Software Project Engineering – History Trails

Overview

Client

Our client for this project is the Bristol Museum and Art Gallery and M Shed. Both museums are part of Bristol Culture, and aim to showcase different pieces of artwork from all periods of time by many internationally famous artists, as well as the history of Bristol. Our main source of contact is Mark Pajak, head of Digital Development at Bristol Culture. As the strategic lead on digital and user experience, he has a particular interest in meeting user needs and providing the best user experience.

Domain

By developing a web app for Bristol Museum and Art Gallery and M shed, this will improve visitors' experience at the museum. Since the start of covid, the number of visitors have drastically fallen. Hopefully, this alternative to the touch screen interpretation system will be able to increase visitor numbers again by making the general population feel safe enough to enjoy the artwork and Bristol culture at both museums.

Project

Due to Covid-19, both the Bristol Museum and Art Gallery and M Shed have had to switch off their legacy touch screen interpretation system for safety reasons. Our project, History Trails, is based on creating a web app as an alternative for visitors at art galleries to find out more information about the objects and paintings on display. One important criteria of this web app is that it should be accessible to everyone. As a result, the web app should be compatible with the accessibility features on the visitors' phones, so that those with visual impairment would be able to use the screen reader as required.

Our Vision

First and foremost, our web app must meet our client's needs and show the basic information about the object of interest, including the name of the object, who created it,

when it was created and a general description, along with an image of the object. The web app should be easy to navigate, providing a pleasant user experience.
In order to present this information in a useful format, we plan to have a QR code for each gallery so that visitors can scan the code and be brought to a page with all the objects in that gallery. In the case that the visitors are unable to scan the QR codes (perhaps because of their phone's functionality), they would also be able to navigate to the galleries manually. Each gallery would then be sorted by the type of object(i.e. sculpture, painting etc.) or perhaps in the order the visitor would see when exploring the room in a circular order. We will also implement a favourites' functionality so that the visitors can revisit their favourite objects.

Requirements

Non-interacting Stakeholders

Director:
The Director of Bristol Museum & Art Gallery is responsible for the museum's daily operations and for long-term planning and policies. The Director ensures the museum adheres to federal guidelines for safety and hiring practices and follows industry regulations regarding the acquisitions and maintenance of artefacts.

Bristol City Council:
The Bristol Museum & Art Gallery is part of Bristol Museums which is a group of museums, historic houses, galleries and archives in Bristol which patrons can visit for free. Bristol City Council is the local authority of Bristol and therefore supports the museum and has the overall responsibility for the management of the museum.

Art Council England:
The Bristol Museum & Art Gallery is supported and funded by Art Council England which is a non-departmental public body of the Department for Digital, Culture, Media and Sport. It invests in artistic/ cultural experiences across museums and libraries.

Project team:

The project team is the group which was assigned this Software Development Project. The five members must carefully plan and collaborate in order to produce a functional product.

Communities:
There may be certain communities that are connected to specific collections in The Bristol Museum & Art Gallery as they may possess very personal and historical ties to the artefacts and art. Also, there may be local communities who rely on museum services to fill leisure and recreational needs.

Interacting Stakeholders

Curator:
The Curator of Bristol Museum & Art Gallery is responsible for acquiring, maintaining, displaying and interpreting collections of artefacts or art with the intention of enlightening the public. He/She is expected to understand the website software as part of enhancing visitors' experiences. This new digital platform will present new opportunities for the Curator to disseminate collections.

User Story

As a Curator, I want to be able to understand the application so I can provide museum visitors with information.

As a Curator, I want to be able to search for an item so I can get information quickly.

As a Curator, I would like to use robust search options to accurately group objects.

Educational Coordinators:
The educational coordinators of Bristol Museum & Art Gallery ensure that collections in the museum act as a learning resource for people of all ages by planning, coordinating, and implementing educational events, workshops, and lectures. Programmes are often designed to engage those who may not conventionally use the museum (young people, children, older people). Educators would also depend on a software that delivers relevant search results.

User Story

As an Educational Coordinator, I want to be able to search for items quickly so I can provide museum visitors with information.

As an Educational Coordinator, I want to create groups or lists of items so I can plan activities for museum visitors around them.

As an Educational Coordinator, I want to be able to view items by gallery so I can organise activities more efficiently.

Exhibit Designers:

The Exhibit Designers of Bristol Museum & Art Gallery create displays for the galleries for educational and enjoyment purposes. Thus exhibit designers will use the software to look up an item's history and description which may be used to create exhibit display panels.

User Story

As an Exhibit Designer, I want to search for items quickly so I can attain information swiftly when doing exhibition designs.

As an Exhibit Designer, I want to be able to view items by gallery so I can improve the design of existing galleries.

As an Exhibit Designer, I want to create groups or lists of items to aid me in creating exhibitions consisting of these items.

Museum visitors:

Museum visitors are those members of the public who tour the museum to see the exhibitions and galleries in-person or online and can either be frequent visitors or one-time visitors. They may be of a wide age range (from young children to the elderly) and may possess a diverse selection of interests. Some visitors may be differently abled and thus have special needs and requirements. Museum visitors are typically the number one stakeholder.

User Story

As a Museum visitor, I want to be able to access the application easily so I can use it throughout the museum visit without a long time being spent learning to navigate.

As a Museum visitor , I want be able to easily install the Application onto my device so that I can explore the museum freely without having to download anything else

As a Museum visitor, I want to be able to add items to a list of favourites so I can revisit them at a later date.

Researchers:

Researchers may choose to engage with the museum's material for personal reasons and hobby purposes or engage with the material for professional reasons . If they are an academic researcher, he/she will tend to need materials for his/her work product.

User Story

As a Researcher, I want to create groups or lists of items that may be relevant to my research area to help me analyse data more efficiently.
As a Researcher , I want to scan QR codes quickly with my phone so I can instantly access data without manual data entry.
As a Researcher, I want to be able to access links to additional information about items as I may require more details for my study.

For each user stakeholder, user stories will be provided below.

As a Curator, I would like to use robust search options to accurately group objects.

1. The user downloads and launches the app
2. The app asks for permission to access the internet.
3. The app asks for permission to access the camera.
4. The user locates the search bar
5. The user enters the type of object eg. Painting, sculpture, photograph, ewer etc
6. A list of all objects of the specified type is generated.

Alternative Flow:
5. The user enters an invalid object type
6. An error message is presented.

Exceptional Flow:
2. The user declines the app's permission to access the camera and download external files and a failure message dialogue is displayed. User case ends.

As an Exhibit Designer, I want to be able to view items by gallery so I can improve the design of existing galleries.

1. The user downloads and launches the app.
2. The app asks for permission to access the internet.
3. The app asks for permission to access the camera.
4. The user selects the scan QR code option.
5. The QR code of the gallery that is required is scanned.
6. All items in the gallery will be shown

Alternative Flow:

5. The QR code is not recognised.
6. An error message is displayed.
7. Users are taken to a search bar where they can manually enter item.

Alternative Flow:

5. The QR code is not detected despite being in-camera focus.
6. The user must fiddle with the camera to find a new view

Exceptional Flow:

2. The user declines the app's permission to access the camera and download external files and a failure message dialogue is displayed. User case ends.

As a MuseumVisitor, I want to be able to add items to a list of favourites so I can revisit them at a later date.

1. The user downloads and launches the app.
2. The app asks for permission to access the internet.
3. The app asks for permission to access the camera.
4. The user selects the scan QR code option.
5. The QR code of the gallery that is required is scanned.
6. All items in the gallery will be shown.
7. An item is selected.
8. Item is added to favourites list

Alternative Flow:

4. The user locates the search bar
5. The user enters the name of item
6. An item is selected.
7. Item is added to favourites list

Alternative Flow:

5. The QR code is not recognised.
6. An error message is displayed.
7.Users are taken to a search bar where they can manually enter item

Alternative Flow:

5. The QR code is not detected despite being in-camera focus.
6. The user must fiddle with the camera to find a new view

Exceptional Flow:

2. The user declines the app's permission to access the camera and download external files and a failure message dialogue is displayed. User case ends.

As a Researcher, I want to be able to access links to additional information about items as I may require more details for my study.

1. The user downloads and launches the app.
2. The app asks for permission to access the internet.
3. The app asks for permission to access the camera.
4. The user selects the scan QR code option .
5. The QR code of the gallery that is required is scanned.
6. All items in the gallery will be shown.
7. An item is selected.
8. The user clicks on link which takes you to additional information

Alternative Flow:

4. The user locates the search bar
5. The user enters the name of item
6. An item is selected.
7. Item is added to favourites list
8. The user clicks on link which takes you to additional information

Alternative Flow:

5. The QR code is not detected despite being in-camera focus.
6. The user must fiddle with the camera to find a new view

Exceptional Flow:

2. The user declines the app's permission to access the camera and download external files and a failure message dialogue is displayed. User case ends.

Below we will outline one detailed user story.

As a MuseumVisitor, I want to be able to add items to a list of favourites so I can revisit them at a later date.

1. The user downloads and launches the app.
    - The application should be accessible to the public.
2. The user should be able to comfortably navigate functions of the application in a short space of time.
    - The user should be able to freely use the app without reaching a dead-end.
3. A native screen reader should be allowed to read aloud displayed information.
4. The app asks for permission to access the internet.
5. The app asks for permission to access the camera.
6. The user selects the scan QR code option.
7. The camera view is output to the screen.
8. The QR code of the gallery that is required is scanned
    - A QR code is detected by the app and its raw value is decoded.
    - The app must be able to decode the data encoded in a QR code pattern.
9. All items in the gallery will be shown.
10. An item is selected.
11. Item is added to favourites list

Personal Data, Privacy, Security and Ethics Management

This web app will not collect any personal data from users, since it is unnecessary to achieve the required functionality, so there is no need to take any steps to comply with GDPR.

However, in order to implement the QR code scanner, access to the camera of the user's smart device is required. Thus, we will ask device holders to grant camera access at the beginning of use. This will be supplied simply through a prompt window.

Cookies are used to help improve our users' experience. We will add features like "favourites" in our app. When users like an exhibit, they can click the like button to add it to favourites. In order to achieve this, we will have cookies built into the app.
To comply with the information requirements of PECR, we provide information in a way users will see when they first visit our service. We will also provide more detailed information about cookie use in a privacy or cookie policy. These will be done within the cookie consent mechanism itself and a link at the bottom of the web app.

As we want this app to be accessible to everyone, we will take measures to ensure that the web app is compatible with the devices' accessibility features so that users with visual impairment would be able to use the screen reader. This means that we will have to ask for access to the devices' screen reader app. More related features contributing to equality will be applied in the later development.

Ethics pre-approval was applied for on November 12, 2020 at 14:40.

Architecture

We identified the fundamental requirement of this project after the first two meetings with our client, that is, to build an online web gallery for the public where all information of a particular object can be found. To achieve this objective, we agree that an artwork browser is a better implementation rather than a map application, which the project name "History Trails" might indicate. Compared to map application, artwork browsers can more effectively fulfil client's needs, as it displays data in a more concise way.
After identifying the requirements from our client, we analysed the possible impact on the system under different attributes by using the iso/iec 9126 software model. First of all, in terms of functionality, the basic quality trait for the project is accuracy, in order to avoid misleading and confusing users. There is no doubt that the project needs to show corresponding artworks from different museums and the exact information for each object. The second point is reliability. The final version of software handed to the client must be a mature one, which means the frequency of failure is low. In the case that the software fails,

there are approaches to restore original data. Next, is usability, which influences the project in a most significant way. This project certainly has a large number of potential users of varied ages. So, understandability, learnability and operability must be considered. Lastly, with regards to portability, this software is adaptive and installable. Designed to be multi-platform, it can be accessed on both PC and portable device - anywhere with a browser. Taking all those features into account and due to the limited size of the project, we chose the most common online application design pattern, client-server pattern as our software architecture. In this architecture, software is divided into two main parties, the providers of a resource or service, called servers, and service requesters, called clients. The server component will provide services to multiple client components. Clients request services from the server and the server provides relevant services to those clients. In the case of this project, we only have a single client interacting with the server, which is the web interface. Users send requests either by scanning QR code or by inputting museum names manually through the interface. The server based on AWS will then provide relevant data from its database. Finally, these data will be sorted and displayed in a readable format. Our software architecture is relatively straightforward, so this may contain some shortcomings, and we may adjust or change this aspect in subsequent developments.

Diagram 1

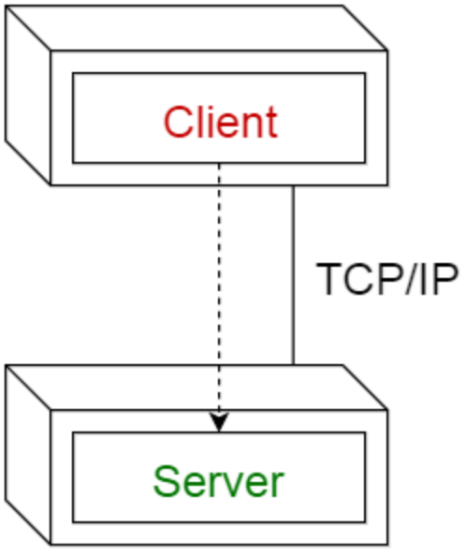
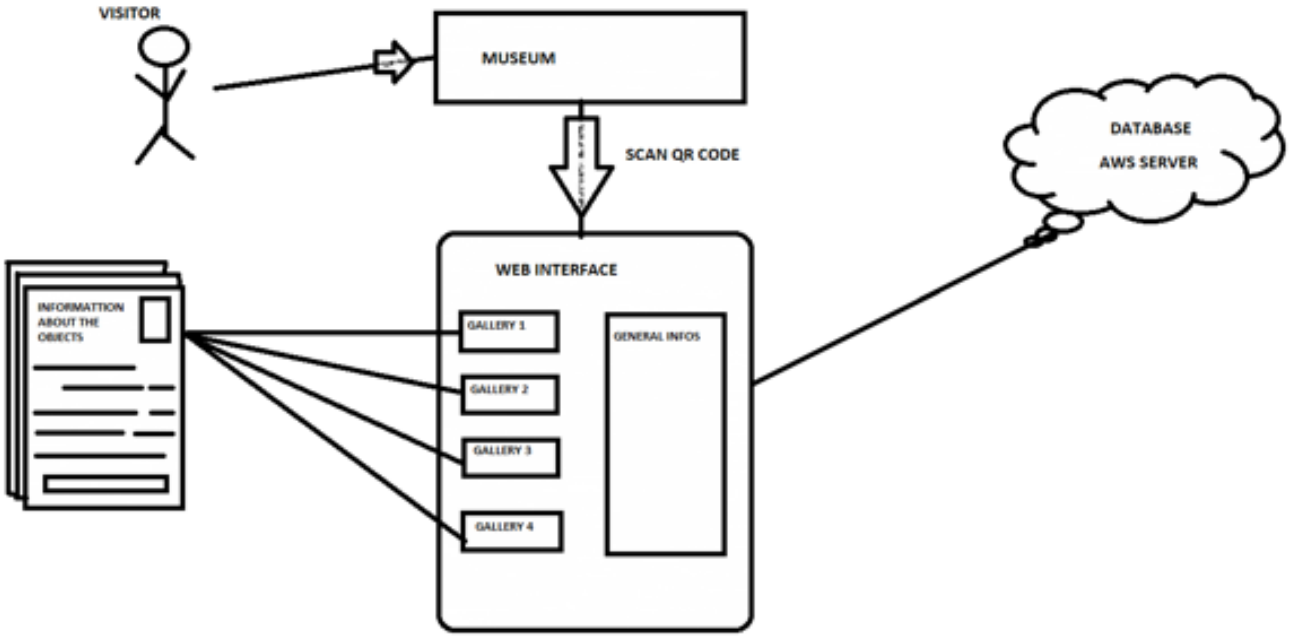


Diagram 2



Development Testing

Development Testing enables higher levels of efficiency in the software development cycle, helps to reduce the effect of software errors, and speeds up the delivery of new features and bug fixes to customers.

This technique includes all testing activities that are carried out by the team developing the system:

Unit testing: individual program units or object classes are tested; should focus on testing the functionality of objects or methods.

Component testing: several individual units are integrated to create composite components; should focus on testing component interfaces.

System testing: some or all of the components in a system are integrated and the system is tested as a whole; should focus on testing component interactions.

From all the testing methods specified above we will use unit testing for individual units of the source code to determine whether they are fit for use. A core component of our web application is the function that makes the back-end work of extracting all the necessary information from the client database about the galleries and their corresponding objects in order to be arranged in an efficient and user friendly way for all the visitors who want to know more about one piece of art in particular.
The unit testing is automated so that tests are run and checked without manual intervention. We made use of the JUnit test automation framework to write and run our program tests such as testing each get request asserting that the content displayed on the web matches with the correct contents from the json file.

Release Testing

Release testing is the process of testing a particular release of a system that is intended for use outside of the development team. The primary goal of our release testing process is to convince the customer of the system that it is good enough for use. Release testing, therefore, has to show that the system delivers its specified functionality, performance and dependability, and that it does not fail during normal use. That being said, we will choose a date prior to the release of our product in order to organise a live testing environment with some real users.

For the Minimum Viable Product we will test:
QR Scanner and Camera (manually)

Check if the mobile phone can use the camera to scan the QR code under different levels of light or angles.

QR Code (automatically)

Check if the QR code directs the user to the correct page.

Web interface (manually)

Check if all links and buttons displayed lead to correct pages