Accessible Immersive Animal Exhibit

Interactive Exhibit

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Executive Summary

Introduction:
The use of virtual reality (VR) and augmented reality (AR) in museums has the potential to transform the way visitors experience exhibits. In this project proposal, I will present a plan to create a VR/AR immersive animal exhibit for a The National Museum of Scotland's "Natural World" exhibit, with a focus on accessibility for visually and hearing-impaired individuals.

Need:
Many museums struggle to provide an immersive and interactive experience for visitors, especially for those with disabilities. Traditional exhibits can be difficult for visually and hearing-impaired individuals to fully appreciate and engage with. VR and AR technology can fill this gap by offering a more dynamic and inclusive experience.

Solution:
The VR/AR animal exhibit will feature interactive elements, such as puzzles and games, to keep visitors engaged. The exhibit will also include detailed 3D models of animals, which can be viewed through VR headsets or AR capable mobile devices. These exhibits will be accompanied by audio descriptions and visual captions to provide access to the full experience for visually and hearing-impaired individuals.

Resources:
The project will require a team of developers and designers with experience in creating VR and AR content. Funding will be needed to cover the cost of development and to purchase the necessary hardware, such as VR headsets and AR capable mobile devices. It will also be necessary to work with organizations and individuals with expertise in accessibility to ensure that the immersive exhibit is fully inclusive.

Confidence:
I am confident in the success of this project due to the increasing popularity of VR and AR technology and the potential for enhanced visitor engagement. I believe this accessible VR/AR animal immersive exhibit will be a valuable addition to the museum and will attract a wide range of visitors, including those with disabilities.

Conclusion:
In conclusion, this accessible VR/AR immersive animal exhibit will provide a unique and immersive experience for all visitors to the museum. I believe this project has the potential to be a success and will enhance the museum's offerings by making them more accessible to all individuals.

Background

My proposed project is to create a VR/AR experience also known as “Extended Reality (XR)” for the National Museum of Scotland’s “Natural World” exhibit.

Virtual Reality (VR) museum exhibits come in 2 forms, remote and location-based experiences. Already “remote” helps to resolve the issue of having to go to the location to view the experience, overcoming a major issue for most people, however, not everyone has access to VR headsets or similar equipment, eliminating them from the “remote” experience. This is where (Augmented Reality) AR can come in and help to alleviate this, the ownership of “smartphones” has dramatically increased over the years in the United Kingdom, especially in the 55+ category (Hiley, 2022, Taylor, 2022).

The main problem I will focus on is accessibility. There are many different disabilities, the main disabilities I will focus on are Visual, Audio and Input. VR and AR are all about visually and audibly interacting with something, so people who suffer from visual/hearing impairments will have a bad experience with the technology. “*The majority of people with vision impairment and blindness are over the age of 50 years; however, vision loss can affect people of all ages.”* (WHO, Liste, 2022)

Designing a VR/AR experience for an animal exhibit that has multiple accessibility options will have multiple positive impacts on the end user and museum.

1. It can help increase the number of people who can attend/access the exhibit due to the available accessibility options.
2. It promotes inclusivity which can improve the public’s view of the museum.
3. The use of VR/AR will help the museum to reach a wider audience.

Existing strategies in museums already exist such as.

1. Audio Descriptors (*Visual Impairments*)
2. Closed Captions/Transcriptions (*Deaf/ Hard of Hearing*)
3. Touch Screen Displays
4. Games and Quizzes

Audio Descriptors allow visually impaired people to experience an event, they do this by describing the object. A study conducted by *Dr Rachel Hutchinson* found that users who experienced artwork with the addition of an audio descriptor remembered more details about the artwork (Hutchinson, 2020)**.**

“11 million people across the UK are affected by hearing loss” (Kids in Museums, 2021). Closed captions are a great way to convey the information to people who may be affected. Subtitles or transcripts should be available in video formats.

Potential Gaps.

1. Limited input methods
2. Exhibit designers not considering people with disabilities
3. Cost and Resources

Current VR technology is limited in many ways, the size of the headsets is still large and heavy, and the input methods require precise movement, eliminating people with physical disabilities.

The cost for such exhibits can vary by the size and complexity of the project.

Proposal

High Concept

Description:

This project would be the creation of an immersive experience using Virtual Reality (VR) and Augmented Reality (AR), This can be combined into one Extended Reality Experience (XR). This immersive experience would be for the National Museum of Scotland's "Natural World" exhibit. The already existing exhibit at the museum can be enhanced to allow for the integration of this project. For users accessing the exhibit on-location using AR, a barcode can be added to each animal allowing the users to scan the barcode.

This experience would allow for visitors to view the animals within the exhibit in an interactive way with detailed models and information of the animals. To keep the users engaged, optional games and puzzles can be implemented, allowing for a wider range of possible users. Keeping accessibility in mind, the experience will be designed with visual captions and audio descriptors available throughout. The experience is designed to be as accessible as possible.

Figure 1 Natural World Galleries: National Museum of Scotland, No Date

The combined use of both VR/AR allows for remote, and on-location access the exhibit. AR can be used on-location while VR allows for users who are unable to have on-location access to "tune-in" using an application on the VR device from the comfort of their own home. This also allows for 2 main input methods. The VR device "Meta Quest 2" also supports hand tracking (Meta, No Date) and full body tracking can be done with extra equipment, adding more input methods for users who may be experience motor movement impairments.

Relevance:

The use of VR and AR in this immersive experience allows for a more engaging way to view the exhibit. This experience adds a new layer of visual and audio representation, allowing users who have never been able to experience a museum on the same level as others thanks to VR/AR integration. Keeping up with accessibility, the use of visual captions and audio descriptors allows for a more engaging experience for users who experience such impairments. As noted in *Dr Rachel Hutchinson* study, users have a more memorable experience with the use of additional aid such as visual captions and audio descriptors so not only will people with impairments have a better experience, people with no such impairments experience will also improve. As this project is enhancing the existing exhibit, visitors who want to experience the traditional exhibit still can.

As noted, earlier, smartphone ownership in the UK has been on a constant increase, the same can be seen in the VR market with predictions for it to continue to grow (Andrić, 2022).

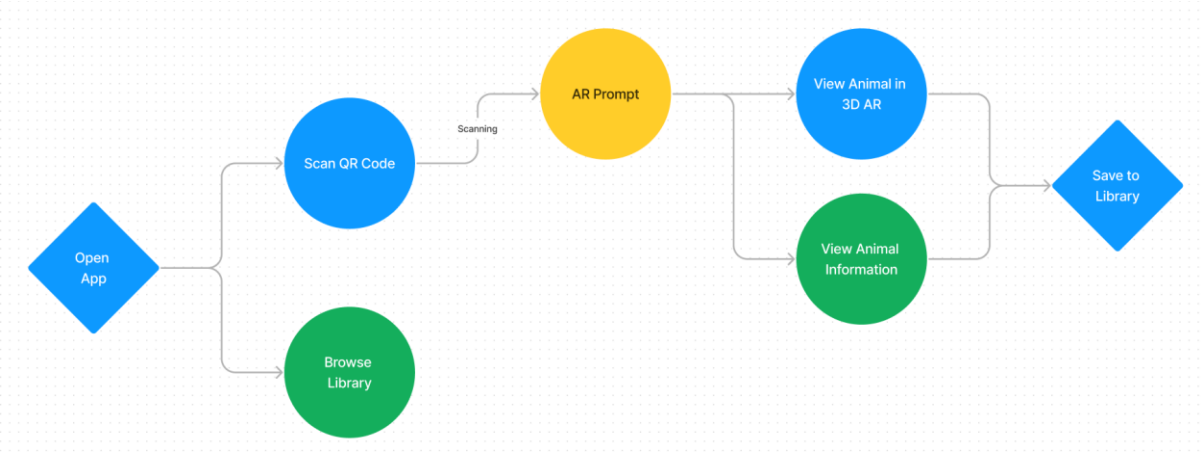
Overall, the experience will be improved for both the museum and all visitors who partake in the immersive experience without effecting traditional museum visitors.

Visuals:

Since this experience is available in 2 different forms (VR/AR) the visuals will differ between them, especially in AR, as individual phones have different processing limits this could cause the program to have varying levels of detail among different phone devices especially compared to the VR version. As the VR version will only be made available on the Meta Quest 2, the visuals will be more coherent across these devices.

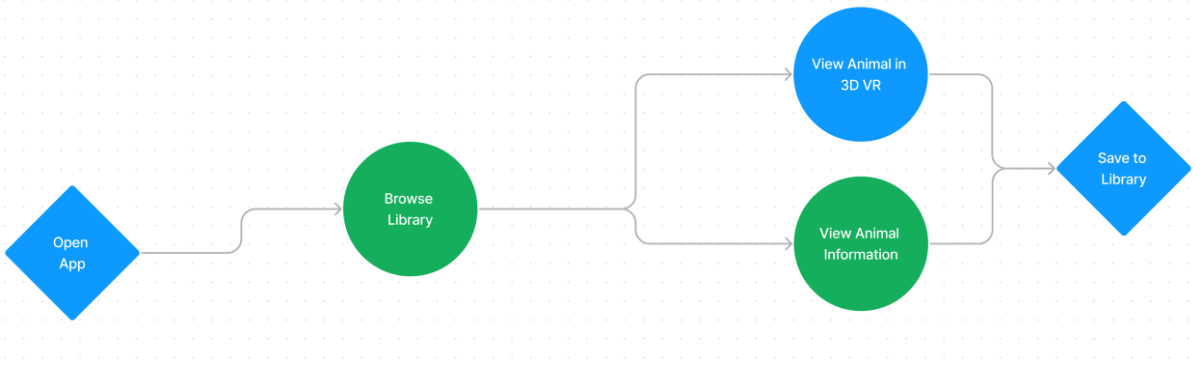
As future cost-effective devices are released, the program could expand to allow for more compatible devices and increase accessibility levels even more.

Below is a quick user-flow chart of the scanning process:



The Library feature allows you to save any animal you scan so you can view it outside the museum, this allows people who can't visit the museum and also can't access it through VR, they can get someone to show them the exhibit through their phone by saving their experience.

Whilst the above flowchart showcases AR, the VR application would function similarly.



The VR application would not need to "scan" anything, therefore they could access the "library" and select specific animals and view them in VR with their information.

Unique Selling Points:

1. The use of VR/AR allows visitors to experience the museum exhibit in a new light. VR/AR alone is a selling point for many.
2. The exhibit is designed around accessibility, with visual captions and audio descriptors for those with impairments.
3. To keep users engaged, games and puzzles are optional features.
4. Once Visitors have scanned an Animal, they can view it again outside of the museum, this prevents a "locked" system.

The use of detailed models and animations allows the users to see the animals in ways they would not be able to in a traditional museum setting. As traditional museums have an animal in a pose, whereas in AR/VR the animal can move, you can zoom and rotate around the animal to see what you want.

Audience and Market Research

Customer:

The proposed primary target audience would be people with accessibility issues, mainly people who have visual and/or hearing impairments. The proposed project's focus is on accessibility therefore the target audience would need to follow; however, the experience is accessible to those without such impairments.

Already 41% of museum visitors are over the age of 55 (The Audience Agency, 2018) and in accordance with the WHO, people of age 50+ are more likely to experience visual impairments.

Taking this information into account it can be said that people of this age group with these specific impairments can be classified as the target audience for this proposal, however, age does not disqualify anyone from having such impairments.

Key Partners:

The key to this project being successful is accessibility, therefore accessibility experts would be required. Working alongside them would help to ensure the project is designed to be as accessible as possible.

The museum itself would be another key partner, as they could provide people with special skills to help design the exhibit as well as museum educators to help create an engaging and informative program, museum educators also provide a way to reach target groups and get them into see the museum exhibit (Zippia, 2022).

Meta, the now owner of "Oculus" provide the VR device for this project, they would be a key company to work alongside with to develop new ways of interacting with the virtual world and allowing for more accessibility implementations.

Funding can be done in multiple rounds, with each new round acquiring new investors by providing proof of concept, statistical improvements to visitor engagement and returns to ensure they are investing in something "worthwhile". The largest tech companies such as Microsoft, Sony and Google are all potential investors, each of these companies have attempted or create or invest before into the VR/AR space (Microsoft, No Date. Sony Interactive Entertainment LLC, No Date. Google, No Date). Apple is reportedly going to be entering the VR/AR space in the coming year, another potential device and investor in the future (Pritchard, 2022).

Competitors:

The Smithsonian's National Museum of Natural History unveiled "skin & bones" in 2015, an augmented reality application, in the reveal video it shows the user using an iPad to view animals within an exhibit in augmented reality, the video reveals however that this application is only available on "iPhone and iPad" eliminating any android or alternative device owner (Smithsonian's National Museum of Natural History, 2015).

Other applications of this technology do exist; however, Skin & Bones was the main one I came across that related to Animals, while other exhibits focus on Art Galleries, Space or Micro-Biology.

SWOT Analysis

Strengths:

- This exhibit allows for a unique way to experience and interact with the exhibit.
- VR/AR allows for a wider range of visitors/users to access it.
- People with physical, visual, and hearing impairments can access this exhibit.
- Museum immersive experiences are on the rise, taking on this project will show that you are an early adopter of the technology and see the benefits it can provide.

Weaknesses:

- This exhibit will be costly to create and maintain.
- Even with accessibility measures in place, those who do not have access to a VR device, or an AR-capable device will not be able to experience the exhibit.
- Technical support can be limited due to limited staffing.
- Remote visitors who would like to experience this will have to invest in a VR device which can be costly to the visitor.

Opportunities:

- With VR/AR capabilities, this exhibit will attract a new audience that may not have been interested in the traditional setting of a museum.
- With this exhibit only be target at an animal exhibit, the future possibilities are endless as the museum could expand the experience to other things such a vehicle or space immersive experience.
- With the use of VR/AR, updating the exhibit with new features, models etc can be done to keep the exhibit up to date with the moving technology.

Threats:

- Competition from other museums with a VR/AR experience could pose a threat and make it difficult to attract visitors.
- As this technology is constantly improving, keeping up with the latest could be difficult resulting in outdated technology which could lead to a decrease in visitors.
- VR/AR relevance could fade off and those once interested visitors will no longer be interested in the technology.

Requirements

Resource	Description	Cost (£)
Producer	Manages multiple teams, scheduling and tracking tasks (Indeed, No Date).	£36,849/yr
Exhibit Designer	Designs the displays and fixtures for large exhibitions (Indeed, No Date).	£36,933/yr
Museum Educator	Develop teaching programs to help involve the public with the museum's exhibits (Indeed, No Date).	£25,335/yr
Designer	Design systems, rules, and gameplay. Help to make the experience engaging and fun (Indeed, No Date).	2x £33,032/yr
User Experience Designer	Make the experience enjoyable and accessible (Indeed, No Date).	2x £46,047/yr
User Interface Designer	Work closely with UX designer (above) to create a good looking and feeling program interface (Indeed, No Date).	2x £45,713/yr
Programmer	Program the core mechanics, loops, and experience (Indeed, No Date).	3x £35,329/yr
QA Tester	Test the program throughout development across different devices and submit bug reports to be resolved (Indeed, No Date).	2x £36,619/yr
Technical Support	On-location technical support for users who may experience difficulties, may be supplied by the museum (Indeed, No Date).	£24,560/yr
Meta Quest 2	Virtual Reality device available for both consumers and developers (Meta, No Date).	9x £399.99/per device £399.99 * 12 = £3,599.91
Workstation	Workstations can vary in price, a single high-end workstation can cost upwards of £3k-£12k or above (Puget System, 2022).	8x £3.2K "Designer PC" 3x £11.7K "Programming PC"
Workstation Utilities	Keyboard & Mice, price can vary, from everyday bundles to higher end bundles. Optimally, office bundles would be best suited. (Dell Inc, No Date)	12x £44-£111 £44 * 12 = £528
Workstation Monitors	Monitors for this type of work need be specialised to this area, high quality panels, individuals can opt to have different ratio monitors e.g., 16:9, 16:19, 21:9.	12x £3k-£5/ per monitor £5k * 12 = £60,000
Unity	Development engine for both VR and AR applications (Unity Technologies, No Date).	"Personal License" Free up to 100k / non-profit org
Unreal	Development engine for both VR and AR applications (Epic Games, No Date).	"Standard License" Free up to 1M /
Office Space	A small office space to hold all staff throughout development. Cost varies depending on square foot requirement of the premise (Valeova, 2022).	£12 - £60 per sq foot £40 x 1500 = £60,000
	Total Costs:	£737,313.91

Impact and KPI

Social:

- This immersive experience can allow the museum to have a positive effect by being inclusive. Reaching new and diverse audiences that may not have been interested in the prior traditional museum experience.
- Accessibility is at the forefront of this immersive experience. As traditional museums may not be accessible therefore excluding certain groups, this experience prevents that and provides an educational experience available to both remote and on-location visitors.
- The educational experience is improved through this immersive experience. This can increase the engagement from students and visitors. Visitors will have a positive impact through the use of this technology.

Cultural:

- Museums as a whole can change their image through immersive experiences and improve their engagement with visitors. Changing the way people interact with your exhibit can have a large impact on the museum culture as people experience new was to learn and interact with exhibits.
- The museum can promote the exhibit through different social media platforms. Informing more people of the experience, any “influencers” or visitors can then comment about your exhibit on their social media once again promoting your exhibit to many different people.
- As the AR version is incorporated into the already existing exhibit, prices may increase for visitors as well as people may have to pay for the VR program individually. People may not want to pay extra, especially those who plan to visit the traditional way.

Economic:

- Immersive exhibits can attract more visitors to museums, which can have a positive economic impact on the local community.
- The cost of creating and maintaining this exhibit could also have a negative impact on the financial resources of the museum.
- Labour income will increase as new jobs will be required to both develop the experience and maintain it. Staff will be required on-location for technical problems and introduce visitors to the experience.
- The VR market is growing and with immersive experiences such as this, the market for VR will continue to grow to add to the already booming market value.

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