

Museum Exhibits Final

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Assignment 2: Usability Analysis of Interactive Museum Exhibits



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1. Introduction

The aim of this report is to evaluate museum exhibits using Usability Theory and Practice. Three museums across the City of Swansea were visited during March 2020 (Figure 1):

- The National Waterfront Museum
- Swansea Museum
- The Dylan Thomas Centre

Exhibits within these museums will be referenced and reviewed in order to analyse how usability engineering can be applied to, and benefit, interactive museum exhibits. This report will also look at guidelines for implementing effective usability and accessibility in museum exhibits, as well using new technology such as Virtual Reality (VR) and Augmented Reality (AR).



Figure 1: Location of Museums visited for research (Google Maps, 2020)

2. Usability Review of Two Exhibits

2.1. Description of Exhibits

2.1.1. Effective Exhibit

Arguably the most effective exhibit was the 'who are you?' digital exhibit in the Waterfront Museum (Figures 2,3 and 4). This utilises modern and interactive technology whereby the user explores people's past on the screen using their hand movements. The exhibit receives user input from 3D gesture technology by enabling motion tracking between two sensors [1].

This creates a fun and interactive digital method of exploring the history of the people of Swansea, bringing together old and new. Communication is both written and sound based, and options were given for Welsh or English.



Figure 2: 'Who are you? / Pwy ydych chi?' exhibit, Waterfront Museum



Figure 4: 3D hand gesture technology

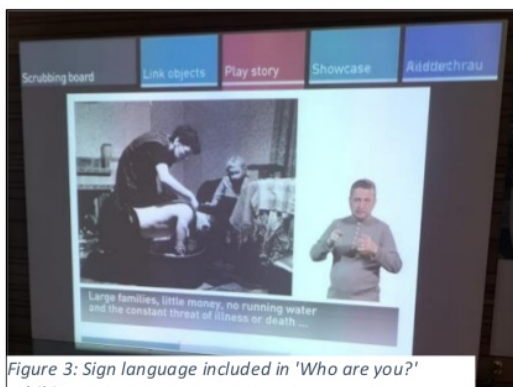


Figure 3: Sign language included in 'Who are you?' exhibit

2.1.2. Ineffective Exhibit

The most ineffective exhibit was the Oriel Hanes Room in Swansea Museum. This held a series of historic items donated to the museum, including a model of the town in 1840, moa bones, historical welsh costumes and a model of a typical welsh kitchen during this era (Figures 5,6 and 7). Information is communicated to visitors through printed paper signs only, many of which were faded and need replacing. Some of these signs were in Welsh and English, others only English. This exhibit did not utilise any form of modern technology and is entirely a visual display.



Figure 6: Moa Bones, Oriel Hanes exhibit

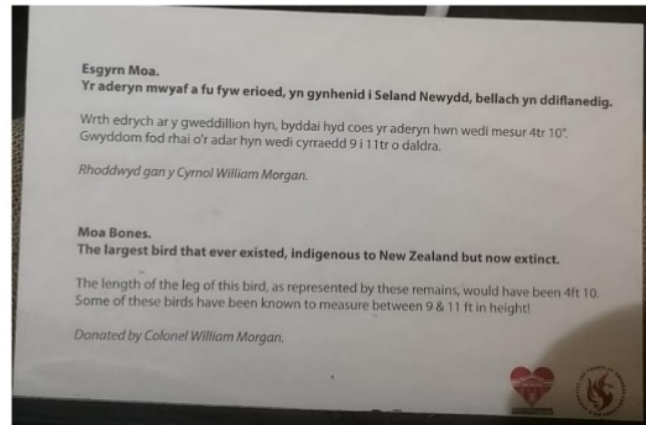


Figure 5: Moa Bones accompanying signage



Figure 7: Model of the town of Swansea in the 1840's, Oriel Hanes exhibit

2.2. Usability Review of Two Exhibits

Usability Features	Effective Design: 'Who are you?' Exhibit	Ineffective Design: Oriel Hanes Room Exhibit
Human Vision, hearing and touch	- Utilises vision, hearing and touch/motion sensory systems - Option for English or Welsh spoken and written communication - British sign language captioning.	- Utilises vision only - Written communication generally given in both English and Welsh.
Metaphor (e.g. piggy bank used to symbolise money)	Metaphors are used effectively (Figure 4) to describe to the user what each category is. For example, an image of a book to represent Welsh literature.	Not utilised in exhibit.
Affordance (cues e.g. arrows)	The user is presented with cues on the screen indicating how to navigate through the exhibit. The hand movements are mirrored by an on-screen cursor pointer which notifies the user where their hand is positioned.	Not utilised in exhibit.
Improvements	- Further accessibility options, particularly for those who are both deaf and blind (i.e. brail) - More language options to aid tourism – French, Spanish, German etc.	- Digitisation to promote user interaction. For example, a holographic projector could be used to show an apparition of the Moa (Figure 8) - Signage uses small text, difficult for those who are visually impaired. Recommended font size 16. - Options for those who are blind i.e. brail, sound.
Conclusion	Quick and easy for user to learn how to navigate exhibit, effectively utilises modern technology and embraces multiple accessibility options. Fun for all levels of users to enjoy learning about Welsh heritage.	This exhibit is overly simple and does not utilise any form of technology, making it very quick and lacklustre to visit. The user is only given information in text format, which in itself is poor quality.

Table 1: Usability review of two exhibits

2.3 Applying Usability applied to design of general Computer Systems

As demonstrated, the application of usability in designing computer systems is also useful for museum exhibits as the aim of both is to be something the user will find usable and ultimately will use to fulfil their needs. Usability increases productivity, engagement and makes the experience more enjoyable for the user.

Evaluation methods can be applied to ensure that requirements of the users have been met and any errors or difficulties encountered have been resolved. The application of interviews, questionnaires

or observations can be applied to see the computer system functioning in real-life. Lack of usability can result in the increase in errors, misjudged decisions and misunderstandings and ultimately the computer system will be unusable [2].

A key purpose of museums is to provide public education and share knowledge among adults and children. Digitisation and technology can provide a new method of engagement and participation in museums but as with any computer system, it must be implemented effectively and embrace usability in order to meet the needs of users [3].

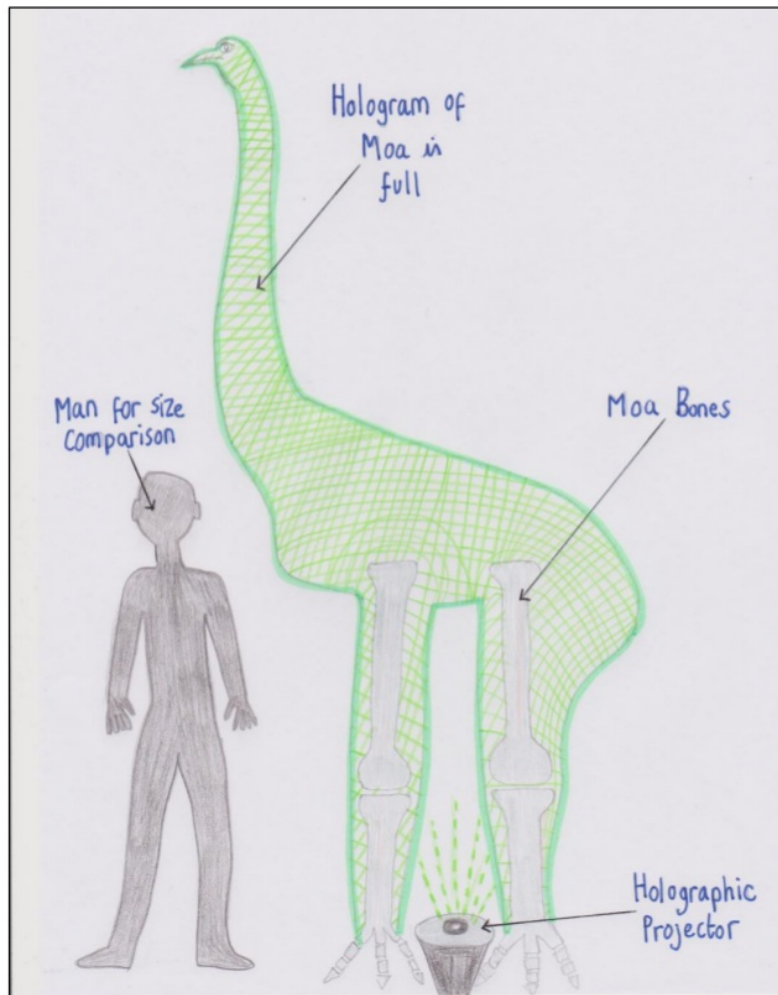


Figure 8: Suggested improvements to Moa display utilising a holographic projector to create a hologram of the creature in full around the original bones

3. Interface Evaluation

3.1. User Interface and User Friendliness

A user interface (UI) is the way in which the user interacts with the computer system. The term 'user-friendly' evolved around the 1980's to describe the usability of the UI and is now used as one of the key metrics to measure the usability of an UI [4].

Usability by Nielsen can be measured through the following:

- 1) Whether the product is easy to learn
- 2) The efficiency of use by the user to undertake the tasks
- 3) How to use the UI should be easy to remember
- 4) The level and frequency of operational errors and their severity
- 5) User satisfaction with the product [4].

3.2. Evaluating Usability

Nigel Bevan considers usability to be based on the level of effectiveness, efficiency and user satisfaction of a specific product which serves a specific purpose within a specific environment [5]. Evaluation strategies can provide organisations with information on what is working, if they are working as intended and ways in which they can be improved [5].

There are various usability evaluation methods such as interviews, questionnaires, experiments, simulations and observations which can be applied to UI design and development stages [5]. These are described below.

3.2.1. Observation

Observing users is applied through direct observation. However, mindfulness around the Hawthorne effect is required; this states that users may perform better upon being participants within an experiment. Individuals may alter their behaviour due to attention from observers [6]. Users are observed without being disturbed in the environment where the system would normally be utilised and an observer will take notes accurately on what is occurring. Video recordings as a variation of this technique can be taken to record interactions which can later be analysed. To apply direct observation, it requires that the product is operational when in use. It is important to note that users being observed must be informed for ethical reasons [7]. During observation, notes will be taken on what the users are doing, what routines they have whilst using the product and how they are integrating it into their lives. In addition, naturalistic observation will be utilised meaning the user will be observed "in the wild" and it will be less structured. This approach is more reliable as it will be utilised in real life therefore, encountering both the frustrations and benefits of real-life use [8].

3.2.2. Interview

A flexible interview can be undertaken which allows the evaluator to gain an insight into the users view of a product at an earlier stage [9]. This is beneficial as if there are any errors they can be identified and fixed efficiently.

3.2.3. Benchmark Testing

Benchmark testing is collecting results that are quantifiable and repeatable, which products can be compared against. The purpose is to compare future system releases with their corresponding

benchmarks. Benchmark testing covers both the software and hardware testing. Benchmark tests are required to be repeatable (each iteration of a load test must have a stable response time against the varying load conditions) and quantifiable (time the user spends on a webpage as a result of a decent UI is quantifiable) [10].

3.2.4. Co-operative Evaluation

Co-operative evaluation is a usability testing method collecting both feedback about the UI design and interactions with the software. Co-operative evaluation is when the user is encouraged to be critical and ask questions whilst reviewing the task. As well as reflecting on any incidents and (potential) usability problems encountered. By gathering user design feedback observers see users as a source of knowledge and creativity [11]. This technique is used to improve UI specification via detecting potential usability issues in an earlier prototype or partial simulation.

3.3. Evaluation of AR Usability

AR (Augmented Reality) is a relatively new concept, therefore there is a limited amount of experience of evaluation design factors. Traditional design guidelines for AR/ digital placemaking exhibits cannot solely be relied upon for UI as they are different from the usual WIMP (window, icon, menu and pointing) based interfaces [12].

Swan and Gabbard believe AR user evaluations can be based on four categories:

- 1) Experiments relating to human perception and cognition studies alongside low-level tasks. These are based on objective measures such as how users perceive text in an outdoor environment [12].
- 2) User performance experiments which is based on the evaluation of spatial ability and if improvements can be made through training with regards to AR-based geometry application education [12].
- 3) Collaboration amongst users' experiments based on various interfaces which compare face-to-face collaboration with AR and projection displays.
- 4) Evaluations which focus on system design and usability. Hix et al provide a methodology of a set of usability evaluation techniques for AR systems as seen below (Figure 9)[12]:

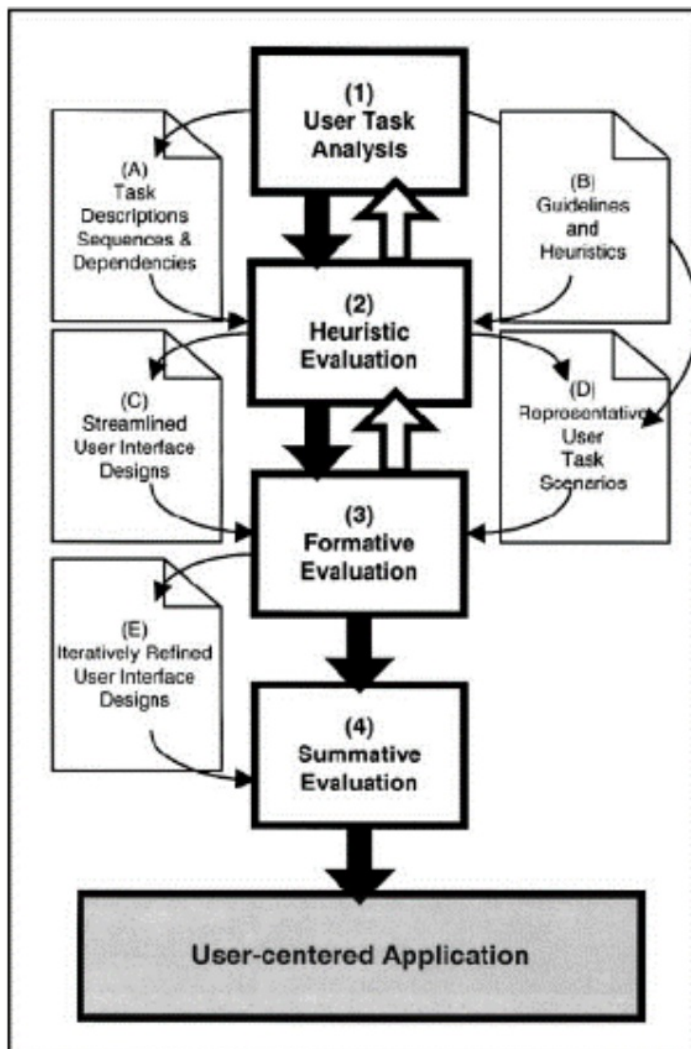


Figure 9: Hix et al usability evaluation techniques for AR systems

3.4. Evaluation Timeline

A project lifecycle will be implemented to undertake evaluation of exhibits. A project lifecycle consists of 4 stages outlined below:

- 1) Initiation phase which is the start of the project [13]
- 2) Planning phase where organisation and preparation are undertaken [13]
- 3) Execution phase where the project is developed [13]
- 4) Termination phase where closure of the project occurs. [13]

These phases and the cycle sequence can be seen below (Figure 10).

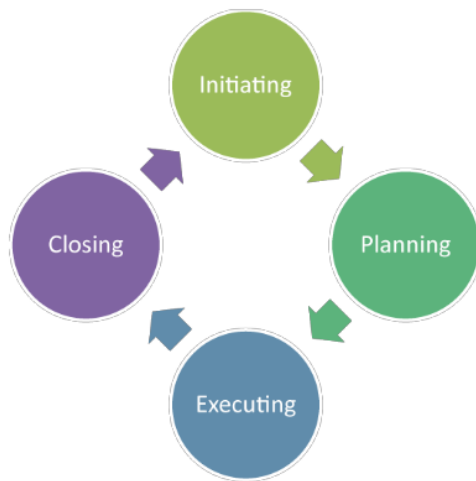


Figure 10: Project Lifecycle [14]

If the project lifecycle is applied as a method of an evaluation timeline for museum exhibits it will consist of the following phases:

- 1) **Observation** (users will be observed utilising the system in place)
- 2) **Interview** (interviewed about the current system in place and what they would like to see in the next system)
- 3) **Benchmark testing** (records how much time the user spends whilst using the system)
- 4) **Co-operative evaluation** (provide a feedback form for user to fill about the UI design and ask any questions with regards to the UI design and any additional feedback)

Therefore, the observation would be the start where an initial evaluation of the current systems in place is undertaken. An interview is conducted as part of the planning and preparation stage for requirements gathering. Benchmarking forms part of evaluating the users utilising the new system in place. Finally, for closure feedback is provided through co-operative evaluation. This can be seen in Figure 11 below.

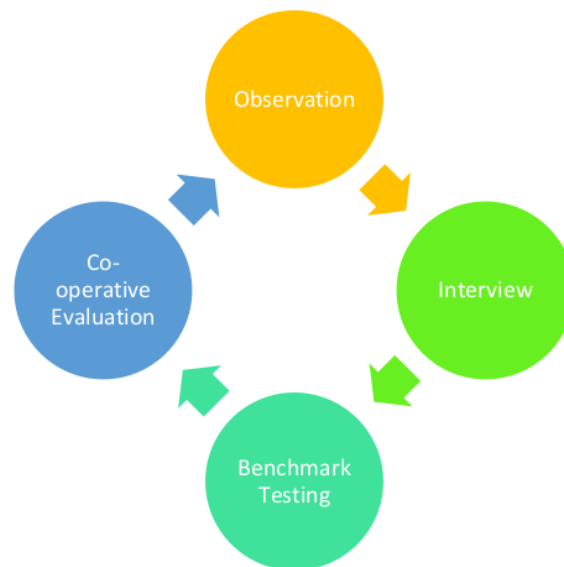
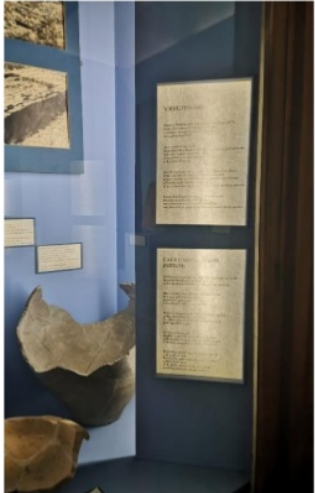
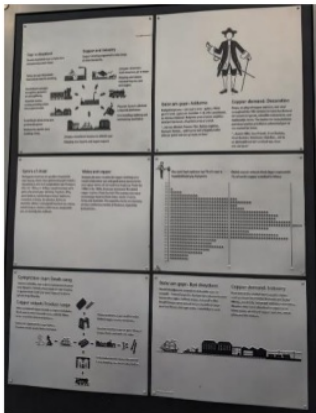


Figure 11: Evaluation timeline

4. Guidelines and Accessibility

4.1. Usability and Accessibility Guidelines

In the Museum Access Information, Guidelines by Vocal Eyes are implemented to improve how visitors access information at museums, especially for blind and partially sighted individuals. This is explored below using good and bad examples from the Swansea Museum's.

Guidelines (Vocal Eyes, 2016) [15]	Effective Examples	Ineffective Examples
Large Print such as Arial (font size 16+). This supports the partially sighted or blind as they can read large print. Large print also supports individuals with learning disabilities and dyslexia. Therefore, it is an important part of exhibits.	 Large text, well-spaced and uses different colouring to clearly distinguish between languages (Waterfront Museum).	 Small and faded blocks of text (Swansea Museum).
Braille is a vital element for blind individuals, and there are two types: - Grade 1 which is character by character translation, is readable by braille readers and can be applied to individual words such as tactile instructive signs. - Grade 2 which is quicker to read	 Braille text can be read by all users (Grade 1) (Wales' Copper Industry, Waterfront Museum).	 Large exhibit in written format only, no brail and no audio option. Only users with visual capabilities can use (Dylan Thomas Centre).

and is applied to longer texts.		
Tactile images are a way to convey non-textual information to individuals who are blind or partially sighted. These can include images of maps, graphs, pictures or diagrams. It enables an individual with visual impairment to feel the raised surfaces and lines. Tactile images should be accompanied by textual information in either braille, large print or audio.	 Clear symbol of a person speaking to indicate there an audio feature (metaphor). Accompanied by written instruction in both Welsh and English, as well as brail to indicate button for choosing preferred language (Waterfront museum).	 Display has audio options in English and Welsh but this is not advertised and would benefit from a tactile image to make this clear. Text provided is small and crowded.

Table 2: Usability and accessibility guidelines

As shown, accessibility and usability are done tremendously well in Swansea’s waterfront museum (See Figure 12 for further examples). A big investment has been put into accessibility such as multilingual voiceovers and British Sign Language captioning on its interactive content [15]. Digital features include touch screen workbenches, button activated displays and an interactive skyline of Swansea where a trackpad is used to examine ‘hotspots’. When locations are selected using the trackpad, further information is displayed. There is also a shopping game where users drag and drop historically important food items into their basket to learn more. Other exhibits have QR codes which can be scanned to access further information through a mobile phone or tablet device. Other museums could learn a lot from these features.

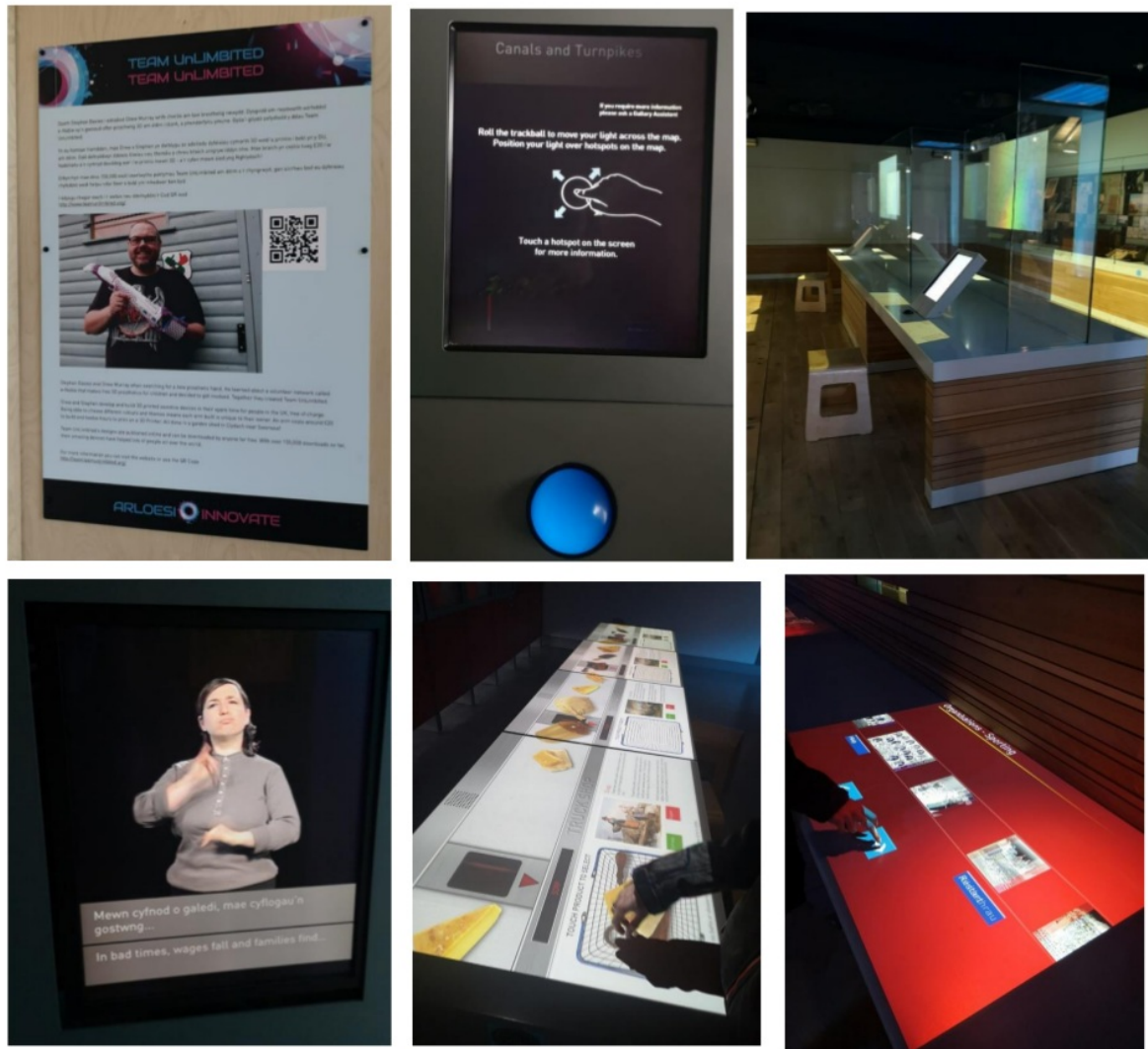
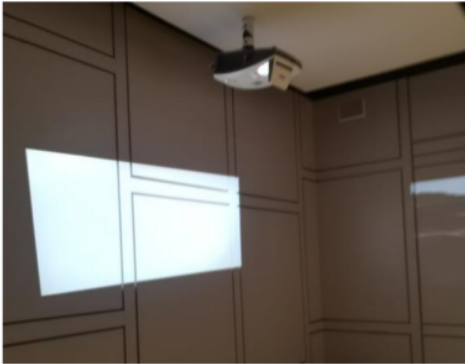


Figure 12: Examples of effective implementation of digitisation in the Waterfront Museum

Nielsen & Molich advise on the below UI design guidelines; their suitability for museum exhibits is explored below.

No.	Nielsen & Molich UI Design Guidelines	Applicable to Museum Exhibits?
1	Visibility of the system status so that user is aware of current system status [16].	Not generally applicable – Users left to assume system status i.e. if not working as expected, user will assume it is faulty (Figure 13). Status would be beneficial to avoid confusion.  Figure 13: Blank projection screen (Dylan Thomas Centre)
2	The system and real-world are required to match-up as well as mirror the language and concepts. Designers should mirror the language and concepts users encounter in their everyday lives users [16]	Applicable. Done effectively in Waterfront Museum through use of sound i.e. transport section contains engine and traffic sounds. Also, where actors portray people of the past in video exhibits, appropriate accents, language and costumes from that era are used. Users can better imagine being in the era in question.
3	User freedom and control i.e. implementing a back button and the ability to undo and redo previous actions [16]	Applicable. In interactive exhibit users have option to restart or go back to previous screen. It also provides the relevant information to guide on how to use the exhibit (Figure 14).

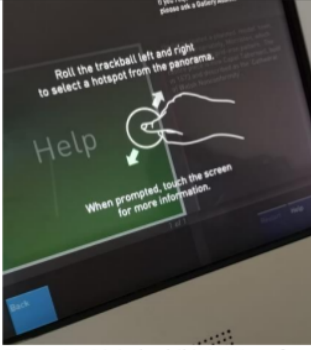
		 Figure 14: Digital exhibit in Waterfront Museum
4	Displaying task-relevant information as human attention span is capped to record 5 items in its short-term memory at a given time [16].	This can be applied in the interactive exhibits as seen in figure 12. The visitor is presented with instructions on how to use the exhibit then interacts with it with limited information.

Table 3: Nielsen & Molich Ui Design Guidelines

To conclude Nielsen & Molich UI design guidelines can be applied to museum exhibits and can be used as a guideline to improve general usability of exhibits in particular interactive ones.

4.2. Usability and Accessibility Guidelines for Museum Exhibits

After review existing guidelines and visiting museums across Swansea, the following is a tailored set of recommendations for ensuring accessibility of museum exhibits:

- Ensure content is accessible to various intellectual levels and is available on more than one sensory channel (i.e. another sensory system can be used aside from visual).
- Items in exhibitions are required to be visually accessible.
- Labels are required to be readable for all visitors and must be available in alternative formats such as audio and braille for those who are unable to read print.
- Enough lighting must be applied on objects and labels, so they are visible/readable for visitors.
- Controls to operate interactives are required to be accessible and usable to all visitors.
- Instructions on how to use interactives must be available and accessible to all visitors.
- Status of interactives to be made clear to avoid confusion; particularly if out of order.
- If colours are applied to labels it is required that they portray a high contrast between text and background.
- Any images are required to be large and clear, so they are legible for all visitors.
- Exhibits/interactions are not to be overcrowded with information and sufficient space between.
- Wherever possible, apply tactile images to exhibits to convey non-textual information.

The guidelines outlined above provide best-practice guidance for museums to ensure their exhibits are accessible for all.

4.3. Accessibility advice for Web Designers

Websites experience the outlined common barriers below in relation to web text accessibility. All of these principals can be applied to museum exhibits and would enhance their accessibility.

- **Text** being too small (an option to increase text size would be beneficial or magnify the entire page. Recommended text size is 16) [17]. Furthermore, Plain colour is required to be formatted to text and text should not be placed on top of images.
- **Low contrast** is advised to be applied to both the text and background with the option to alternate any background or font colours. It is preferable for those visually impaired to have yellow/white on black. should be applied between text and background. [17].
- **Text-as-image** requires the text to be live (rendered in HTML) to be screen read. [17].
- **Images** are required to be large and clear. Users who are visually impaired rely on text-to-speech software. The software uses alt attributes to replace images an example can be seen if an image is used for a car. The software will read it as “image of car” and expressed as alt = car. Alt text is advised to be kept short and concise (ideally under 8 words). It should not go into detail [17].
- **Icon graphics** are required to have an alt attributes such as ‘PDF File’ to signify if an attachment is next to a link. If there is multiple documents alternative text within the link is required to distinguish the specific document [17].
- **Graphs and infographics** are required to have an alt attribute for example “infographic displaying the increase in visitor numbers to museums” and data should be provided in a text format elsewhere [17].
- **Video** is required to be accompanied by Audio Description (AD), as it illustrates visual content for the partially sighted or blind so they can understand the exhibit. It is recommended that video is not the only medium for information to be conveyed and that a text description of the video is provided allowing for it to be read prior or after the video [17].

The guidelines provided above can be applied to museum interactive and pre-existing exhibits to improve accessibility to all.

5. Virtual and Augmented Reality

5.1. Virtual Reality (VR)

5.1.1 Background & Development

Sutherland defined VR as being a window where its users can see a virtual world through and act realistically [18]. In 1968, Ivan Sutherland alongside his student Bob Sproull, built the first head mounted display system - Virtual Reality (VR) and Augmented Reality (AR) at the University of Utah. The device was given the name the 'Sword of Damocles' due to its appearance, which was suspended from the ceiling due to its weight. The UI and realism system were ancient, and the graphics were wireframe rooms [19]. The HMD (Head Mounted Display) which allowed the user to be mobile whilst wearing the HMD despite being to a computer system that was reinforced by cables affixed to a metal stand [20].

Philco created the first HMD, which when combined with Sutherland's 'The Sword of Damocles', allowed for the virtual images to be updated through the positioning of the user's head and track their orientation [18].

VR since that time has gone through various definitions, Fuchs and Bishop in 1992 defined VR as "real-time interactive graphics with 3D models, combined with a display technology that gives the user the immersion in the model world and direct manipulation" [18].

5.1.2 System Features & Use

VR systems have three common features:

- 1) Immersion
- 2) Perception of being present within an environment
- 3) Interaction with said environment

VR has a key role in creating successful virtual experiences which can be recognized through input and output devices. Users can use input devices such as joysticks, keyboards or gloves (capturing finger movements or postures) to communicate with the virtual environment which can be via a joystick, keyboard or glove (capturing finger movements or postures). A joystick, mouse, trackball and keyboard allow so commands or movements can be launched to the environment. However, tracking devices allow for hand movements, gestures and postures to be captured and transfer the user's movements into the virtual environment. Users can touch, hear, smell and see through the use of output devices within the virtual environment. This would be through visual devices such as a monitor, HMD, helmets or VR glasses (systems). It can also include speakers or auditory which stimulate the body senses which in turn increases levels of real virtual experiences [18].

5.1.3 VR in Museums

The aim of a museum is to submerge users into different eras and different environments and VR is arguably the most effective way of achieving this. An example of this is in London's National History Museum whereby users are immersed into a 360 degree, 3D experience of the museum's collection of rare species using VR technology [21]. The user can handle and resize these as David Attenborough shares knowledge on the objects; his 3D hologram was produced using Microsoft's volumetric capture technology [22].

5.1.4 Constraints

However, utilising VR in museums is challenging for a number of reasons:

- Cost:
- Hygiene:
- Simulation Sickness:

5.2 Augmented Reality (AR)

5.2.1 Background & Development

AR consists of 4 systems: AR, augmented virtuality, real environment and virtual environment. AR has been described as a new technology system which contains virtual objects displayed within the real world in real-time throughout the user's experience [18].

5.2.2 System Features & Use

Requirements	Principles	Components
Combine real and virtual objects	Feeling present	Geospatial datum for virtual objects
Run interactively	Realism	A surface to project the virtual elements on
Both real and virtual objects required to register with one another	Reality	Processing power which is capable of animating and merging both images and graphics

Table 4: AR features and uses

The AR system is run through a camera and tracks user movements enabling the merge of virtual objects and visual display [18]. Currently there are 2 existing display systems:

- 1) VST (Video See-Through) where virtual objects are disclosed to the user by using a camera to capture of real objects and/or scenes which are overlaid to project them on a video/monitor [18].
- 2) OST (Optical See-Through) virtual objects are merged on a translucent surface [18].

The key difference between them is latency; an OST system can require additional time to project the virtual. This can affect the user's action, performance and detection of them [16].

5.2.3 AR in Museums

AR can be applied in museums to add further explanations to exhibits. It can add digitisation to pieces for example a digital version of an artist can be displayed next to their work providing narration. It can also bring the scene to life as it adds third dimension to exhibits [23].

An example of an AR implementation in museums can be seen in The Smithsonian Institution, Washington D.C. They introduced AR technology in 2017 using an app 'Skin and Bone'. The skeletons in the Bone Hall have been on exhibit since 1881. The 13 skeletons now feature in the app which reconstructs the creatures allowing the user to see how the skin and muscle looked like and how they moved. This in turn brings the display to life [23].

5.2.4 Constraints

AR is costly to implement and requires vast amounts of specialist equipment. AR also brings concerns around the idea of technology being isolating, as visitors become absorbed in a world on their phone/their own bubble. Furthermore, this technology could exclude the elder generations as they could struggle with understanding new technology and feel left out [23].

5.3 Comparison of VR and AR

Below is a table that sets out the main differences between VR and AR:

Virtual Reality (VR)	Augmented Reality (AR)
Artificial environment [24]	Virtual objects are overlaid in real-world environment [24]
Full immersion	Enhancement of real world with digital objects
Virtual environment generated by a computer [24]	Users interact merge both the real world and digital content an example being Pokemon Go [24]
Advanced VR can provide freedom of movement experiences [24]	AR headsets for example Google Glass (where a small screen is used to display the content in front of the user's eye) [24]
A VR headset such as (Oculus Rift) (PlayStation VR) for a gaming console requires the headset to be connected to a computer. Moreover, there are VR headsets like Google Daydream; where a smartphone is inserted into the headset [24]	

Table 5: Comparison of VR and AR

5.4 Proposed Digital Exhibit

5.4.1 Overview

The proposed AR exhibit is based on adding digitisation and modern technology to the existing display of a typical welsh kitchen in Swansea Museum. Currently this display is the centrepiece of the Oriel Hanes Room, showing a life-sized model of a welsh kitchen including the items which it would typically contain. Although it is impressive, there is little interaction and poor distribution of information on the display and its items. Once users have spent a minute looking over the items, there is little further to keep their attention and they move on without learning very much about the display.

5.4.2 Hardware & Software Requirements

The proposed AR exhibit would utilise the user's phone or tablet camera to explore the display as well as a museum app, which would need to be downloaded. Clear instructions would be provided in front of the display; a QR code could be included to provide a direct link to the app.

5.4.3 System Features & Use

As users move around and explore the display with the device, the kitchen comes 'alive' on screen. For example, bread is shown cooking in the oven, the candle is burning and steam is leaving the kettle as it boils. Accompanying these animations is text describing their significant during this era.

Users can also see the characters (currently plastic manikins) come to life and demonstrate how the kitchen was typically used. Users can use 'zoom' and 'click' actions to explore the display and gain knowledge.

5.4.4 Rationale

AR was selected over VR because of its more widespread accessibility; it only requires an app and a suitable device with a camera. Whereas VR would also require a headset and although cardboard 'build your own' headsets could be provided, this may also raise safety issues if multiple users are walking around the display with headsets restricting their vision of the outside world. AR is therefore available to more users and has less safety restrictions. It is also less costly for the museum to employ, as it only requires the development of a suitable application. This application can have customisable accessibility options including type of communication, language, etc.

5.4.5 Sketch



Figure 15: Sketch of proposed AR exhibit

6. Conclusion

To conclude, usability measures the levels of effectiveness, efficiency and user satisfaction which can be applied to museum exhibits. As demonstrated, technology can enhance the user's sensory involvement in the exhibits, improving their experience and promoting a better learning environment, which is essentially the aim of museums. Furthermore, through AR/VR museums can immerse users in a completely different world and era, bringing exhibits to life and further increasing interactivity.

Appropriately designed usability evaluation helps ensure requirements are met and detect any errors earlier on and rectify these. Evaluation methods such as interviews, observations or benchmark testing can be applied to gain user feedback and measure user interaction with the software. UI design guidelines can further support levels of usability and accessibility through its user interface design, ensuring that the user is aware if exhibits are not functioning, freedom of control, consideration of only displaying task-relevant information and use of appropriate language.

The type of digitisation utilised is dependent on the amount of funding; there are many low-cost, off the shelf options available. By applying usability and accessibility guidelines, this can help rule out if exhibits are effective or ineffective and can support further alternations to increase levels of usability and accessibility. Digitisation and technology can bring together the old and new as well as improving accessibility and usability to all.

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Museum Exhibits Final

GRADEMARK REPORT

FINAL GRADE

83/100

GENERAL COMMENTS

Instructor

A very thorough and well explained analysis of usability issues, especially given the changes and timescale. Excellent presentation to clearly communicate your

Usability Review of Two Exhibits

The comparison table is a good feature and includes plenty of appropriate theory with good referencing. The two exhibits are described engagingly and you took the opportunity to take many useful photos before the museums shut down. The moa example was explored with constructive suggestions. The goals of stakeholders are considered making this a very good and purposeful answer.

Usability Evaluation

A range of suitable methods is outlined here with good explanation and justification. A good source on VR/AR evaluation was identified, this could have been further applied to the museum exhibit context. An excellent, iterative exploration of timeline planning issues was well illustrated with examples.

Guidelines and Accessibility

Comprehensive use of examples and photos here and the table presentation works well to structure your points and highlights the coverage of your choice of points to present. Very good depth of analysis demonstrated and it was impressive that you moved quickly to identify those relevant examples and photograph them. You customised guidelines were a great feature, both for general usability and for accessibility.

Augmented and Virtual Reality

Excellent research into VR and AR with the practical considerations in context analysed effectively. A very effective design for an AR system to enhance a traditional display was presented.

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Comment 1

no comment

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