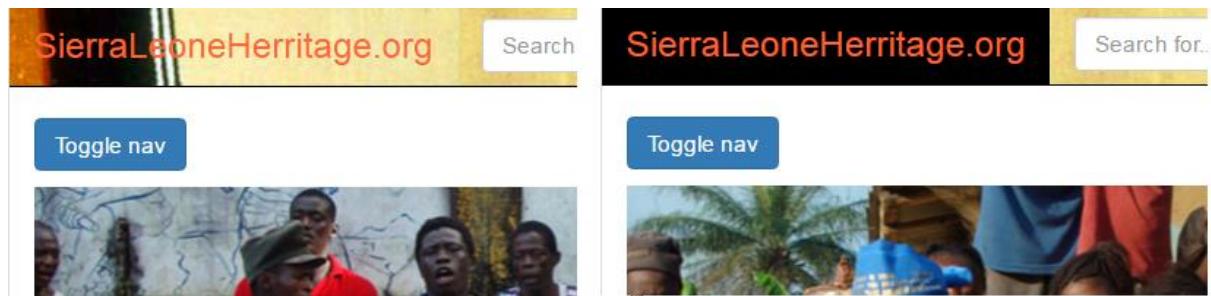


Figure 23 the left image shows the navigation bar without a black background. The image to the right shows the image with a black background to improve the contrast

The last change that had to be implemented from the initial design was to add a similar styled footer to the web page. This footer was implemented by copying the source code from the original site and pasting it into the new site. The only thing that needed to be changed

from that is to make sure it displayed properly on a mobile phone. This was done by adding paddings so all images and links could be seen at all times no matter the resolution of the display. Using Bootstraps fluid grid layout saved a lot of work here because it moved the images and text in the footer closer together than it ever did on the current Sierra Leone heritage site. Figure 24 shows how you can't see half of the footer on the original Sierra Leone site when in a mobile view; but can see it on the new mobile friendly implementation.

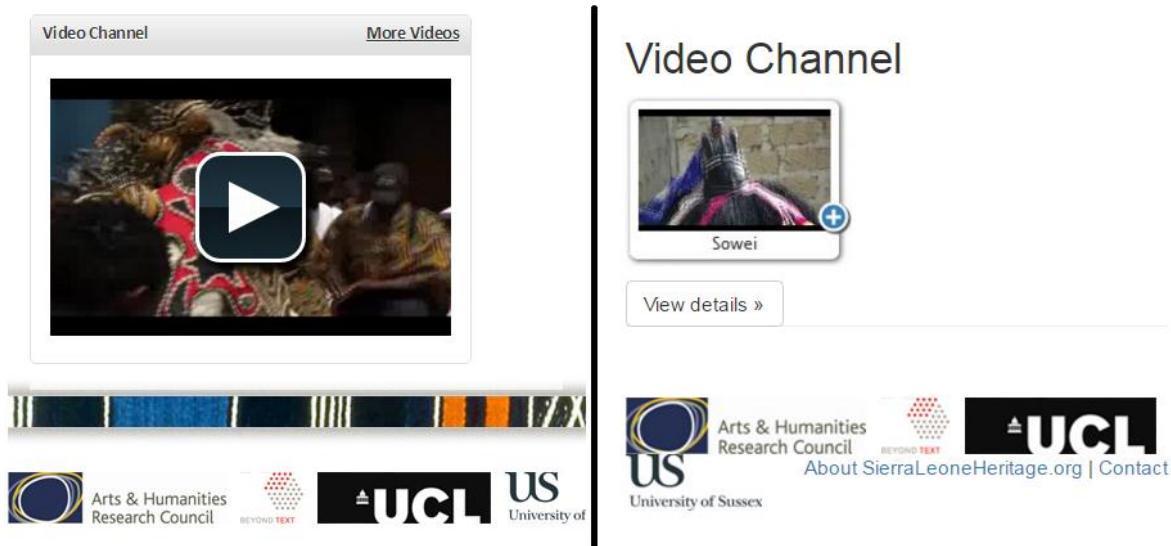


Figure 24 shows the footer of the Sierra Leone current site on the left, and the footer of the new implementation on the right.

After implementing these initial draft changes, it was important to make sure that they worked for all views of the website. The most tedious part of the project was to add different offsets so everything would display correctly on all different views. It's very important that all views of this website should show data properly no matter the window size as this is one of the functional requirements.

5.1.2 Creating a Universal Fluid Grid Layout Template for Static Content

After the changes that were implemented to produce a home page layout. The home page layout will not be universally transferable for any other page that would be created on the website. To save time and effort it would make more sense to create a template that could be used on the majority of content. Since dynamic content will be retrieved from using the API this template will be towards on all static content page. The main advantage to doing this is that it will save a lot of time and effort than having to recreate the same style of web page over and over again.

Analysing the current site, the majority of static content is in the form here, in figure 25.

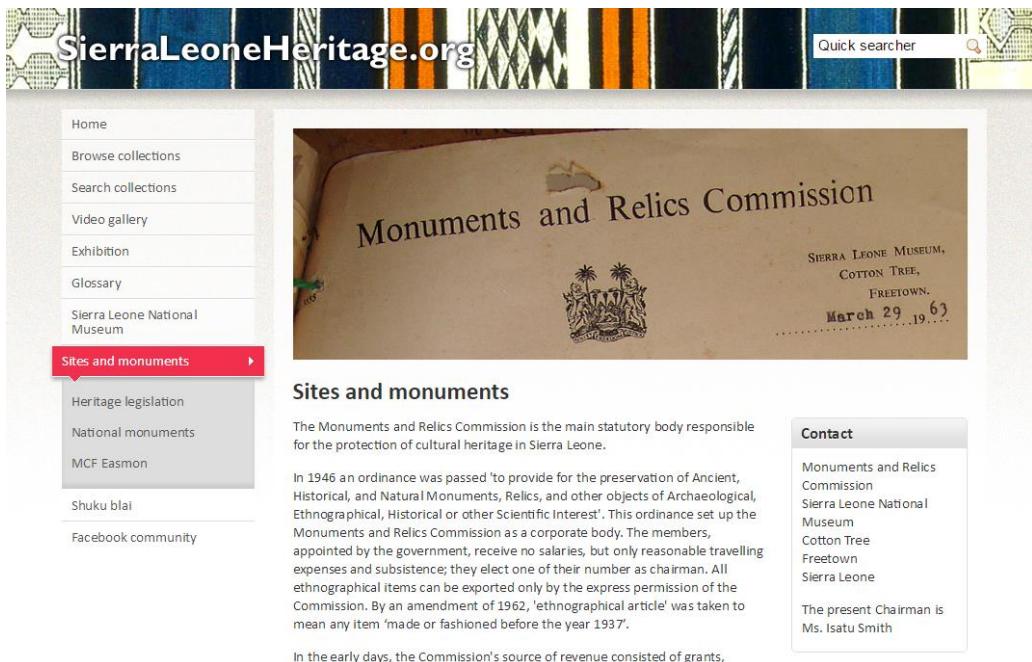


Figure 25 shows the default layout for static content from the Sierra Leone current website

The next steps from seeing this design was to create a design for each window size that Bootstrap accounts for etc. XS, SM, MD and LG, which can be seen in figure 5. These designs are drawn using Paint and are mock-ups of the skeleton of each of the views.

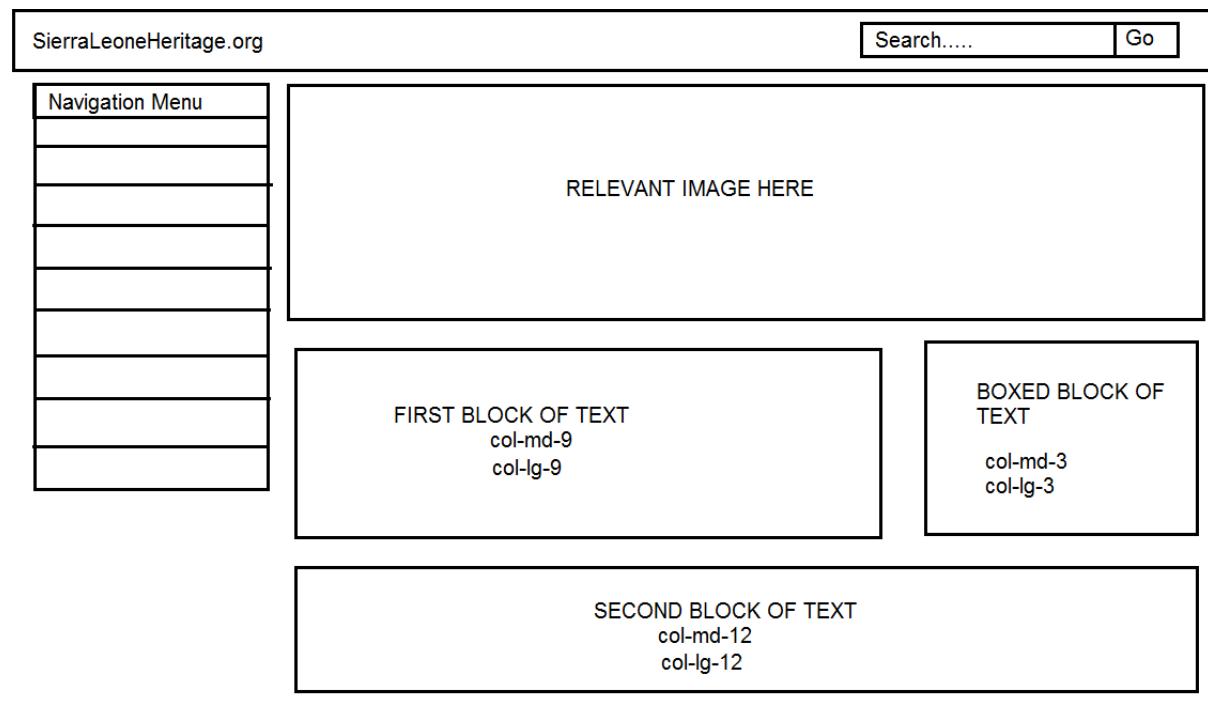


Figure 26 shows the skeleton for the generic layout for static content from a large and medium windows size.

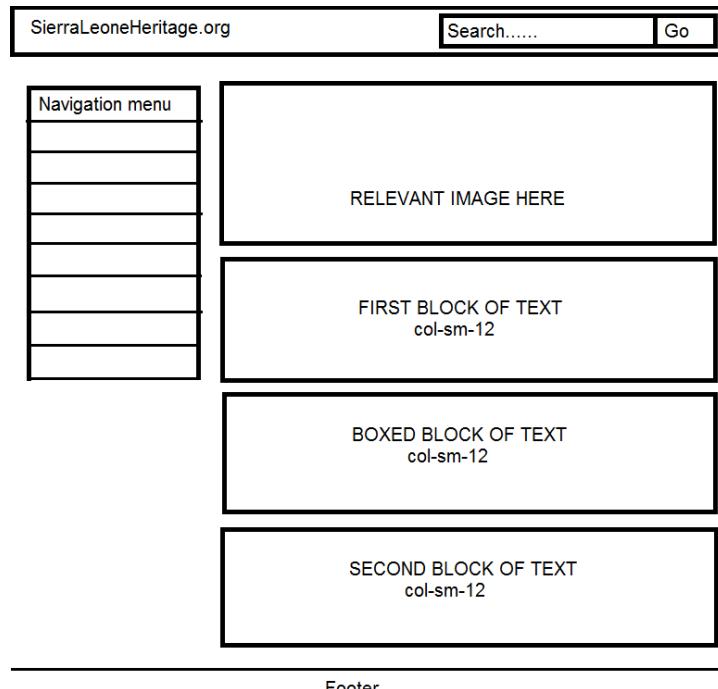


Figure 27 shows the skeleton for the generic layout for static content from a small window size.

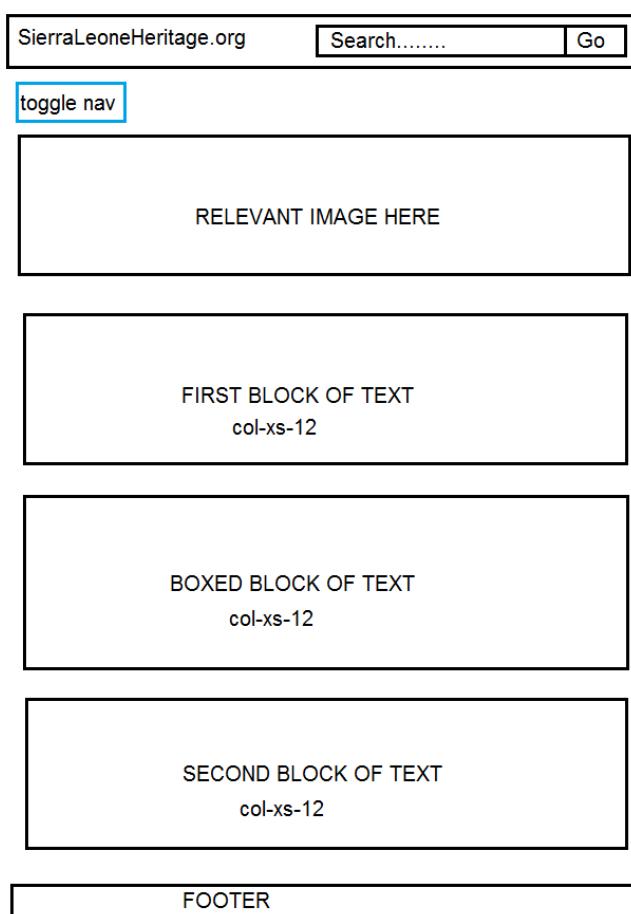
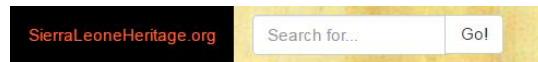


Figure 28 shows the skeleton for the generic layout for static content from an extra small window.

From these figures you can see that the desktop layout, classed as in Bootstrap medium and large, that the design is almost identical to the current Sierra Leone site. As soon as the window size drops to small the navigation bar is still there. However to compensate for the

loss of size for the first block of text and the boxed block of text, instead of making these two containers more squished they become more spaced out. The first block of text is now above the boxed block of text this appears easier on the eyes and looks better. This is the same for both small and extra small displays.

The implementation for extra small can be found here in figure 29.



Sierra Leone National Museum

Sierra Leone's National Museum is located at the centre of Freetown under the branches of the city's famous Cotton Tree. It is the hub of many cultural activities in Freetown and holds an important collection of Sierra Leonean artefacts and artworks.

The museum was opened in 1957 as the museum of the Sierra Leone Society, a 'learned society' whose members included colonial officials and prominent members of Freetown's Krio community. With the demise of the Sierra Leone Society in the mid-1960s, the museum came under the control of Sierra Leone's Monuments and Relics Commission and Ministry of Tourism and Cultural Affairs, and thus became the Sierra Leone National Museum.

Contact

Sierra Leone National Museum
Cotton Tree
Freetown
Sierra Leone

The Acting Curator is Ms. Josephine Kargbo

The museum has rarely benefitted from significant financial resources and has survived largely due to the commitment of its dedicated staff. It still occupies what was originally intended to be

[A small decorative illustration of a building with a flag on top is positioned between the contact information and the note.]

Figure 29 shows the implementation for the universal fluid grid layout for static content from an extra small view.

5.2 Implementing the use of an API

Arguably the most important requirement of this project is to extract all data needed for dynamic content from the API [2], given as a resource for this project from the university. This basis of the API works by extracting data from the database and returning it as JSON data. All API functions are created in the file renderer.js, this was originally used from the API website [2]. All functions that weren't created by me are clearly marked. All functions created for this project have been documented.

5.2.1 Getting to Grips with the API

The website that contains the API has a good user interface to see the sort of functionality you can expect from the functions. The source code of this website provided a good insight to how you can use the given functionality from the API and retrieve data in a suitable way. By analysing the code from this website to retrieve data from the database you needed to have two functions. One function to retrieve the JSON data and the other function to search through that JSON data, picking out the key information to return and converting it to HTML then sending it to a specific HTML element.

Before thinking about creating any functions to be used in the final implementation, the approach taken was to create the most basic function. From this function getting to grips on how to return basic data in a suitable format to be displayed in HTML. Below in the figure shows the most basic function created.

```
22  function renderItemTitle() {
23      $.getJSON('http://sierraleone.heritageinformatics.org/index.php/api/search_service/get_item/coid/' + vCoid + '/format/json',
24      function(jsonObj) {
25          renderRchResultsTitle(jsonObj);
26      });
27 }
```

Figure 30 shows a function return data from the database and passing into another given function in the form of JSON.

The above figure shows the call to the database to retrieve a given COId in the database in the format of JSON. This then calls another method to then process the given JSON data to be then displayed later in a suitable format.

```
218 function renderRchResultsTitle(json_data) {
219     var strHtml = '';
220     strHtml += 'a href="'+json_data.data.Media[1].Media.medium+'" ><img src = " ' + json_data.data.Media[1].Media.medium + ' " /> </a>';
221     $('#results_widget').html(strHtml);
222 }
```

Figure 31 Shows a function that has been passed JSON data that then gets turned into a string that can be interpreted by HTML. It is then sent to a HTML div called results_widget.

The figure above shows the JSON data being passed into this second function. This function then creates a string, which is then outputted back to the HTML. When building this string you use the syntax of HTML but including the data from the database. In the figure above you see the “+json_data.data.Media[1].Media.medium+” This is a link from the database that is an actual URL to the data once executed.

The last line “\$('#results_widget').html(strHtml);” sends the data back to the HTML and displays it in the given div with ID “results_widget”. This is all done in the format of a string. To get the function to be called you include the body on load method in HTML with the given method name as shown below in figure 32. This calls the given methods once the body of the website has loaded.

```
24 <body onLoad="renderItemTitle();">
```

Figure 32 shows the HTML that calls the function once the body of the HTML has fully loaded.

Overall creating this function helped to see how simple displaying a single object from the database using a given API function. The next steps were to implement the functions used to display the dynamic content of the database.

5.2.2 Creating Dynamic Content for the Video Gallery

The main aim for this function was to display data similarly to the data displayed on the current Sierra Leone site. Data was displayed on the site in rows of images that were the thumbnails of the clips. Clicking these thumbnails would bring up the video over the top of the current window. This method of bringing the video up over the current window is extremely effective and is definitely the preferred choice for many. As it goes for all function

that were created for the use of displaying data they take the same format mentioned in the section before.

Extracting all videos from the database was more difficult than initially thought. There is a given API functions that retrieves all videos from the database. However, this contains loads of duplicates. The task was to eliminate these duplicated results and then display the data clearly on a web page.

5.2.2.1 Removing Duplicates

The approach taken to remove duplicates was a very program oriented styled approach. The approach was to have an empty array, for every new video (a video with a different name) it will be added to the array. If the video was already in the array it would not be added. After the searched finished searching over the entire database it will then contain all videos to be displayed in the HTML. In the figure below shows the code that implements this.

```
342 function renderVideosAll(json_data) {
343     var strHTML = '';
344     var names = new Array();
345     for (i = 0; i < json_data.data.length; i++) {
346
347         var isIt = false;
348         for(j = 0; j < names.length; j++){
349             if (json_data.data[i].AssociatedMediaFileName.toUpperCase() == names[j]){
350                 isIt = true;
351             }
352         }
353         if (json_data.data[i].AssociatedMediaType == 'Video' && !isIt && (json_data.data[i].AssociatedMediaFileName != "female_figure")) {
354
355             strHTML += ' <a href="'+json_data.data[i].MediaObjects.media + '.mp4'+ '" data-group="mygroup" data-thumbnail="'+json_data.data[i].MediaObjects.media + '.mp4'+ '">';
356             strHTML += '<img src = "'+json_data.data[i].MediaObjects.small+'"/>';
357             strHTML += '</a>';
358
359             names.push(json_data.data[i].AssociatedMediaFileName.toUpperCase());
360         }
361     }
}
```

Figure 33 shows the code for removing duplicates of the same video.

To further the implementation there was an anomaly in the database where one of the videos was not capitalized and therefore, for the comparison to check to see if the name of the video was in the array they had to be capitalized. If they didn't it would show multiple occurrences of the same video. Another anomaly that was found was the video file names 'female_figures' for some reason this was spelt once like 'female_figure', which caused the video to appear twice in the array. A hard coded variable was used to correct this error.

5.2.2.2 Displaying Data

Displaying the data was easy with the aid of a plug-in for JavaScript. The plug-in used was HTML5 lightbox [12]. This plug-in gave the desired effect that was mentioned at the beginning of section 5.2.2. Since there is no easy way to do this apart from create a similar plug-in, which would take up a lot of time. To get the videos from the array into HTML, having to use the syntax on the website, which can be viewed in figure below.

3. Add a `class="html5lightbox"` attribute to any link tag to activate the Lightbox effect

```
<a href="images/Toronto_1024.jpg" class="html5lightbox" title="Toronto">Image</a>
<a href="images/Big_Buck_Bunny_1.m4v" class="html5lightbox" data-width="480" data-height="320" title="Big Buck Bunny">Video</a>
```

Figure 34 shows the structure to a basic HTML5lightbox element.

And converting where the links for the data are to the links from the database as so, in the figure below.

```

strHtml += ' <a href="'+json_data.data[i].MediaObjects.media + '.mp4'+ '" data-group="mygroup" data-thumbnail="'+
json_data.data[i].MediaObjects.small+'" class = "html5lightbox" title="'+json_data.data[i].AssociatedMediaFileName+' " >';
strHtml += '<img src = "'+json_data.data[i].MediaObjects.small+' />';
strHtml += '</a>';

```

Figure 35 adds the URL for the images from the database where needed in the HTML5lightbox element.

One issue that was overcome when using this plug-in was that, since the HTML was generated from the function, the plug-in was not automatically loaded into the webpage causing the data to not be displayed properly. This was solved by calling the plug-in again essentially reloading it. This was done by being the last thing that was added to the string of data that was sent over from the JavaScript function back to the HTML as shown in the figure below.

```

362     strHtml += '<script type="text/javascript"> $(".html5lightbox").html5lightbox();</script>';
363     $('#video_panel').html(strHtml);
364 }

```

Figure 36 shows adding the lightbox function to the end of the string.

The finished result out of this was quite effective. As shown in the figures below.

Video Gallery

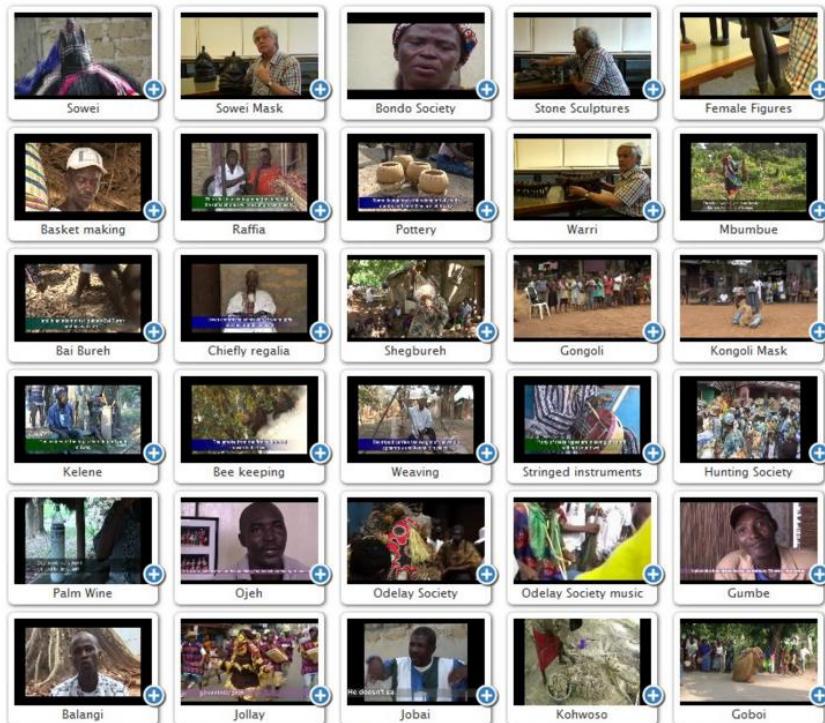


Figure 37 shows the final implementation of the video gallery.

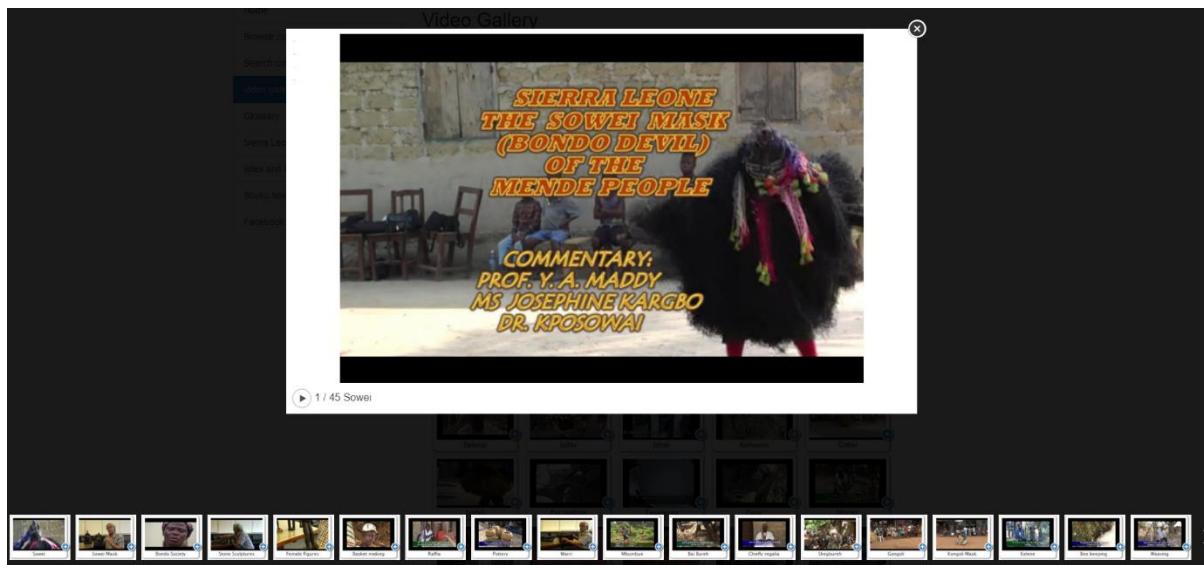


Figure 38 shows the final implementation of the video gallery with the lightbox plug in active and viewing a video.

5.2.3 The Quick Search Function

The quick search function is used for every query searched at the top right of the page. A user will give an input, this input then will be checked to see if it matches a COId, if not it will then be checked against the descriptions of all object. Any results that match should then be displayed in a HTML page called results.

5.2.3.1 Parsing the Input

The first challenge of implementing this search function was getting data from one page over to the another HTML page called results that would then show the answer. The module called Web Computing taught about methods of sending data across webpages. One of these methods was through the use of the GET and POST methods that HTML has. The GET methods sends data over in the URL of the browser, this is ideal in this situation. The post methods send data securely ideal for passwords and usernames. The GET methods was suitable enough for the purposes of this project.



Figure 39 shows the URL after a GET request. From this you can see what the user has typed, "wooden mask".

The first steps to being able to search the given query made was to parse the input in using JavaScript. As soon as the results.html page is loaded in it reads in the input String “?searchTerm=X” where X is a given search term. From this it removes “?searchTerm=” part and so far leaves us with X the given search term. However, all spaces between words in X are translated into pluses since HTML does not allow spaces in the URL. This is easily removed by using another regular expression in JavaScript to replace all pluses with spaces.

```
118 var manip = searchterm.replace("?searchTerm=", ""); // replaces search term with nothing  
119 finalsearchterm = manip.replace(/\+|g|_"/); // replaces all instances of + as a space  
120 finalfinalsearchterm = finalsearchterm.replace(/\sa\s|\sthe\s|\a\s|\s\the\s|\sis\s|\sand\s|and\s|\sof\s|of\s|\sis|\sthe|\sa/gi, " ");  
121 var results = finalfinalsearchterm.match(/\w+|\d+\s?gi/); // puts all remaining words into an array of words to search.
```

To refine the search to stop some unnecessary results occurring another regular expression is to eliminate the use of common words such as: the, is, and, of and a. This can be expanded later for a refiner search. The last steps before searching through the database is to put each individual document into its own file. This is done using the following command:

G. J. L. B. VAN WIL

Supervision: Dr Martin White

Final Report

regular expression. Once each word or number set is in the array, each word or number set can be individually searched through the database. This array is called results.

5.2.3.2 Extracting Data from the Database.

After collecting the words or COId to query the database, it was time to compare each word or COId to each entry in the database. The first steps to this was retrieving all of the data in the database and retrieve it in the form of JSON. This is done at the beginning of the function as mentioned in the previous section. This function has a similar setup to the function that returns all the videos. This is in the same way that there is an array that contains all the objects that need to be rendered in a suitable format at the end. For the purpose of not getting confused with the array called results this is called coidToSearch.

For every word/set of numbers in the array results it will compare the word/set of numbers firstly to the description of every object in the database. If the word matches it will get added to coidToSearch. If it doesn't it will then check to see if it's COId and if so that will then get added to coidToSearch. Then for each subsequent match it will check if it's not already in coidToSearch. Once every word has been checked in the database the array of coidToSearch will contain all the IDs for each object that got a match from the search.

```

127   for(y=0; y<results.length; y++){ //for every word in the array
128     for(t=0; t<json_data.data.length; t++){
129       var isit = false; // boolean variable to check if a COId is in the coidToSearch
130       for(j=0; j<coidToSearch.length; j++){
131         if(json_data.data[t].COId-1 == coidToSearch[j]){
132           isit = true; //if the COid is already in the array it will skip the next step
133         }
134       }
135       if ((json_data.data[t].Description.indexOf(results[y])>-1) && !isit){ // if not already in coidToSearch add the coid of object to the array
136         coidToSearch.push(json_data.data[t].COId-1);
137       }
138       else if((json_data.data[t].COId == results[y]) && !isit){ // if not already in coidToSearch add the coid of object to the array
139         coidToSearch.push(json_data.data[t].COId-1);
140       }
141     }
142   }

```

Figure 41 shows the loop that searches through the array of words and adds matches to the coidToSearch.

The next step of the function is to render each item and send it back to the HTML to then be displayed. This is done for each object that had a hit in the database and displays key parts of the data such as it's: COId, Object, Materials, Production date, Museum, Description and all images of the object. This is done similarly as in the function that returns all unique videos. Once all the relevant data is added to a string it's then sent back to the HTML.

```

145   res += "<p><h1>Search results for: " + results.toString() + "</h1></p>";
146   for(x=0; x<coidToSearch.length;x++){
147
148     res += "<p>";
149     res += "<li>COId: " + json_data.data[coidToSearch[x]].COId + '</li>';
150     res += "<li>Object: " + json_data.data[coidToSearch[x]].Object + '</li>';
151     res += "<li>Materials: " + json_data.data[coidToSearch[x]].Materials + '</li>';
152     res += "<li>ProductionDate: " + json_data.data[coidToSearch[x]].ProductionDate + '</li>';
153     res += "<li>Museum: " + json_data.data[coidToSearch[x]].Museum + '</li>';
154     res += "<li>Description: " + json_data.data[coidToSearch[x]].Description + '</li>';
155     for (l = 0; l < json_data.data[coidToSearch[x]].Media.length; l++) {
156       res += '<a href=' + json_data.data[coidToSearch[x]].Media[l].Media.large + '><img src = "' + json_data.data[coidToSearch[x]].Media[l].Media.small + '"></a>';
157     }
158     res += "</p>";
159     res += "<hr>";
160   }
161   if (coidToSearch.length == 0) {
162     res = "<h1><p> No Results Found </p></h1>";
163   }
164   $('#box1').html(res);
165 }

```

Figure 42 Converts the data from the database into a string that can then be read by HTML. This string is then transferred over to the HTML.

s.html?searchTerm=wooden+mask

Search results for: wooden,mask

- COld: 1
- Object: Sowei Mask
- Materials: Wood
- ProductionDate: Pre 1946
- Museum: Sierra Leone National Museum
- Description: Carved wooden helmet mask used by the exclusively female Sande (Mende) or Bondo/Bundu (Temne) societies. The mask is traditionally worn by a high-ranking member of the society, the dancing sowei, known as the ndoli jowei among the Mende or a-Nowo among the Temne. Worn with a raffia costume, the masks typically have a polished black finish, with neck rings, elaborate coiffure and dignified facial expression. The mask is thought to represent conceptions of idealised womanhood. This example resembles Sherbro-Bullom types, from the turn of the 20th century. It has a high vertical forehead, and a chequered hairstyle.

- COld: 19
- Object: Kputie
- Materials: Wood; Metal
- ProductionDate: Pre 1957
- Museum: Sierra Leone National Museum
- Description: This is a kputie, cutlass, or machete, made by a Sierra Leonean blacksmith. It has a wooden handle, and a long curved metal blade.

Figure 43 shows the final implementation of the search function in action. Notice at the top of the page the URL.

5.2.4 Browse Collection function

Creating the browse collection function was almost identical to the creation of the video gallery. To give the end result a more professional feel, the aid of a plug-in was used. This plug-in is called Jssor [13], a thumbnail slideshow that functions well and produces professional looking results.

The first step of this function was to extract all data from the database and then to process it selecting the most suitable data to return. Since this function was to get collection by museum, an approach was used to isolate data by museum type. This was implemented by creating an array of all museums that were in the database. This was done manually instead of making a dynamic call to the API.

```
421  var arrayOfMusuem = ['Sierra Leone National Museum', 'British Museum', 'Cootje van Oven Collection',
422    'Brighton Museum and Art Gallery', 'Glasgow Museums', 'World Museum Liverpool'];
```

Figure 44 shows the array of all museums.

The next step was to iterate through the museum list comparing each object in the database to see if the museums matched. For every museum that matched, an image would be added to the slider for that museum, making sure to follow the syntax of the Jssor plug-in.

```
147 <div id="jssor_1" style="position: relative; margin: 0 auto; top: 0px; left: 0px; width: 980px; height: 100px; overflow: hidden; visibility: hidden;">
148   <!-- Loading Screen -->
149   <div data-u="loading" style="position: absolute; top: 0px; left: 0px;">
150     <div style="filter: alpha(opacity=70); opacity: 0.7; position: absolute; display: block; top: 0px; left: 0px; width: 100%; height: 100%;"></div>
151     <div style="position: absolute; display: block; background: url(/theme/img/loading.gif) no-repeat center center; top: 0px; left: 0px; width: 100%; height: 100%;"></div>
152   </div>
153   <div data-u="slides" style="cursor: default; position: relative; top: 0px; left: 0px; width: 980px; height: 100px; overflow: hidden;">
154     <div style="display: none;">
155       
156     </div>
157     <div style="display: none;">
158       
159     </div>
160     <div style="display: none;">
161       
162     </div>
```

Figure 45 shows the syntax of the Jssor plug-in.

Since the Jssor plug in required the use of a JavaScript function to work, the function that generates the string of data to be sent back to HTML needed to contain this JavaScript function to make the plug-in work. Since there was going to be a thumbnail slider for every museum, a different JavaScript function for each slider needed to be created.

```

448 strHtml += '<a data-u="ad" href="http://www.jssor.com" style="display:none">Responsive Slider</a></div></div>';
449 strHtml += '</p><p></p>';
450 strHtml += '<script>jQuery(document).ready(function ($) { var jssor_"y+"_options = { $AutoPlay: true, $Idle: 0,
451 $AutoPlaySteps: 4, $SlideDuration: 1600, $SlideEasing: $Jease$.SLinear, $PauseOnHover: 4, $SlideWidth: 140, $Cols: 7};
452 var jssor_"y+"_slider = new $JssorSlider("jssor_"y+"", jssor_"y+"_options); }); </script>';

```

Figure 46 shows the syntax for creating a JavaScript function for each slider.

This produced a great result but there were some limitations to this function. Returning the entire gallery (about 3500 images) into the thumbnail sliders caused JavaScript to crash in the web browser. To stop this from happening a hard coded value of 50 per a museum slider was put in place. Furthermore, another limitation found was that for the “Cootje van Oven collection” no images were found in the first section of the database and only the second section of the database. A solution was hard coded in to solve this issue, for where the museum that matched was “Cootje van Oven collection” it would return the second image.

```

419     var iscoot = false; //variable used to see if of cootje van over collection
420     var cooty = 'Cootje van Oven Collection'; //comparison variable
430     if(json_data.data[i].Museum==arrayOfMusuem[y]&& !iscoot && (limit < 50)){
438     if(json_data.data[i].Museum==arrayOfMusuem[y]&& iscoot && (limit < 50)){

```

Figure 47 shows the hard coded variables for the "Cootje" problem. Note you can see the hard limit of 50 in each if statement.

The last thing to mention is that all the images have a reference link, the images can be clicked on to take them to this reference link that contains more details on the object. This is done by referencing the COID of each object combining it with the way the quick search works. For instance clicking an object that has COId 2350, the link for the webpage will be “results.html?searchTerm=2350”. Thus taking you to the results page and displaying object 2350.

The final implementation can be seen in the figure 48.

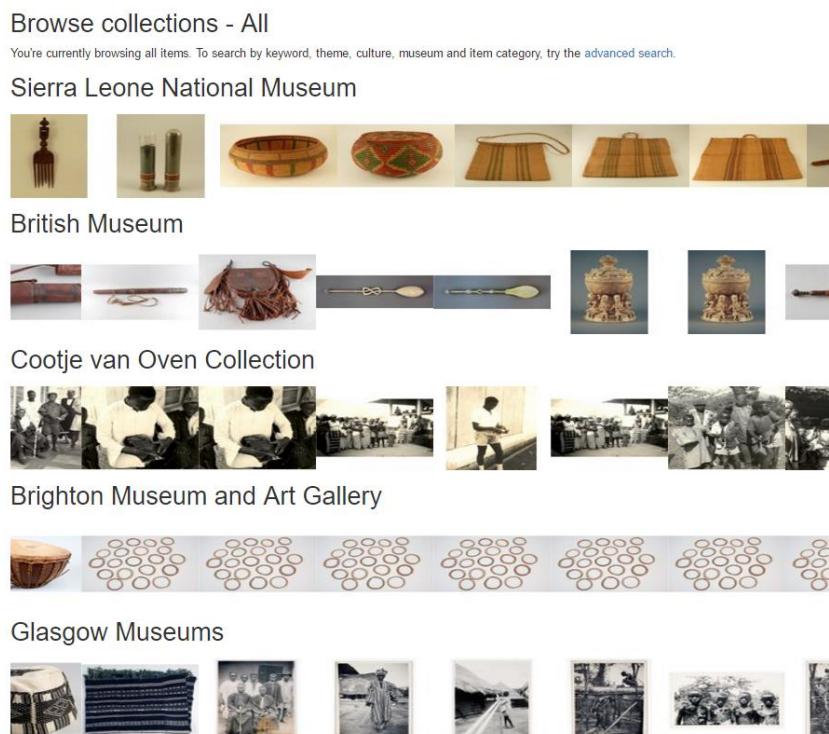


Figure 48 shows the final implementation of the Browse collection function.

5.2.5 Search Collection function

The last major function to be implemented with use of the API is the search collection page. This search collection page is a more refined search compared to the quick search. Users are given an input by keyword and selection boxes to extract certain data. This function is not on renderer.js but on the webpage SearchCollection.html: this is to make the search results appear on the same page.

The first part with creating this with the API was to setup the form required for user input. One text box for entry of keywords that could be: description, object or Accession number. A tick box for each different option for each culture group, material, collection and object type. Each of different types of option could be distinguished through a name. For instance, all options in material had name material but would have a different value such as stone or metal, this was done the same for the remaining groups such as culture group, collection and object type.

Search Collections

Search keywords in this box.

Object type

Toggle All

<input type="checkbox"/> Body adornment, jewellery	<input type="checkbox"/> Natural History
<input type="checkbox"/> Containers, vessels	<input type="checkbox"/> Production equipment
<input type="checkbox"/> Costume, dress	<input type="checkbox"/> Regalia
<input type="checkbox"/> Currency	<input type="checkbox"/> Religious/ritual equipment, charms
<input type="checkbox"/> Domestic equipment	<input type="checkbox"/> Sound Recordings
<input type="checkbox"/> Figures, sculpture	<input type="checkbox"/> Textiles, cloth
<input type="checkbox"/> Games, toys, models	<input type="checkbox"/> Toilet/cosmetic equipment
<input type="checkbox"/> Hunting, fishing	<input type="checkbox"/> Tools, implements
<input type="checkbox"/> Ivories	<input type="checkbox"/> Transport
<input type="checkbox"/> Masks, headresses	<input type="checkbox"/> Weapons armour
<input type="checkbox"/> Musical instruments	<input type="checkbox"/> Unknown
<input type="checkbox"/> Photographs	

Culture group

Toggle All

<input type="checkbox"/> Bulлом	<input type="checkbox"/> Fula	<input type="checkbox"/> Gola	<input type="checkbox"/> Kisi	<input type="checkbox"/> Kono	<input type="checkbox"/> Krim
<input type="checkbox"/> Krio	<input type="checkbox"/> Kuranko	<input type="checkbox"/> Limba	<input type="checkbox"/> Loko	<input type="checkbox"/> Mandingo	<input type="checkbox"/> Mende
<input type="checkbox"/> Sherbro	<input type="checkbox"/> Soso	<input type="checkbox"/> Temna	<input type="checkbox"/> Vai	<input type="checkbox"/> Yalunka	<input type="checkbox"/> Unknown
			<input type="checkbox"/> Other		

Materials

Toggle All

<input type="checkbox"/> Bone, ivory, tooth	<input type="checkbox"/> Shell
<input type="checkbox"/> Ceramic	<input type="checkbox"/> Stone
<input type="checkbox"/> Feather, fur, hair, horn	<input type="checkbox"/> Textile
<input type="checkbox"/> Glass	<input type="checkbox"/> Vegetable, organic fibre
<input type="checkbox"/> Leather, animal skin	<input type="checkbox"/> Wood
<input type="checkbox"/> Metal	<input type="checkbox"/> Unknown
<input type="checkbox"/> Paper	

Collections

Toggle All

<input type="checkbox"/> Sierra Leone National Museum	<input type="checkbox"/> Glasgow Museums
<input type="checkbox"/> Brighton Museum & Art Gallery	<input type="checkbox"/> World Museum Liverpool
<input type="checkbox"/> British Musuem	<input type="checkbox"/> Textile
	<input type="checkbox"/> Cootje Van Oven Collection

Figure 49 shows the completed form.

After the form was created it was to now do the back-end side of things. The approach taken was to input the giant data set in the form of JSON then filter by each group. The first step was passing in the data for the boxes that were ticked. Once the data for each box that was found to be ticked, a function to filter results for each function was called. This function inputs a data set and filters out any results that don't match the boxes that were ticked or match any keywords. This can be seen in figure 50.

```
580 |     var results = json_data.data // results = the entire database in the form of JSON
581 |     .filter(filterByCultureGroups)
582 |     .filter(filterByMaterials)
583 |     .filter(filterByObjectType)
584 |     .filter(filterByCollectionType)
585 |     .filter(filterByKeyword); //filters by given function
```

Figure 50 shows the results being filtered by each type of group.

Now the results have been filtered to match the input form, the variable results as shown in figure 50 contains all objects that match all fields selected. Like all the other API functions this must now be sent to the HTML, however first being converted to string that HTML can understand. This can be seen in figure 51.

```
592 |     for(x=0; x<results.length;x++){
593 |         res += "</a>";
594 |         res += "<p>";
595 |         res += "<li>COId: " + results[x].COId + '</li>';
596 |         res += "<li>Object: " + results[x].Object + '</li>';
597 |         res += "<li>ObjectType: " + results[x].ObjectType + '</li>';
598 |         res += "<li>Materials: " + results[x].Materials + '</li>';
599 |         res += "<li>Culture Group: " + results[x].CultureGroup + '</li>';
600 |         res += "<li>Production Date: " + results[x].ProductionDate + '</li>';
601 |         res += "<li>Museum: " + results[x].Museum + '</li>';
602 |         res += "<li>Description: " + results[x].Description + '</li>';
603 |         for (l = 0; l < results[x].Media.length; l++) {
604 |             res += '<a href="'+results[x].Media[l].Media.large+'" ><img src = "' + results[x].Media[l].Media.small + '" /></a>';
605 |
606 |     } //return appropriate data for each object that was filtered.
```

Figure 51 shows the results that are filtered being rendered into a string that HTML can understand.

A typical search would give an output as seen in figure 52

Search Collections

[Retry](#)

- COId: 34
- Object: Kissi Pennies
- ObjectType: Currency
- Materials: Metal
- Culture Group: Kisi [Kissi]
- ProductionDate: 19th century
- Museum: Sierra Leone National Museum
- Description: A collection of 11 kissi pennies. Kissi (or kisi) penny is a term given to a form of indigenous African currency, used in the interior of Sierra Leone in the 19th century. A Kissi penny consists of a rough strip or rod of iron, about a foot in length, which is t-shaped at one end, and flattened at the other. The original Sierra Leone National Museum accession register records that these were called Ko-goli in Mende and that 10 such bars were the value of an able slave in the 19th century. Ko was the name of the blacksmith skilled at making the bars of standard weight and length. Ko-goli means Ko's iron bar .



Figure 52 shows a result from search collections with given input all types of currency from Sierra Leone National Museum.

5.3 Implementing Facebook

The task for implementing Facebook was to implement posts from the Sierra Leone Facebook group [15] and put these in the webpage Facebook Community. The ideal approach was to use the social page plug-in [14] by Facebook. However, this was not supported by current group, trying to create the plug-in you're greeted with not a valid Facebook page. This is because it was a Facebook Group and not a page. A new approach was taken and that was to add manually the latest posts from the group on to the website. This approach has its limitations, the biggest being that you don't get an update feed.

There are ways to embed the Facebook group, but they cost money to use. The most popular being WordPress pro [16]. This allows you to dynamically customise all group data given that you have admin rights on a private group or no admin rights for it being a public group.

The implementation used for this project is shown in figure 53.



Figure 53 shows the implementation for the Facebook Community.

5.4 HCI and usability insurance

With the majority of this project working on the front end of a website, it is priority that human computer interaction and usability is good to ensure a good user experience. Throughout this project making sure that small things are changed to improve user experience. This section will contain the design changes that were implemented to improve the user experience.

One of the biggest changes to improve user experience was the addition of a loading icon. This loading icon is used when loading in specific API functions. The reason why this is essential is that without this the user would not know if the website is doing anything. Giving good feedback is essential for the user experience. The loading icon can be seen in figure 54.

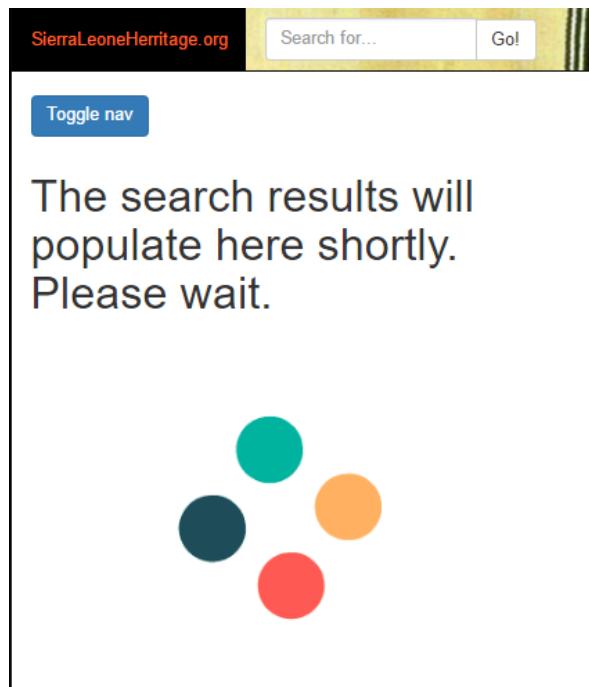


Figure 54 shows the loading icon. This icon rotates clockwise and pulsates.

Other useful changes to improve user experience are:

- Creating a fluid grid layout so all functionality can be used no matter the device.
- In search collections a retry button is implemented so after you query a search you can click the retry button to change the search. This is implemented because you cannot use the built in browser functions to go back and forward because it's all dynamically done through JavaScript.
- In the quick search bar at the top you can use enter to search rather than clicking on go, this is somewhat standardised nowadays.
- Adding a toggle all checkbox to the search collections that toggles all checkboxes a certain section.
- Adding a line bar between every results to appear easier on the eyes.

Overall small implementations like the ones mentioned above can have a big impact on user experience and therefore have a big impact on user's views overall.

6.0 Testing

To ensure that the system does what it's supposed to do an acceptance test will be completed from the criteria given in section 3.4 of this project. To also test if all functionality works appropriately from the front end, a set of black box test will be performed. The choice to use black box testing over white box testing is influenced by this being a front end application. Black box testing examines the functionality without having to dive into the code, which is ideal in this case. After testing is done a quick talk about the performance of operation will be noted.

6.1 Black Box Testing

All black box testing results can be found in the appendix. The tests consisted of testing all functionalities of the website that a user would be expected to use.

The tests show that two core pieces of functionality have failed. These were the quick search function and in the search collection function. Both wouldn't have necessarily been caught unless black box testing hadn't been used. This just shows the importance of testing the product in all aspects.

6.2 Acceptance testing

Acceptance tests can be found in the appendix. The test consisted of testing the requirements made in section 3.4 of this project and grading whether they pass, fail or somewhat with a description why.

The results from acceptance testing are that 16/19 passed with two of the 19 being additional work. The things that failed were.

1. *"The website should have a webpage for the Facebook Community that dynamically adds posts from the public Facebook group to the webpage."*
2. *"Fully complete the API for further use"*
3. *"Make sure new written API functions are fully functional"*

The reason why the first point failed has already been explained in section 5.3 where there is no easy way to implement a group page into a website. Points 2 and 3 failed because there was not enough time to implement any additional feature to speed up the use of the API.

6.3 Performance

The performance overall was great apart from when the use of the large collection of the data from the API was used. This given call that collected the whole data can be found in figure 55.

```
569 |     $.getJSON('http://sierraleone.heritageinformatics.org/index.php/api/search_service/get_collection_list/format/json',  
570 |         function(jsonObj) {
```

Figure 55 shows a function that returns all items in the database in JSON format.

In total, three of the functions use this call: search collection, browse collection, and the quick search function. The common feature of these functions was that they required the entire database to be searched each time they were called. The loading times weren't disastrous, with an average of 10 seconds to process the data in from this call on a desktop PC and 15 seconds on a modern mobile device. Compared to the current Sierra Leone website however, it was considerably slower, and this could be down to the huge limitations of retrieving all this data from the API at once.

Time taken to load website using API function			
	Desktop (s)	Mobile (s)	Tablet (s)
Function			
Search collections	8	13	12
Browse collections	12	17	16
Quick search	10	14	12

Figure 56 shows the time taken to load API function that returns all database objects as JSON data on various devices.

To increase performance of this function there would have to be a better way to retrieve data rather than directly calling all the data in the form of JSON, then manipulating it to the desired result. Whether this be through a different database or retrieving different data through the APIs functions. There was not enough time to investigate this, leaving it as a task for future re-visitations to this project.

6.4 Corrections

Corrections were made throughout the project, though there was no real structure to the testing used. Most of the corrections were made before the black box testing, which was not really the ideal way to go about it. Since working on front end web development is very visually rewarding in the sense if it looks right it probably does the right thing, the majority of the corrections that were made through black box testing were to do with the API. This is where a comparison was used between the current Sierra Leone website for the same results given a certain set of input parameter.

Corrections that were found during test that were not documented in section 5 were.

1. Spelling mistakes in Search Collections, these caused results to not be filtered correctly.
2. Incorrect regular expression for separating words for the quick search function.

Both of these mistakes have been corrected, the first one by editing the string values in the search collection function. The second one was corrected by creating a new regular expression that only accepts words.

7.0 Evaluation & Conclusion

7.1 Project Success

Given the title of the project:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

The implementation fits the description, given that the newly developed website has all the functionality of the original Sierra Leone Heritage site, but works for mobile and extracting all dynamic data through the given API. Because of this, the project can be considered a success, if far from perfect. There are still many improvements that can be made.

Although the end product lacks extensive user testing, it looks and feels like a responsive website. It feels like it could replace the old Sierra Leone site concurrently, this furthers the success of this project.

7.2 Potential Improvements

One of the more popular methods of Test Driven Development could have made an impact on the testing of the implementation. Test Driven Development could have been used in addition to more user testing when developing the final implementation. This type of user test could gather feedback on what users want from the website. Whether it be removing a button or adding functionality when a web product is going to be used by the community it's good to get them involved.

Another key improvement to this project would be to make the quick search function quicker and more accurate. In its current state it is functional, although it is occasionally inaccurate when involving low values of COId. Isolating numbers and only searching them through COId would give a more refined search but would take a while to implement but could potentially increase performance. Another improvement would be to hide the main image in the page for static content from a mobile view because this can take up lots of room on a small screen.

With regards to the API, it is very slow for certain functions, and having a way to speed this up would improve the overall experience, especially on a mobile device because of the longer loading times. Optimising the API would be a task that would have to be saved for future projects, however, since as of now optimising it is far out of this project's scope. Optimisation is a key aspect on modern devices especially for preserving battery life.

7.3 Future Work

If this project were to be revisited in the future, the main goal would be to optimise everything, starting with various API functions. The delays involved with using the search functions can be attributed to the API, as retrieving such a large amount of data through JSON format puts strain on any device that has to process it. Researching another format of data or another way of displaying the data from the database, such as using PHP, would be a promising avenue for future work on this project. The current Sierra Leone website uses PHP and it seems to react much faster than using the API to do the same functions: possibly another implementation from a mobile first approach but this time using PHP.

8.0 Appendix

Acceptance Testing Results

Original Specification Point	Pass?	Comments
Same functionality as the current Sierra Leone website.	Yes	
Video gallery should be interactive and frustration free.	Yes	
All static content should be kept in the same format as the current Sierra Leone website	Yes	
The website should have the same branding as the Sierra Leone website.	Yes	
The website should have an accessible navigation bar that can be used to go between key web pages on the website.	Yes	
The website should have a webpage for the Facebook Community that dynamically adds post from the public Facebook group to the webpage.	No	The website fails to update the page dynamically, there is an implementation but that doesn't update automatically and is just a selection of posts.
The website should have a search function at the top of all pages to quick search items and keywords and display the results in a separate web page.	Yes	
The website should access all data from the database through the API given.	Yes	
The website should have a search function at the top of all pages to quick search items and keywords and display the results in a separate web page.	Yes	
The website should not make more than 1000 calls to the API in less than a minute.	Yes	However this can be abused but no normal user should ever reach 1000 calls per a minute.
The website should be easy to use and interact with.	Yes	

The website should load specific pages within 2 seconds on an average internet connection of (2mpbs)	Yes/No	All static content loads within 2 second, but the majority of static content does not.
The website needs to resize all content depending on the resolution of the display, as long as the display is above 400x300 pixels.	Yes	
The entire website should be no more than 10MB size.(does not include additional dynamic content such as videos)	Yes	The website is 3.80MB in size.
The website work with all modern web browsers	Yes	All functionality works with all modern web browsers
The style of the website should not be intimidating	Yes	
The website should not be unresponsive on modern devices.	Yes	On non-modern devices the Browse collection page can lag.
Fully complete the API for further use.	No	Not enough time.
Make sure the new written API functions are fully functional.	No	Not enough time

Black Box Testing

N.O.	Test	Action Expected	Action received
1	All navigational links from the navigation menu work.	All links take you to right places.	All links take you to the right place
2	All static content can be seen as long as the resolution doesn't go below 400x300 pixels.	All static content automatically resizes and displays properly when above 400x300.	All static content automatically resizes and displays properly when above 400x300
3	The text with labelled SierraLeoneHeritage.org should take you to the home page on all webpages.	Clicking the text takes you to the homepage.	Clicking the text takes you to the homepage
4	All videos work when being clicked on.	All videos load properly	All videos loaded properly
5	The footer navigation should work for every page.	All links in the footer should take you to the right places.	All footer links take you the right places.
6	The search function at the top of the page works on all pages.	The search function works for all pages.	The search function works for all pages.
7	All hyperlinks on all pages take you to the correct pages.	All hyperlinks on each page takes you to the correct pages.	All hyperlinks on each page takes you to the correct pages.
8	All dynamic content display properly on a resolution above 400x300 pixels.	Dynamic content displays correctly above 400x300 pixels	Dynamic content displays correctly above 400x300 pixels
9	All dynamic content from the Facebook plug-in works for the Facebook Community page.	Videos and images display properly and can be interacted with through the use of Facebook.	Videos and images display properly and can be interacted with through the use of Facebook.
10	All options in search collections for culture group work.	All options in search collections for culture group work.	All options in search collections for culture group work.
11	All option in search collections for materials work.	All options in search collections for materials work.	All options in search collections for materials work.

12	All options in search collections for object type work.	All options in search collections for object type work.	All options in search collections for object type work.
13	All options in search collections for collection/museum work.	All options in search collections for collection/museum work.	Three options did not work for collection/museum, these were: Brighton Museum & Art Gallery, British Museum and Cootje Van Oven Collection . This was due to them having a different spelling on the current Sierra Leone website.
14	The input should parse words properly for the quick search function.	The input will parse words properly for the quick search function.	The input parses words properly for the quick search function.
15	The input should parse COId properly for the quick search function.	The input will parse each individual COId properly in the quick search function.	The input did not parse properly, numbers less than two in length did not appear. This was due to a problem in the regular expression.
16	All thumbnails that are clicked on in browse collections sliders take you to the correct item in results.	All thumbnails that are clicked on in browse collections sliders take you to the correct item in results.	All thumbnails that are clicked on in browse collections sliders take you to the correct item in results.
17	For loading content from the API there is a loading icon before the content is displayed.	A loading icon appears for functions that have use of the API.	A loading icon appears for functions that have the use of the API.
18	All content that works on the desktop site works properly on a mobile device that meets the requirements.	All content displays correctly no matter what modern device is used.	All content displays correctly no matter what modern device is used.

User testing results.

User testing for requirements analysis

Users are expected to carry out 5 basic tasks on a modern mobile phone and a modern mobile device. These tests will be about accessing data from the Sierra Leone heritage website (<http://www.sierraleoneheritage.org/>)

The tasks will consist of going to <http://www.sierraleoneheritage.org/> on a modern web browser and navigating from that page to what is asked in the task:

1. Watch the Beekeeping video.
2. Search number 23 in the quick search and read the first 3 items that show.
3. Find information about Martello tower navigating through the navigation menu through sites and monuments and national monuments.
4. Access War horns in the glossary.
5. Search for only glass objects in british museum from the search collections page.

User 1 used a mobile phone

No.	Observations	User comments	Other
1	Very close to the screen, initially tried to search for it with the quick search.	Couldn't search for it. It's like for ants.	
2	No problems with the website		
3	Carried out task with speed. Although had to do loads of zooming in to see the navigation menu.	Can't search for martello tower. Has to zoom in everytime pages refreshed which is annoying.	
4	Miss Clicked button. This is because the navigation is so small.	Can't search for war horns.	
5	Found it extremely annoying to click on the small text.	Is this website build for ants.	
	Overall experience?	Search bar could be more developed, very annoying to zoom in every 2 seconds to click on a web page to then zoom in again.	

User 2 used a mobile tablet

No.	Observations	User comments	Other
1	Done pretty simple, having to zoom in looked frustrating	Kept having to zoom in.	
2	Very easy to do.	No comments.	
3	Very simple to do. Chrome built in function to zoom in automatically activates when clicking a small button.	Kept having to zoom in.	
4	Chrome keeps trying to zoom in to compensate for the small buttons because making it easier for the user to click on.	No negative feedback.	
5	Was done very quickly and easily. However, chrome automatically zooms into compensate for the small buttons.	Better if in the search collections that they weren't all ticked already.	

User 3 Used a mobile tablet

No.	Observations	User comments	Other
1	Chrome keeps auto zooming.	Chrome auto zoom helped to tap the small buttons.	
2	Very quickly to search 23.	Easy to do.	
3	Miss clicked a button because it was close to another one.	Buttons needs to be more spaced out.	
4	Very quick to do, chrome tries to zoom in if the user did not pinch to zoom before trying to click on the button.	Simple enough	
5	Clicked tick all instead of tick none.	Text is displayed smaller than the user would like. Making it hard to click on the check boxes.	

User 4 mobile phone device

No.	Observations	User comments	Other
1	Buttons looked annoying to press for the user as they had to pinch zoom.	Website is really hard to see on this screen.	
2	Had to zoom in to click the search box.	Website is hard to see without zooming in.	
3	Miss clicked multiple navigation buttons	Frustrating to use, constantly have to zoom in.	
4	User didn't have any issues completing this task.	none	
5	Clicking tick all or none look very difficult on a mobile phone since they were tiny buttons.	Annoying to try and click the right area without having to zoom in loads every time you load a new webpage.	

User 5 Device Mobile Tablet

No.	Observations	User comments	Other
1	User had no issues carrying out the task.		
2	User had no issues carrying out the task.		
3	Chrome's auto zoom looked like it helped the user out when trying to click on objects.	Chrome auto zoom was rather annoying when trying to click on the navigation.	
4	User had no issues carrying out this task		
5	User had no issues carrying out this task	User wondered why all the boxes were ticked straightaway. Would of preferred them to not be ticked.	

Ethical Compliance Form for UG and PGT Projects*
School of Engineering and Informatics
University of Sussex

This form should be used in conjunction with the document entitled "Research Ethics Guidance for UG and PGT Projects".

Prior to conducting your project, you and your supervisor will have discussed the ethical implications of your research. If it was determined that your proposed project would comply with **all** of the points in this form, then both you and your supervisor should complete and sign the form on page 3, and submit the signed copy with your final project report/dissertation.

If this is not the case, you should refer back to the "Research Ethics Guidance for UG and PGT Projects" document for further guidance.

-
1. Participants were not exposed to any risks greater than those encountered in their normal working life.

Investigators have a responsibility to protect participants from physical, mental and emotional harm during the investigation. The risk of harm must be no greater than in ordinary life. Areas of potential risk that require ethical approval include, but are not limited to, investigations that require participant mobility (e.g. walking, running, use of public transport), unusual or repetitive activity or movement, physical hazards or discomfort, emotional distress, use of sensory deprivation (e.g. ear plugs or blindfolds), sensitive topics (e.g. sexual activity, drug use, political behaviour, ethnicity) or those which might induce discomfort, stress or anxiety (e.g. violent video games), bright or flashing lights, loud or disorienting noises, smell, taste, vibration, or force feedback.

2. The study materials were paper-based, or comprised software running on standard hardware.

Participants should not be exposed to any risks associated with the use of non-standard equipment: anything other than pen-and-paper, standard PCs, mobile phones, and tablet computers is considered non-standard.

3. All participants explicitly stated that they agreed to take part, and that their data could be used in the project.

Participants cannot take part in the study without their knowledge or consent (i.e. no covert observation). Covert observation, deception or withholding information are deemed to be high risk and require ethical approval through the relevant C-REC.

*This checklist was originally developed by Professor Steven Brewster at the University of Glasgow, and modified by Dr Judith Good for use at the University of Sussex with his permission.

Figure 57 Ethical compliance form part 1

If the results of the evaluation are likely to be used beyond the term of the project (for example, the software is to be deployed, the data is to be published or there are future secondary uses of the data), then it will be necessary to obtain signed consent from each participant. Otherwise, verbal consent is sufficient, and should be explicitly requested in the introductory script (see Appendix 1).

4. No incentives were offered to the participants.
The payment of participants must not be used to induce them to risk harm beyond that which they risk without payment in their normal lifestyle. People volunteering to participate in research may be compensated financially e.g. for reasonable travel expenses. Payments made to individuals must not be so large as to induce individuals to risk harm beyond that which they would usually undertake.
5. No information about the evaluation or materials was intentionally withheld from the participants.
Withholding information from participants or misleading them is unacceptable without justifiable reasons for doing so. Any projects requiring deception (for example, only telling participants of the true purpose of the study afterwards so as not to influence their behaviour) are deemed high risk and require approval from the relevant C-REC.
6. No participant was under the age of 18.
Any studies involving children or young people are deemed to be high risk and require ethical approval through the relevant C-REC.
7. No participant had a disability or impairment that may have limited their understanding or communication or capacity to consent.
Projects involving participants with disabilities are deemed to be high risk and require ethical approval from the relevant C-REC.
8. Neither I nor my supervisor are in a position of authority or influence over any of the participants.
A position of authority or influence over any participant must not be allowed to pressurise participants to take part in, or remain in, any study.
9. All participants were informed that they could withdraw at any time.
All participants have the right to withdraw at any time during the investigation. They should be told this in the introductory script (see Appendix 1).
10. All participants have been informed of my contact details, and the contact details of my supervisor.
All participants must be able to contact the investigator and/or the supervisor after the investigation. They should be given contact details for both student and supervisor as part of the debriefing.

Figure 58 Ethical compliance form part 2

11. The evaluation was described in detail with all of the participants at the beginning of the session, and participants were fully debriefed at the end of the session. All participants were given the opportunity to ask questions at both the beginning and end of the session.

Participants must be provided with sufficient information prior to starting the session, and in the debriefing, to enable them to understand the nature of the investigation.

12. All the data collected from the participants is stored securely, and in an anonymous form.

All participant data (hard-copy and soft-copy) should be stored securely (i.e. locked filing cabinets for hard copy, password protected computer for electronic data), and in an anonymised form.

Project title: Digital Repatriation of Sierra Leone heritage cultural objects using a mobile first and API approach.

Student's Name: Ben Wilson

Student's Registration Number: 21302890

Student's Signature: Ben Wilson

Date: 17/11/15

Supervisor's Name: Dr MARTIN WHITE

Supervisor's Signature: M. White

Date: 8/11/2015

Figure 59 Ethical compliance form part 3

Project title:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

Project information:

The aim of this project is to create a new front end for the Sierra Leone Heritage site.

All participants must have used a website on a modern mobile device and a desktop prior to taking the user tests.

To help me establish requirements on why the current Sierra Leone Heritage site is not considered mobile friendly, participants will be asked to carry out certain tasks while on a mobile device. They will be observed while they're taking the test and observations will be recorded.

Participants will be able to give feedback about how they found using the device, but there will be no formal interviews or questionnaires.

Answers will be recorded and used to draw a conclusion for the requirements needed to create the new Sierra Leone Heritage site.

All data will be stored securely and only made available to the project team. No data will be collected about participants' identities or be traceable in any way.

Please answer the following questions to confirm you understand and consent to taking the interview or questionnaire: (please cross out as appropriate)

I confirm that I have read and understand the project information Yes | No
and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I Yes | No
am free to withdraw at any time, without giving reason.

I agree to take part in the above study. Yes | No

Signed:

x Joe

Print Name:

JOE WILSON

Date (DD/MM/YY):

13/04/16

Contact details:

Researcher: Ben Wilson (bacw20@sussex.ac.uk)

Supervisor: Martin White (m.white@sussex.ac.uk)

Figure 60 user consent form 1 from requirements testing

Project title:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

Project information:

The aim of this project is to create a new front end for the Sierra Leone Heritage site.

All participants must have used a website on a modern mobile device and a desktop prior to taking the user tests.

To help me establish requirements on why the current Sierra Leone Heritage site is not considered mobile friendly, participants will be asked to carry out certain tasks while on a mobile device. They will be observed while they're taking the test and observations will be recorded.

Participants will be able to give feedback about how they found using the device, but there will be no formal interviews or questionnaires.

Answers will be recorded and used to draw a conclusion for the requirements needed to create the new Sierra Leone Heritage site.

All data will be stored securely and only made available to the project team. No data will be collected about participants' identities or be traceable in any way.

Please answer the following questions to confirm you understand and consent to taking the interview or questionnaire: (please cross out as appropriate)

I confirm that I have read and understand the project information Yes | ~~No~~

and have had the opportunity to ask questions.

Yes | ~~No~~

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.

Yes | ~~No~~

I agree to take part in the above study.

Yes | ~~No~~

Signed:

x JBorett

Print Name:

Jack Borett

Date (DD/MM/YY):

13/04/16

Contact details:

Researcher: Ben Wilson (bacw20@sussex.ac.uk)

Supervisor: Martin White (m.white@sussex.ac.uk)

Figure 61 user consent form 2 from requirements testing

Project title:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

Project information:

The aim of this project is to create a new front end for the Sierra Leone Heritage site.

All participants must have used a website on a modern mobile device and a desktop prior to taking the user tests.

To help me establish requirements on why the current Sierra Leone Heritage site is not considered mobile friendly, participants will be asked to carry out certain tasks while on a mobile device. They will be observed while they're taking the test and observations will be recorded.

Participants will be able to give feedback about how they found using the device, but there will be no formal interviews or questionnaires.

Answers will be recorded and used to draw a conclusion for the requirements needed to create the new Sierra Leone Heritage site.

All data will be stored securely and only made available to the project team. No data will be collected about participants' identities or be traceable in any way.

Please answer the following questions to confirm you understand and consent to taking the interview or questionnaire: (please cross out as appropriate)

I confirm that I have read and understand the project information and have had the opportunity to ask questions. Yes | No

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. Yes | No

I agree to take part in the above study. Yes | No

Signed:

x F.W

Print Name:

Jonathan Li

Date (DD/MM/YY):

13/04/16

Contact details:

Researcher: Ben Wilson (bacw20@sussex.ac.uk)

Supervisor: Martin White (m.white@sussex.ac.uk)

Figure 62 user consent form 3 from requirements testing

Project title:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

Project information:

The aim of this project is to create a new front end for the Sierra Leone Heritage site.

All participants must have used a website on a modern mobile device and a desktop prior to taking the user tests.

To help me establish requirements on why the current Sierra Leone Heritage site is not considered mobile friendly, participants will be asked to carry out certain tasks while on a mobile device. They will be observed while they're taking the test and observations will be recorded.

Participants will be able to give feedback about how they found using the device, but there will be no formal interviews or questionnaires.

Answers will be recorded and used to draw a conclusion for the requirements needed to create the new Sierra Leone Heritage site.

All data will be stored securely and only made available to the project team. No data will be collected about participants' identities or be traceable in any way.

Please answer the following questions to confirm you understand and consent to taking the interview or questionnaire: (please cross out as appropriate)

I confirm that I have read and understand the project information and have had the opportunity to ask questions. Yes | No

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. Yes | No

I agree to take part in the above study. Yes | No

Signed:

x Ben Wilson

Print Name:

Thomas WIJA

Date (DD/MM/YY):

13/04/16

Contact details:

Researcher: Ben Wilson (bacw20@sussex.ac.uk)

Supervisor: Martin White (m.white@sussex.ac.uk)

Figure 63 user consent form 4 from requirements testing

Project title:

Digital Repatriation of Sierra Leone Heritage Cultural Objects using a Mobile First and API approach

Project information:

The aim of this project is to create a new front end for the Sierra Leone Heritage site.

All participants must have used a website on a modern mobile device and a desktop prior to taking the user tests.

To help me establish requirements on why the current Sierra Leone Heritage site is not considered mobile friendly, participants will be asked to carry out certain tasks while on a mobile device. They will be observed while they're taking the test and observations will be recorded.

Participants will be able to give feedback about how they found using the device, but there will be no formal interviews or questionnaires.

Answers will be recorded and used to draw a conclusion for the requirements needed to create the new Sierra Leone Heritage site.

All data will be stored securely and only made available to the project team. No data will be collected about participants' identities or be traceable in any way.

Please answer the following questions to confirm you understand and consent to taking the interview or questionnaire: (please cross out as appropriate)

I confirm that I have read and understand the project information and have had the opportunity to ask questions. Yes |

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. Yes |

I agree to take part in the above study. Yes |

Signed:

x Lewis Green

Print Name:

LEWIS GREEN

Date (DD/MM/YY):

13/04/16

Contact details:

Researcher: Ben Wilson (bacw20@sussex.ac.uk)

Supervisor: Martin White (m.white@sussex.ac.uk)

Figure 64 user consent form 5 from requirements testing

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