



PRIFYSGOL CYMRU
Y Drindod Dewi Sant
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).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

Jonathan Thomas

1	Student Number	241978
2	Title of Examination Paper	Usability Engineering
3	Module Code	M3X8648
4	Date and Time of Examination	8th May 13:30
5	Examination Venue	Gym (NPTC)
6	Seat Number	10A

7	Number of Answer Books handed in	1
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List the numbers of the questions you have attempted	Office Use
1A	22
1B	14
2A	17
2B	10
3A	21
3B	10
1A	22
1B	14
2A	18
2B	10
3A	21
3B	10
Total	94

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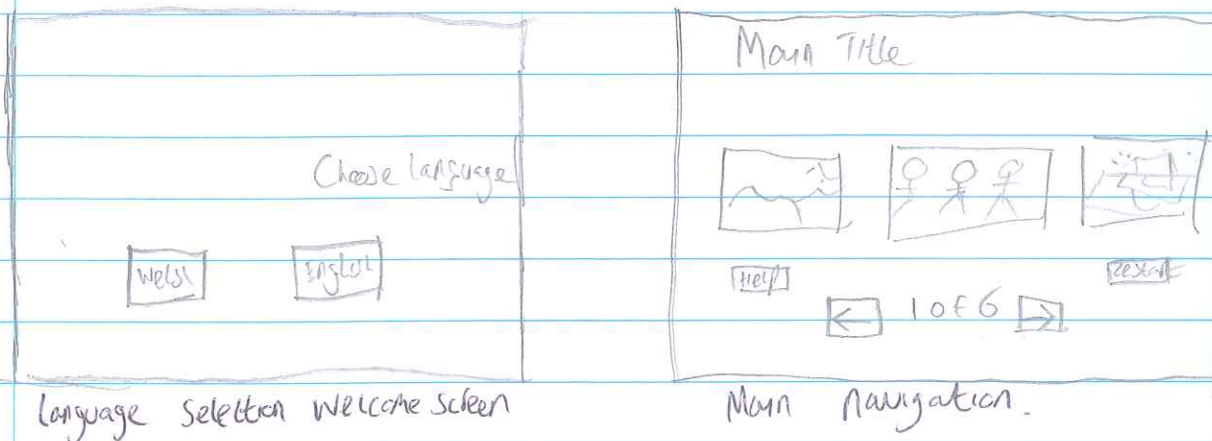
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Question one

a)

Exhibit one

Exhibit one is an interactive display that shows information about significant moments and groups in Welsh history. The exhibit is touch screen operated.



The initial welcome screen has clear instructions ('choose language') and displays a choice of Welsh or English. Following language selection the exhibit displays an animation of the available categories moving from right to left. Each time the category changes a mechanical movement noise is played. This gives a clear demonstration of how the exhibit is to be navigated. The main navigation screen features left and right arrows, a counter indicating the total number of available options, a large heading displaying the category title and help and restart buttons. When buttons are touched they change color giving visual feedback and also make an audible clicking sound as feedback. The help and restart buttons are consistently located on all screens. When the user does not interact with the exhibit images fade to become instructions on how to proceed. When a category is selected the same animation as earlier is played to reinforce

how the exhibit is to be navigated. When viewing a category a "back" button is displayed on the left of the screen. Displaying it on the left is a good use of metaphor as left (in Welsh and English) is where text starts. A button on the left implies going backwards.

Exhibit two * Continued on next page.

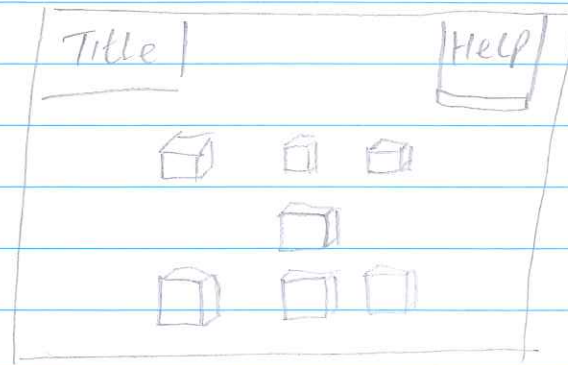
An interactive

Exhibit two

An interactive exhibit displaying pictures and information about historical Welsh items such as trophies, books and antiques. The exhibit is navigated by pointing at the screen the motion sensors.



Physical view of exhibit.



Main navigation screen.

The initial welcome screen displays clear ~~language~~ language selection options. Unlike exhibit one the screen is out of reach and there are no accompanying ~~the~~ instructions on how it is navigated. When the screen is pointed at a cursor is displayed. When a button is hovered over a small progress bar appears and the button is selected when the progress bar is filled. There is no audible feedback provided.

The user is presented a showcase of items to select from yet in this ~~showcase~~ showcase when an item is hovered over no progress bar is ~~displayed~~ displayed. This is inconsistent to earlier navigation. When an item is selected from the showcase it is enlarged on the screen with no instructions on how to continue navigation. The item can be rotated by pointing to the left or right but there is no guidance to instruct the user. This exhibit would be very difficult to navigate for users with gross motor disabilities or unsteady hands.

Comparison

Both exhibits share a similar focus on items and events in Welsh history yet take two contrasting approaches to the delivery of information and user experience.

Exhibit one adopts a now familiar approach by using a touch screen display. The user is presented clear options and given visual and audible feedback throughout.

The feedback given confirms user selection and satisfies Nielsen's "visibility of system status" usability heuristic. Conversely, exhibit two provides little in the way of instruction or user feedback. Exhibit two provides no audible feedback and is inconsistent in its use of the progress bar that identifies when a button has been selected. For example, navigation buttons are selected by hovering over them and filling a progress bar but this same progress bar is not displayed when selecting a showcase item. This is a contradiction of Nielsen's "consistency and standards" heuristic. Exhibit one successfully uses human factors such as vision, hearing and touch to create a positive experience. Exhibit two is inconsistent in its adoption of visual feedback and its nonexistent audible or touch feedback will leave users dismayed and uncertain.

Exhibit one successfully utilises metaphor to enhance its usability in a number of ways. For example, when launched an animation is shown that displays the available categories moving from right to left. Each time the category changes it is accompanied by a mechanical movement sound. Following the animation the user is presented a minimalist design with left and right arrows. This short display animation shows the user how the exhibit is navigated. Visual and audible feedback

provide positive reinforcement of user behaviour. The mechanical movement noise satisfies Nielsen's "Match between system and real world" heuristic.

Finally, exhibit one implies its functionality through affordance. The screen on a hard surface in front of a chair with the absence of physical buttons, knobs or switches implies it is touch screen. Exhibit two showed no parallel with real world objects or interactions.

22
✓

Q1

b) Exhibit two contravenes a number of good practice guidelines and usability principles. To improve the user experience the exhibit should be evaluated against Nielsen's usability heuristics. The exhibit requires more clear instruction (principle 1) to allow the user to navigate successfully. It must enforce ~~feedback~~ feedback and selection more consistently (principle 4) so the user is clear on what is expected of them. It should also make more effective use of matching the system to the real world (principle 2) by ensuring sufficient visual, auditory and other feedback is given. Its current inconsistency relies on human memory to recognise how to navigate. This contravenes Nielsen's "recognition rather than recall" (principle 6).

✓

The exhibit would benefit from:

- More clear instructions.
- Demonstration / example of navigation.
- Consistently applied buttons / selection

14

✓

Question Two

- a) To effectively evaluate interactive exhibits I propose following heuristic evaluation in line with Nielsen's Usability heuristics. Nielsen's principles:
1. Visibility of system status.
 2. Match between ~~the~~ system and real world.
 3. User control and freedom.
 4. Consistency and standards.
 5. Error prevention.
 6. Recognition rather than recall
 7. Flexibility and efficiency of use.
 8. Aesthetic and minimalist design
 9. Help users recognise, diagnose and ~~the~~ recover from errors
 10. Help and documentation.

Nielsen's heuristics have guided usability designs for many years. It is an evaluation technique that can be adopted throughout the design and development process in an attempt to catch and fix issues early. It is highly efficient and flexible so can be used on a range of exhibits. I propose that 5 evaluators be free to assess and critique ~~system~~ designs. Identified issues should be recorded on a scale of ~~1~~ 1-5 with most severe issues requiring the most immediate attention.

- b) To evaluate an AR app I propose conducting Cognitive walkthroughs. The ~~cog~~ Cognitive walkthrough is designed to determine whether users can perform tasks easily. Success is determined by the completion of failure of tasks. Cognitive walkthroughs are highly-efficient and cost-effective and can be implemented prior to deployment. The cognitive walkthrough developed by Polson in 2002 proposed four questions an evaluator should use during a walkthrough.

1. Will the user try and achieve the right outcome?
2. Will the user notice that the correct action is available to them?
3. Will the user associate the correct action with the ~~for~~ outcome they expect to achieve? ✓
4. If the correct action is performed; will the user see that progress is being made towards the intended outcome?

The questions are answered by an evaluator at all stages. Where an issue is found the assessor reports it to designers to provide a resolution.
~~This evaluation method is more detailed than~~

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Question Three

a) VR exhibit

I propose a VR experience that gives visitors the opportunity to learn more about the history of the coal industry in Wales. ✓

The VR exhibit would allow the visitor to gain insight into some of the sights and sounds that a coal miner experienced. The user would be placed in a virtual coal mine designed to replicate one of Wales' many coal mines. In the virtual environment the user would be able to interact with their surroundings and perform tasks including: ✓

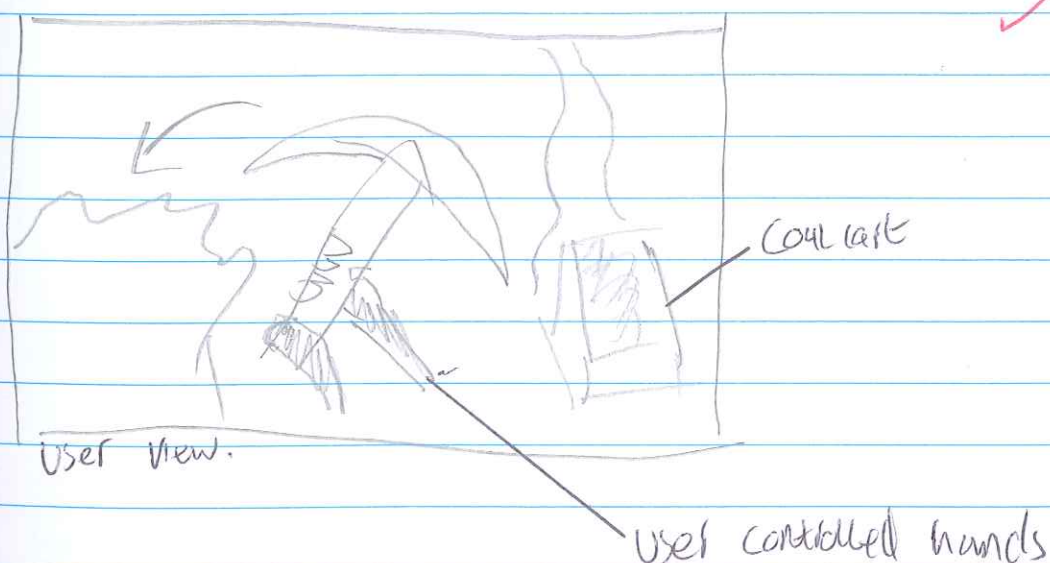
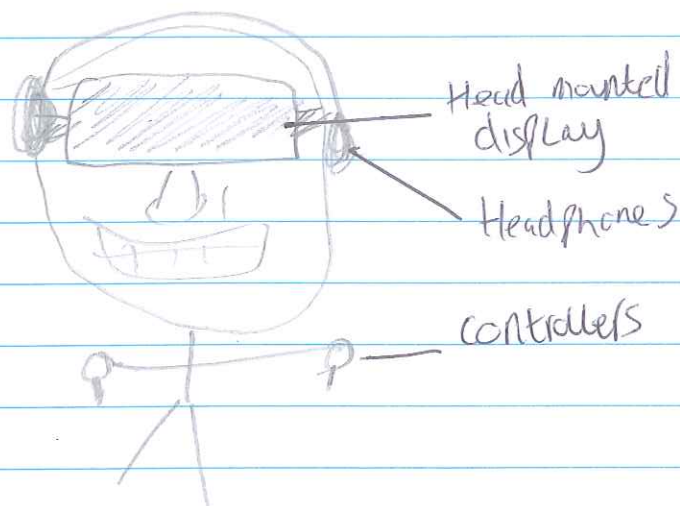
- Crawling through mine shafts. ✓
- Setting structural braces. ✓
- Saving a pick axe. ✓
- Shovelling coal. ✓
- Pushing a coal cart. ✓

how

To enable this ~~the~~ VR experience key hardware components would be required:

- Head-mounted display - visual. ✓
- Headphones - Audio ✓
- Touch controllers - Touch/motion. ✓

Specifically, I propose the museum invest in the PC-driven Oculus Rift VR equipment. ~~OCULUS~~ ✓
Oculus are a tech company who specialise in VR.
The museum would be required to seek the services of a video game developer to design, develop and publish their ~~the~~ desired VR experience. ~~in~~ ✓
~~to~~

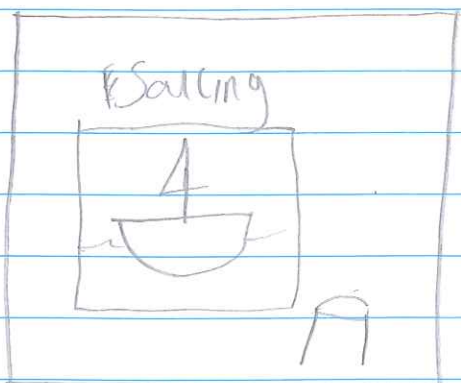


AR exhibit

Aimed at younger visitors to the museum I propose an app with AR capabilities. This can be installed on phones or tablets.

I propose an addition to existing museum exhibits. Exhibits will have a small pedestal alongside them and when the AR is pointed at the pedestal a digital character appears. Characters will be appropriate to each exhibit. The character will talk about the exhibit which users can hear through speakers or headphones. The character will ask the visitor a question and if answered correctly the user will receive a digital badge. When leaving the museum the visitor can claim a prize depending on the number of collected badges.

The app can be installed on phones or tablets either owned by the visitor or museum. The museum would provide an app/games designed to create the AR app.



Real World View



View through AR app

Q3 b) In 1965, Ivan Sutherland published a ~~paper~~ paper entitled "The Ultimate Display" which has since come to be considered a blueprint for many modern-day concepts of VR. Sutherland envisaged an "ultimate display" in which "a computer can control the existence of matter". In 1968, Sutherland developed the first head-mounted display called "The Sword of Damocles".

By definition, VR creates an entirely synthetic ~~virtual~~ environment ~~that~~ that can be intercalated with in a seemingly ~~for way~~ real way. Modern VR is immersive but does not yet manipulate actual matter as Sutherland envisaged. Unlike VR, AR intends to create a digital layer that interjects the real world. AR provides a digital layer over a real environment in real time.

AR vs VR

Similarities

- Leverage similar technologies
- Create experiences for entertainment and education.
- Can both be used to simulate medical practices.

Differences

- VR ~~is~~ creates entirely synthetic ~~to~~ environment.
- AR interjects with real world.
- VR is intended to immerse user.
- AR intended to enhance experience with digital layer.