



PRIFYSGOL CYMRU

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UNIVERSITY OF WALES

Trinity Saint David

Examination Answer Book

24 Pages

Instructions to candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right and seal to hide your name.
3. The answers must be **legibly** written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
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1	Student Number	182500
2	Title of Examination Paper	Usability Engineering
3	Module Code	M3X8648
4	Date and Time of Examination	1:30 May 2018
5	Examination Venue	Gym
6	Seat Number	4A

7	Number of Answer Books handed in	
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List the numbers of the questions you have attempted	Office Use
1A	21
1B	12
2A	22
2B	12
3A	20
3B	12
1A	21
1B	13
2A	23
2B	12
3A	20
3B	13
Total	99

66%

102
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Complete section, remove strip, fold as indicated and SEAL

Please complete this section and SEAL before the examination starts.

(Block Capitals) Forename(s)

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Question 1

a) After the completion of a successful visit to the National Waterfront Museum in Swansea, I selected two interactive displays in which I am going to further analyse. The displays that I selected were chosen based off their effectiveness.

One of the displays being effective and the other being less effective. The first interactive display that was selected was the less effective display. This display (as shown in Figure 1, on following pages) is an interactive map of the Swansea area.

This display was controlled using a track ball, which was located on the individual booths.

When the user interacted with the track ball, it would move a highlighted cursor on the projected screen in front of them. Depending on where the cursor was placed on the map, the relevant information about that position will be displayed on the screen within their booth.

Looking at the human factors that were applied to this ~~dis~~ display, there was not a considerable amount present. With regards to the human

touch, the only interaction the user had was with the trackball, and with this object there was no feedback present on whether something had been selected. Also, there was no sound present within this display, meaning that the information was only available by reading the text. As there were two displays present within the display, it was difficult to distinguish.

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Description

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what screen you should be looking at. Relating to the complexity of the display, it was very basic and it did not include the use of any relevant metaphors. After reviewing the use of affordance within the display, it was clear that when a selection was made on the large projection, the corresponding information will be displayed.

The second display that was selected, was seen as the more effective one. This display (as seen in Figure 2) was a projection of an application on a blank table. To interact with this display, the user would just simply press the 'buttons' on the projected application, with their fingers and it would be recognised as a physical click. This is done with the calibration of a sensor, relating to the projection on the table. This application provided information on different objects that were used previously in industry, and when the user 'clicked' on an item it would provide an audio description of the item, along with a set of visual text. Comparing these two present Human Factors with those of the less effective design, it is clear to see that there is a lot more interaction with the effective design. The advantage of applying sound to the display gives a more diverse element, meaning that it is accessible by more users, providing a meaningful asset. Looking at the affordance of the effective design, it automatically assumes that you know how to use the display, because it is similar to that what they use everyday on their computers.

and smartphones. Comparing the affordance with the less effective design, it is clear that more thought and time had been put into the effective display. As for metaphors, the buttons on the display for navigation were ">>" for forward, and "<<" for backward, and also these buttons were shaded with colour to look as if they had some relevant depth, to represent a physical button. Overall, after the comparison of the two interactive displays, it is clear to see the importance of when Human Factors are applied, and how it makes the user experience more appreciated.

b) Looking into more depth of the less effective interactive display, there are several recommendations that could be applied. It must be stated that the relevance of the application of Human Factors into a design is essential, and these can especially be extracted from the areas of current computer system. The first recommendation that I would make, is to include some sound to the display. It doesn't necessarily have to be an audio description of the text, but it can be some feedback, such as an 'advancing' or 'error' sound when the users are interacting. The second recommendation that I would make is to investigate into more detail the use of visual perception. For an interactive display, the hardest part of abstraction is deciding what is important. To ensure that this is applied correctly, then I believe that ~~one of the displays~~^{monitor} in the path of the user can be removed, one that the relevant information can be displayed on the projected screen. The final recommendation that

I would propose is to include the use of metaphors. ~~Metaphors~~ Major technology companies such as Apple, Microsoft and Google that are currently driven by daily users, encourage developers and designers to use metaphors in their designs, but they also tend to design sometimes around them which will draw their attention towards their target audience. A good way to take advantage of peoples knowledge of the world is to use metaphors to convey objects and actions within a design.

Question 2

a) The interface evaluation strategy that I would propose for the interactive exhibits at the Waterfront Museum, would be Heuristic Evaluation. The evaluation strategy was first adopted by Jakob Nielsen. Heuristic evaluation is a usability engineering method for finding the usability problems in a user interface design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognised usability principles. Nielsen proposed a list of ten heuristics that were identified to be used as a set of criteria when evaluating a design. These heuristics are as followed:

- Visibility of system status
 - The system should always keep the users informed about what is going on, appropriate feedback with reasonable time.
- Match between system and the real world.
 - The system should speak the user's language with words, phrases and concepts familiar to the user.
- User Control and Freedom
 - Users often choose system functions by mistake, and exits should be clearly marked.
- Consistency and Standards.
 - Users should not have to worry about different words, and actions mean the same thing.
- Error Prevention
 - Good error messages should be present.

- Recognition rather than recall
 - Minimise the users memory load by making objects, actions and options visible.
- Flexibility and Efficiency
- Aesthetic and Minimalist Design
- Help users recognise, diagnose and recover from errors
- Help and Documentation

In general, heuristic evaluation is difficult for a single individual to do because one person will never be able to find all the usability problems in an interface. Luckily, experience from many different projects has shown that different people find different usability problems. Therefore, it is possible to improve the effectiveness of the method significantly by involving multiple evaluators. Heuristic evaluation is performed by having each individual evaluator inspect the interface alone. Only after all evaluations have been completed are the evaluators allowed to communicate and have their findings aggregated. This procedure is important in order to follow independent and unbiased evaluations from each evaluator.

b) The evaluation strategy that I would propose for an augmented reality application running on visitors' phones to enable them to interact with museum exhibits, would be a Cognitive Walkthrough. The cognitive walkthrough is a usability evaluation method in which one or more evaluators work through a series of tasks and ask a set of questions from the perspective of the user. The focus of the cognitive walkthrough is on understanding the system's learnability for new or infrequent users. The cognitive walkthrough was originally designed by Polson et al, as a tool to evaluate work and use systems. A cognitive walkthrough begins by defining the tasks that the user would be expected to carry out. It is these tasks that the cognitive walkthrough will examine for usability.

Polson et al offered four questions to be used by an assessor during a cognitive walkthrough:

- Will the user try and achieve the right outcome?
- Will the user notice the correct action is available to them.
- Will the user associate the correct ^{action} ~~action~~ with the outcome they expect to achieve?
- If the correct action is performed, will the user see that progress is being made?

Question 3

- a) In order for new members at the Waterfront Museum to learn about science and technology, an Virtual Reality and an Augmented Reality ^{exhibit.} ~~system~~ will be proposed.

~~A Virtual~~ ~~Augmented~~ Reality (AR) ~~X~~ VR

The ~~VR~~ exhibit will attempt to put the user within a virtual world where they can experience what technology was used within mines, during the industrial Revolution.

It will allow them to navigate through the mines, and interact with different ~~tools~~ + people, to gain a better understanding.

The proposed exhibit (Figure 3) will use a present piece of hardware called an 'Oculus Rift'.

This piece of hardware is worn on the users head, and it ~~allows~~ ^{also} comes equipt with 2 controllers which are held within their users hand. The headset will display the interpretation of the mining shaft, and will move accurately to the users ~~action~~. If the user wants to interact within the virtual world, then they must use the provided controllers. As of the hardware that is being used, the appropriate software would have to be run through a computer application. This exhibit will need a spacious room, supply the user with as much freedom as possible. The application of usability will be applied as it will provide ~~feedback~~ for vision, hearing and touch.

The effectiveness of the ~~AR~~[✓] exhibit will fully immerse the users into a virtual coal mine, and this will provide them with more meaningful information, and also a memorable experience. ✓

Augmented Reality. (AR) ✓

The AR exhibit will try to attempt to inform the users on the scale of the tools and vehicles used within the industrial revolution. The hardware needed to complete this application is going to be completed via a smartphone; and also the software that is going to be used is a AR mobile application. This application will take what's in the view of the user's camera, and apply an augmented layer of visual information. For example, if the user uses the application outside the mine then they would be able to compare the size difference with a previous mineshaft. The usability theory applied to this exhibit would provide audio feedback, and also a visual representation, although no physical touch will be present. ✓

b) Within 1965 Ivan Sutherland engineered a new type of display, the VR and AR mounted headset known as 'The Sward of Damocles'. This unit was awkward, and ~~extremely~~ heavy, but it included binocular display, head tracking, making it one of the earliest descendants of a Head Mounted Display. Sutherland vision at the time was "Don't think of that thing as a screen, think of it as a window, a window through which one looks into a virtual world. The challenge to computer graphics is to make that virtual world look real, sound real more and respond to interaction in real time, and even feel real." In Modern technology word, VR is a fully immersive computer simulated environment that gives the user feeling of being within that environment instead of the one they are actually in. In order for your brain to perceive a virtual environment there are a few key factors that are vital to the creation of an immersive experience. Augmented Reality is a technology that layers computer generated graphics on top of an existing reality in order to make it more meaningful through the ability to interact with it. ✓

Augmented and virtual realities both leverage some of the same technology, and the each exist to serve user with an enhanced or enriched experience. Both technologies enable experiences that are becoming more commonly expected and sought after for entertaining purposes.

While in the past they seemed merely a fragment of a science fiction imagination. Additionally, both virtual and augmented realities have great potential in changing the landscape of learning fields, and this is why the proposed exhibits are appropriate for the museum.

Figure 1

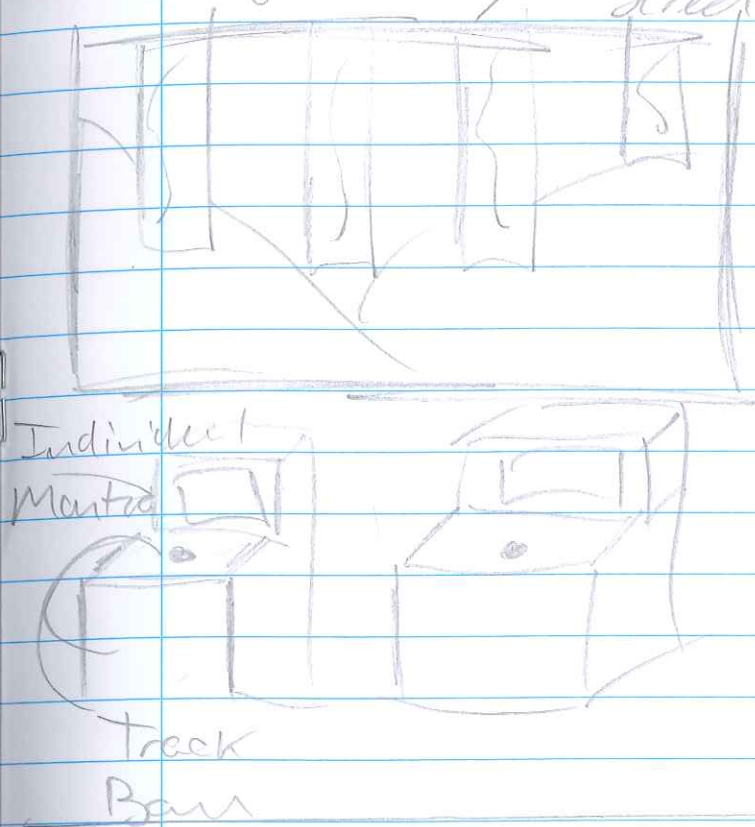


Figure 2

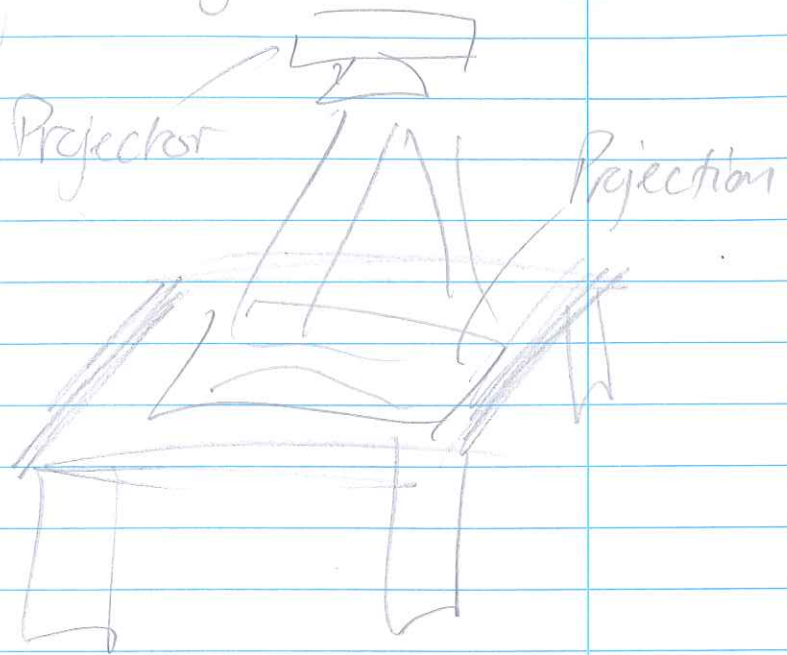


Figure 3

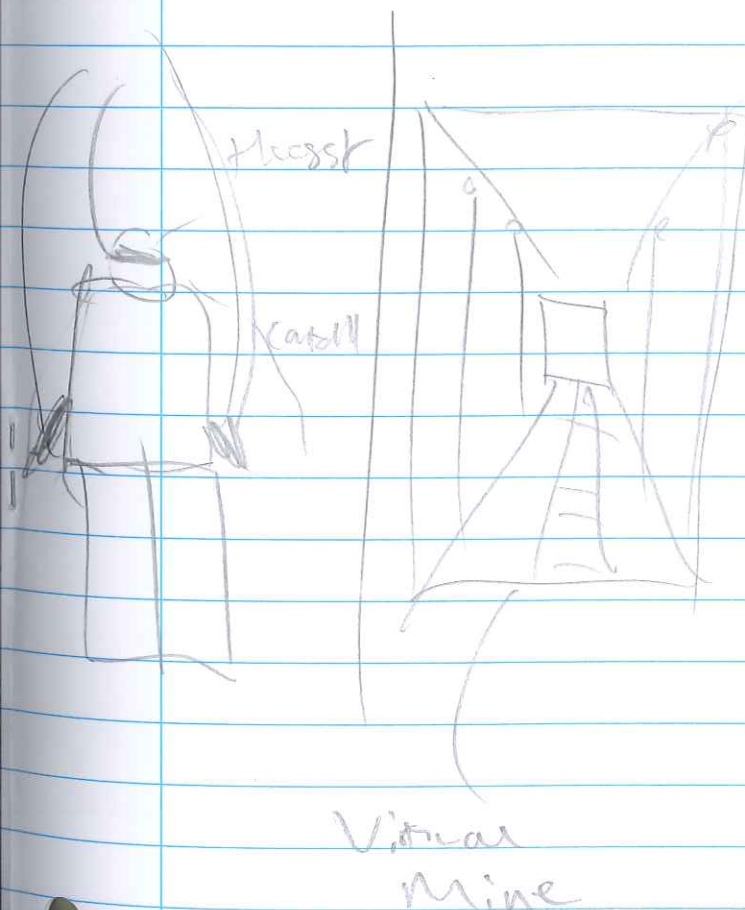


Figure 4

