

Wanzi Su UE Assignment 2

by Wanzi Su

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Contents

0. Figures	1
1. Introduction	1
2. Usability Review	2
3. Interface Evaluation	7
4. Guidelines and Accessibility	9
5. Virtual and Augmented Reality	10
6. Conclusion	12
7. Reference	13

0. Figures

Figure 1 : the sketch of Robyn Goch	3
Figure 2 : the sketch of the room	5
Figure 3 : Virtual Reality for the room	11
Figure 4 : visitor using the VR device	12

1. Introduction

This essay is mainly to apply usability theory to the museum exhibits including some description, comparison, analysis, and design. The whole essay can be divided into four sections.

The first section is Usability Review. It contains the introduction and the comparison of the exhibits of the National Waterfront Museum and the Swansea Museum. Besides, it also mentioned how helpful to apply computer system usability guidelines to museum exhibits.

The second section is Interface Evaluation. It produces an evaluation timeline based on the waterfall project life cycle model. In the timeline, there are many interface evaluation methods including reference to demonstrate their importance.

The third section is Guidelines and Accessibility. It introduces and illustrates some usability and accessibility guidelines that are really helpful or not completely helpful for the museum exhibits.

The last section is Virtual and Augmented Reality. It provides three characteristics of Sutherland's vision and analyses to what extent do VR museum exhibits, AR museum exhibits, and digital placemaking museum exhibits meet these three characteristics. Then it describes a designed VR museum exhibit and Wizard Unite.

2. Usability Review

Here, the two museums to be compared and contrasted are the National Waterfront Museum and the Swansea Museum. They are not very far from each other. The National Waterfront Museum is considered to be the effective design while the Swansea Museum is good but it is not as effective as the National Waterfront Museum.

First, let's talk about the National Waterfront Museum. The National Waterfront Museum is the biggest museum in Swansea and it is also the city museum of Swansea. According to Scott Billings (2005), *part of the museum occupies the shell of the Grade II-listed warehouse that was formerly the Swansea Industrial and Maritime Museum. [1]* In addition to that, in a magazine about National Waterfront Museum, it wrote: *the lowdown The National Waterfront Museum provides a history of Wales' industrial and maritime history through a series of 15 themed exhibition areas. [2]*

On the ground floor, there is a café providing meals for visitors. In addition to that, many vehicles and machines are displayed in a separate hall on the ground floor. An old locomotive, which is a replica locomotive according to the museum website, and a monoplane called the Robyn Goch are very impressive. As we can see in figure 1, this is a rough sketch of Robyn Goch and its colour is red. These things show us some examples of Welsh industry history and explain to us how Wales has upgraded to one of the most advanced in the world at the time since the Industrial Revolution.

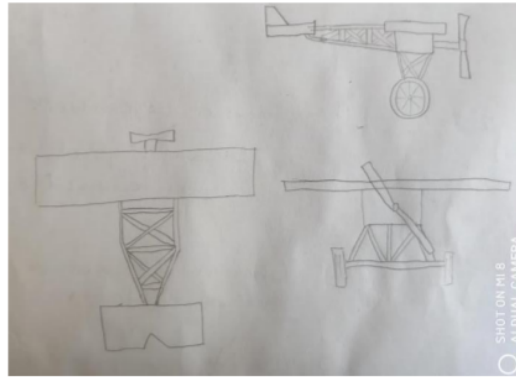


Figure 1: the sketch of Robyn Goch

It is very worth to mention that there are several interactive designs in the National Waterfront Museum. For example, there is a virtual photo album and if you to wave your hand, the sensor would respond to hand gestures and the virtual photo album would turn the pages. Or if you touch the screen, it would show details of the current photo like its story. There are also some interactive workstations, which allows you to manipulate a sphere to move the map and check the information of some spots in the map. Those interactive technologies are not always working. Sometimes the sensor of the virtual photo album would not respond to it even though you wave your hand back and forth many times. Moreover, the interactive workstation on the first floor is completely broken and it is just a presentation of the Swansea digital street maps there. In addition to that, some traditional interactive designs are also available like some buttons, a peephole, or a crank. Those interactive designs make the visitors more involved in the journey because if they are just walking and watching, they will easily get bored.

The first floor has many interesting things. There is a long gallery presenting the stories of many famous people in Swansea. However, those introductions are just literature, photos, or portrait and there is no real heritage of those famous people presenting so this might not be very engaging for the visitors. Across the long gallery is the exhibition of many collections in a great hall. Some of the collections are real heritage and some of them are just models like some boat models or ship models. Another thing to mention is that there is a cubicle and inside the cubicle, there are many collections about the Swansea soccer ball team or other aspects. A screen would play a video introducing the exhibits and the video contains a sign language interpretation. This is really a good accessibility design for disabled people. The exhibits in this zone are more about humanity, the culture, and the society instead of the industry, which shows the way that Welsh people used to live from period to period.

On the first floor of the hall where the vehicles and machines are displayed, there are some projection rooms and films which talk about some industry history of Swansea are projected on the wall of the projection rooms. The visitors can sit on the seat in the room and watch those interesting films. These

films are stating how the industrialisation influenced the life of Welsh people including how they lived, how they worked, and how they travelled.

One thing that is a little bit confusing is the introduction board of the vehicle exhibition on the ground floor. The words are bulging out from the surface of the board but they are not in braille. It is unknown whether this is just for visual effects or other purposes. There are some toys on the ground floor for children, which contain pictures of the exhibits in the museum or other scientific knowledge.

Next, we should know about the other museum: Swansea Museum. Swansea Museum is the oldest museum not only in Swansea but also in Wales and it was completed in 1841. There is little information about this museum in other literature so we can only see the introduction from its website, which wrote: *Swansea Museum is the oldest museum in Wales, and a fascinating treasure house of Swansea's past history. The collections contain all kinds of objects from the past of Swansea, Wales and the rest of the world. [3]*

On the first floor, there is an individual room presenting the Egyptian mummy called Hor and many other collections from the primitive time. One thing to mention is that the mummy is laid in the showcase and some videos about the mummy as well as the primitive time are projected on the wall facing the door. Those collections are telling us what they are and why primitive people would create them. According to the website of Swansea Museum, *from the internationally important Gower bone-caves, for example the Paviland caves (the earliest scientifically excavated cave site in Britain), to Bronze Age burial sites, Iron Age hillforts, and Medieval buildings that remain at the heart of the city. Each site has been discovered and carefully excavated, the finds recorded and interpreted to reveal an astonishing human history of man's cultural evolution in south-west Wales. [4]*

In other rooms, many objects that can date back to the wartime of Swansea are displayed. Interestingly, the exhibits are not the guns, the armours, or the swords, which would ordinarily be used to represent war and show the heroism of the soldiers. Instead, they are some articles for daily use, several wartime posters, and the food, which shows the hard daily life of people during the war. Therefore, the meaning behind this is to see the war from the perspective of the civilians instead of the army or the nation. War would only make the civilians suffer no matter this war wins or loses, is heroic or not. There is a famous saying in China: "Prosperity suffers the common people. Fall suffers the common people." Besides, there are some cartoon characters like a mouse so that the children can understand a little bit even though they do not know the true face of the war.

On the ground floor, there is an art gallery that displays many paintings, the photography and portraits. The most interesting part is the exhibition called “50 years of Music”, which collects flyers, magazines, artefacts, photos, film or memorabilia. They are giving us a chance to know the creativity of the human and experience what people felt in the past time. Among them, the most impressive exhibit is a room that presents exactly what a room looked like decades ago. As is shown in figure 2, there is a radio with a long antenna on the round table, a sofa, and some classic posters on the wall. It really gives people some characteristics of the time just like a black and white movie.



Figure 2: the sketch of the room

There are several reasons why the National Waterfront Museum is considered to be an effective design and the Swansea Museum is less effective. The first reason is that the Swansea Museum does not have an audio interpretation. When blind people come to the Swansea Museum, they would not know what the exhibit is unless there is someone explaining to them. In addition to that, nearly all the exhibits are not interactive. The visitors can only look at them in the showcase and it would inevitably cause aesthetic fatigue. This view is supported by Zhe li et al. (2018), who wrote: *aesthetic fatigue is never evitable while contenting visitors with visual enjoyment and aesthetic experience.* [5] On the other side, the National Waterfront Museum has all the three human factors: the human vision, the human hearing and the human touch. For instance, there is vision guidance, which is sign language interpretation. Therefore, deaf people can also understand the content of the video. There are also some videos, which cover both vision and hearing. Some of the exhibits allow the visitors to touch like the locomotive and some are even interactive like the virtual photo album that is mentioned above. Besides, many of the exhibits have braille. This is the biggest reason why the National Waterfront Museum is more effective than the Swansea Museum.

The second reason is that the National Waterfront Museum has better affordance than Swansea Museum. The whole building of Swansea Museum is very small, which makes its rooms and the corridors pretty narrow. For example, the room with the Egyptian mummy is really small and it only allows one or two people to walk at the same time, which means the wheelchair would be very difficult to move in this room. This happens in a lot of the rooms and the corridors. Therefore, even though the Swansea Museum has disabled parking spaces, a lift, some signs for the disabled people, it is still not the best choice for them. At the same time, the National Waterfront Museum is much bigger and it also has many lifts. Even though the café takes the best place in the museum, it is still better than the Swansea Museum. Besides, the National Waterfront Museum is famous for its interactive technology. According to Cho et al. (2020), *in the seven design principles of the affordance from Norman, it is suggested that feedback should be provided so that users can recognize the progress and results of work.* [6] The exhibition cannot provide any feedback but the interactive designs can. This also adds more affordance to the National Waterfront Museum, which beats the Swansea Museum.

The third reason is that the metaphor of the National Waterfront Museum is better than the Swansea Museum. The Swansea Museum indeed has some good metaphor like the cartoon mouse character or the room that has the characteristics of the time. However, the National Waterfront Museum performs even better. The virtual photo album is an excellent metaphor. Anyone uses it would know the way to interact with it since it looks the same as an album even though it sometimes would not work. The crank is also a nice metaphor. It would drive the whole machine and the visitors can see the huge gear was driven by the crank. This indicates how the steam engine drives the machine. Therefore, both museums are great but the National Waterfront Museum wins a little.

During the visit to those two museums, one thing is not very friendly to disabled people is that they both have long stairs. However, after browsing the website of these two museums, we could find that they both have one or more lifts, which makes up for the inaccessibility.

Overall, the suggestion to the Swansea Museum is that it can add some audio interpretation for the exhibits, which is a benefit for blind people. In addition to that, the Swansea Museum can also rearrange the placement of the exhibits to make them less crowded.

On the other side, the National Waterfront Museum also needs to consider the location of the café. It takes the best place of the National Waterfront Museum on the ground floor. This would certainly attract many visitors and increase the income of the café while this would also make many excellent exhibits have to stay in a rather awkward position. The suggestion to the National Waterfront Museum is to come up with a better plan to balance the importance of the income and the accessibility.

Although the general computer system and the web resource are very different from the museum exhibits, it is still helpful in some aspects. The computer system is interactive but most of the museum exhibits are not interactive. However, they both provide visual feedback and some exhibits provide audio feedback like a computer system so we can apply human vision or hearing usability to the museum exhibits. Museum exhibits are real objects so we sometimes need to consider touch usability, which does not exist in a computer system. This also allows some interactive exhibits to provide all vision, hearing and tactile feedback. For example, the painting exhibits can only apply vision usability like the light effects unless it is with audio interpretation where the hearing usability can be applied. The interactive workstation can fully apply the computer system usability because it is a basic computer while the machine with the crank cannot apply computer system usability because it provides tactile feedback. In short, the computer system usability can be helpful in the vision and hearing aspects but not the touch aspect.

Metaphor is very helpful for both the computer system and museum exhibits. Usually, the museum exhibits are something that we would not see in daily life otherwise they do not worth to be displayed. This also causes one problem that sometimes we do not know what this thing can do. Metaphor is a very good way to make us understand. Malinski and V. M. (2009) did a research of the metaphor contribution in nursing, which points out: *Metaphors can serve as symbolic shorthand for understanding and communicating.* [7] For instance, the cartoon mouse character is a useful metaphor used in the museum. It can help children to partly understand the wartime.

Affordance of the museum exhibits is more comprehensive than the computer system because you have to allow visitors to move around in the museum, which would not happen for a computer system. This means you have to consider not only blind and deaf people but also those who have difficulty in moving. That is why both museums have lifts.

In conclusion, the usability guidelines applied to the general computer system are helpful in some parts of the museum exhibits but they cannot cover all.

3. Interface Evaluation

Those interactive exhibits in the National Waterfront Museum are very appropriate to be evaluated because they are using new interactive technology and they are not perfect. In this section, some recommended interface evaluation strategy would be provided for them.

The interface evaluation process should be designed following the project life cycle. Here, Medvedska, O., and Berzisa, S. (2015) provided a good project life cycle model: *The classical waterfall model divides the SDPL into such phases: (1) feasibility study; (2) requirements analysis; (3) design; (4) development; (5) testing; (6) deployment and maintenance (number and names of phases may vary).* [8] Therefore, we can produce the evaluation timeline according to the waterfall model.

Feasibility study phase should use simulation study method first. Experts simulate all the expected function and solve most of the problems before the workstations put in to use. Besides, augment reality exhibits should also be evaluated by simulation. Then the next method is the user interviews method. The visitors are interviewed when they are walking out of the museum because they can still remember whether these interactive workstations are working as expected. Observation is not used because the observation may have some bad influence on the visitors' experience. This view is supported by Cacciattolo, Karen. (2015), who wrote: *the conduct of the researcher may change the track of actions and behaviour of the individuals being studied, which leads to the issue of intrusiveness.* [9] The reason why survey is not used is that we do not need so much feedback from the visitors and the survey would be easily be ignored, which might be remembered when they almost forget the visit. Sean proposed a concept called survey fatigue, which says: *Survey fatigue is one of the latest issues marketers and researches face. This is particularly because everyone is jumping on the survey bandwagon; feedback tools have garnered a general negative perception due to how excessively prevalent they are in everyday life. Everything from websites to grocery receipts has them incorporated to their systems. Generally, it has become boring, tiresome, and uninteresting to people.* [10]

In the requirements analysis phase, we should use the usability survey method. This is the phase that a lot of qualitative data is needed. The visitors may not very sure about what their requirements are because they just watch what you showed. Therefore, the questionnaire should explain the reasons to the visitors and give options to them. Unlike interviews, the survey gives visitors enough time to think about the questions, which allows them to specify the requirements. According to Anaise Irvine (2018), *the questions of the survey are often many, simple / short-answer, multiple-choice, scaled, or free-text and the survey is good for capturing simple information in numerical or short-text form as well as to bulk-process online surveys and collate results.* [11]

Design phase would use structured expert review method. After the requirements analysis, it is very significant to build a good structure and get rid of those unnecessary requirements. There is a web resource that explained what is an expert review: *The review is carried out by a small group of usability experts (between 1 and 4), who analyse the product or service to identify any potential usability issues.* [12] Here the requirements are analysed instead of the product or service.

Alternatives to images method can be used in the development phase. The interactive workstation should have something more than just a digit map. It is necessary to create some subtitles or labels not only for a

brief explanation but also for deaf people. In addition to that, responsiveness is a method to be used in this phase. The visitors would not want to waste time waiting for the response so it would provide a better experience for visitors. Development phase also needs multithreading method because the workstation allows many people to operate at the same time and a single thread cannot handle this work.

Testing phase should include cooperative evaluation method. The museum exhibits including the augmented reality exhibits in the future are mainly for the visitors so visitors' opinion is really important. However, visitors all have their own thoughts. One problem is solved and another problem occurs. The best solution is to select some typical visitors and evaluators work together with them to provide a satisfying result. Carl-Martin Hellberg (2006) provided the benefits of cooperative evaluation during the testing: *the users and the evaluator will have an open dialogue about the flaws and problems found during the test. This is necessary to avoid that shy users only agrees to everything and accepts all the flaws, thinking it is them doing something wrong.* [13]

Deployment and maintenance phase would use ethnographic evaluation method. Since the new workstation is deployed, the evaluator can get a lot of data when they are experiencing the same thing as the visitors. Then more evaluation can be made. Here, Brandon W. Youker (2005) gave an in-depth explanation: *Other strengths of implementing ethnographic methods in evaluation are exemplified in connecting quantitative data to observed actual outcomes; the flexibility of design; the 'thick description' of program impacts; the clarification of processes; the study of participation; and the identification of unintended positive and negative side effects.* [14]

4. Guidelines and Accessibility

As is discussed above, there are many exhibits that can be considered as examples applied to the usability and accessibility guidelines. This section would give an extension analysis.

On the one hand, Alan Dix (2017) provided an interesting guideline Encourage Sharing, which is useful for the museum exhibits. The museum exhibits should encourage the visitors to share the photos and the feelings about the exhibits. This is a really good way to attract more visitors because it is a free advertisement. Even if it is something bad about the museum, the museum can learn from it and make some improvement to prevent a similar case.

In the interface design guidelines of Molich and Nielson, there is one guideline that is to speak the user's language. This is really significant for museum exhibits. For example, the text description of the exhibits

in the National Waterfront Museum is in both English and Welsh. Museums should consider more for the local people than the website does.

On the other hand, Alan Dix (2017) also mentioned some guidelines like Plugability and Configuration, which would not work for the museum exhibits. Even though some museum exhibits allow visitors to interact with them, they cannot be modified. They are already set to show specific contents like the digit map of Swansea.

As is mentioned above, the recommendations for accessibility for the Swansea Museum are adding some audio interpretation for blind people and rearranging the placement of the exhibits for movement disabled people. For the National Waterfront Museum, the recommendation is to move the café to some less important location and use the best place on the ground floor to display some valuable exhibits. In addition to that, the National Waterfront Museum should fix the broken interactive workstation and check the sensor of the virtual photo album.

Moreover, on the W3C Web Accessibility Initiative website, we could find many helpful accessibility guidelines that can be applied to the museum exhibits. Navigable is a good accessibility guideline both for online exhibits and those visited in person. On the website, visitors need to know where they are or which section they are in and how to go back to the homepage. During the journey, the visitors also need to know the topic of the exhibits in this room. Sometimes they need to go to the toilet and this is when the navigation is really important.

The accessibility guideline Input Modalities is a one that needs to be discussed. It is helpful for online museums but not so helpful for real museums. For instance, the interactive workstation has an input which is the sphere but most of the exhibits do not have input. As a result, the workstation can apply this accessibility guideline while other exhibits cannot, which means the accessibility of people with physical disability should be considered in the workstation.

5. Virtual and Augmented Reality

This section is based on the three characteristics of Sutherland's vision, which are the immersion, the interaction, and the real time.

Virtual Reality museum exhibits would also have these three characteristics. The visitors should feel that they are in a virtual space instead of the museum and they are allowed to move a little bit in the specific area. They should be able to touch and manipulate the virtual exhibits that are not supposed to touch. The virtual exhibits would bend or break as the immediate response to their action.

Augmented Reality museum exhibits do not fit these three characteristics so much. The visitors would still feel to be in the museum and they cannot move in the 3D space but they can manipulate the virtual exhibits. The virtual exhibits would also respond immediately.

The Sutherland's vision does not completely work for digital placemaking museum exhibits. The visitors can see their characters in a virtual 3D space but they would not feel the same as the characters. They can control the characters to move in the 3D space and maybe manipulate the virtual exhibits. The response is as quick as the VR and AR.



Figure 3: Virtual Reality for the room

Figure 3 is a rough sketch of the VR exhibit designed for the room in Swansea Museum that gives people some characteristics of the time. The visitors can do anything they want in this room. For example, they can turn on the radio, switch the channel, or open the window. It gives visitors a real experience of the past time. They can also throw the radio out of the window, push over the table, or tear off the poster as long as they want. This is the software side.



Figure 4: visitor using the VR device

Figure 4 is what the visitors would look like wearing the VR device. The hardware contains two VR handles and a VR headset. The visitors can see the virtual space on the screen of the headset and use handles to interact.

The Wizard Unite is a digital placemaking design and it can show the character in a virtual 3D local map, allow the users to control the character to move in the map or interact with some monsters. This means it still does only meet the interaction and the real time characteristics in the original vision of Sutherland just like other digital placemaking design. It is very different from the VR exhibit above so it is not very useful for the exhibit design.

6. Conclusion

In section 2, I introduced the exhibits of the National Waterfront Museum and the Swansea Museum. Then I compared and contrasted them to show which one is more effective. Next, I illustrated that the usability guidelines applied to the general computer system are partly helpful for the museum exhibits but they cannot cover all.

In section 3, I designed an evaluation timeline for the interactive designs of the National Waterfront Museum using many interface evaluation methods like simulation study and usability survey.

In section 4, I described some usability and accessibility guidelines that can be applied to the museum exhibits. Some of them are helpful but others cannot work for museum exhibits.

In section 5, I discussed to what extent do VR museum exhibits, AR museum exhibits, and digital placemaking museum exhibits meet the original vision of Sutherland. Then I designed a VR museum exhibit and talked about Wizard Unite.

7. Reference

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Wanzi Su UE Assignment 2

GRADEMARK REPORT

FINAL GRADE

60/100

GENERAL COMMENTS

Instructor

You have responded well in completing this in difficult circumstances. It's obvious that you have made good use of time before lockdown to visit the museums and give a thoughtful analysis

Usability Review of Two Exhibits

You have opted to conduct a comparison of two museum rather and bring out some individual features. While it is fascinating to read about the impressions of a guest to Wales, it would have been an improvement to focus more on usability topics. The hand drawn sketches are a very good feature. It's very interesting to read the viewpoint of Chinese researchers, this is a good feature giving a fascinating cultural insight.

Usability Evaluation

A range of suitable evaluation techniques is presented and the timeline is explained. An improvement would have been to sketch the recommended timeline. Good research and use of appropriate quotes to illustrate your arguments.

Guidelines and Accessibility

Again you have widened the scope of your discussion as physical access to the buildings was not in your remit. However good general points are made about in your analysis of the usability of the museum spaces and there is some useful discussion on relevant accessibility issues. You have demonstrated that you've thought carefully about the differences between the Web and museum context and understand the difference well. An improvement would have been to further explore this topic with new guidelines.

Augmented and Virtual Reality

Good understanding of Sutherland's vision for VR systems and a useful brief explanation of the application to museum systems and briefly analysed with respect to digital placemaking so have covered the

question set, with more in depth explanation a possible improvement. The sketches of enhanced exhibit are a great feature.

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13
