

Usability Assignment 2-1809781

by Jessica Elizabeth Marfell

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ACCA6017

Usability Engineering

**Research and Analysis of a Smart Public Transport
System**

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1 Public transport system and design prototype

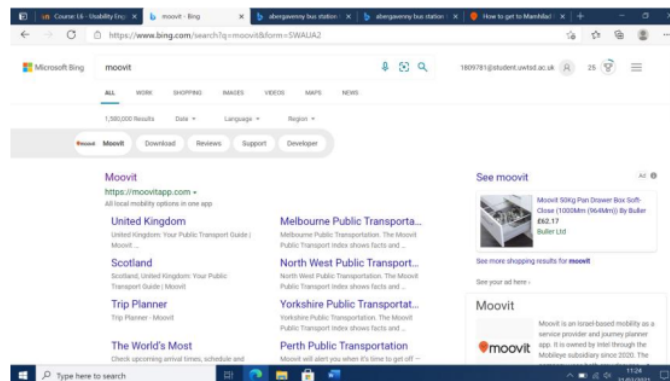
An example bus route from Abergavenny bus station to Mamhilad Park- NHS Building is going to be reviewed.

Below is an image of Abergavenny bus station, multiple buses use the station. It was identified that all facilities are outdoors, and the display boards were printed information next to the bus shelter [1].

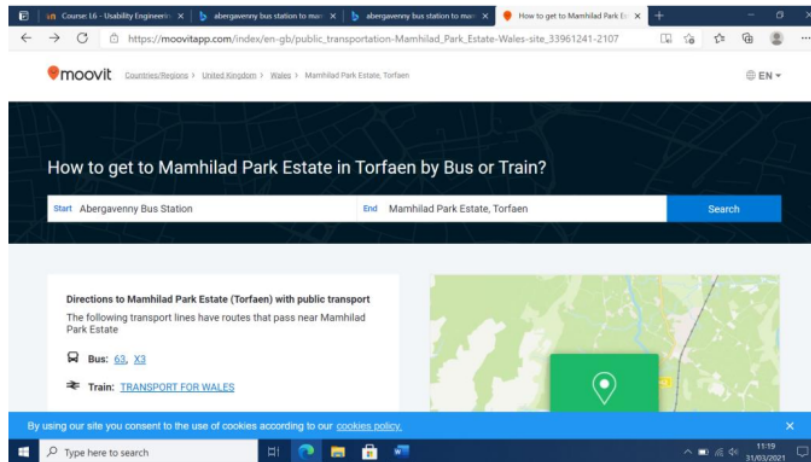


The Moovit website has been used to gather travel information remotely. The steps are detailed below.

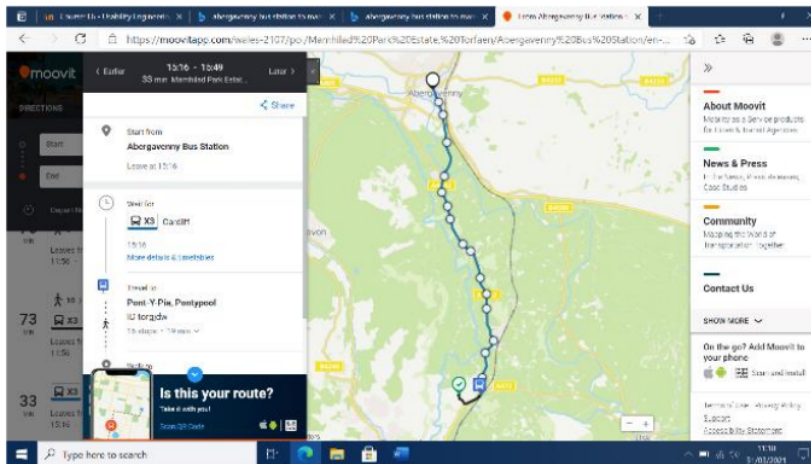
- Search for Moovit on the internet web browser [2]



- Search the start and end destination



- Select the route to display the travel information.



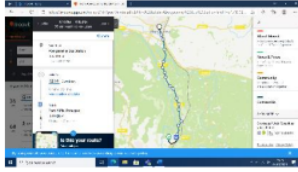
Below is an evaluation on the system interface.

Positives:

Start and End location search
Time options displayed
Bus information displayed
Route map for a visual aid
Icons used as metaphors

Constraints:

Accessibility issues as it requires internet access
Not inclusive for visual disabilities
Unnecessary icons displayed on the web page



A task analysis has identified the following requirements:

Request and display specific to and from journey information as well as time and date options. Up to date information should be provided to display delays to buses and diversions.

1.1 System Design

A new system design is detailed below in accordance to human factors such as interface metaphors, human memory, and visual perception.

Features of the system design include:

- Wide Screen interactive board
- Facial recognition
- Weatherproof
- Touch and speech enabled
- Application integrated – QR Code
- Journey information and print outs
- Display map
- To and from location finder.

The interactive board has two legs and a large display unit to allow bold text to improve visual perception. Accessibility factors have been considered where eyesight ranges from 1.15m to 1.80m. A reduced glare is also incorporated. This allows all users to read information regardless on their eyesight range and environmental factors [3]. The board will also be waterproof, to improve the quality during all weathers as it will be displayed outdoors in the centre of the station.



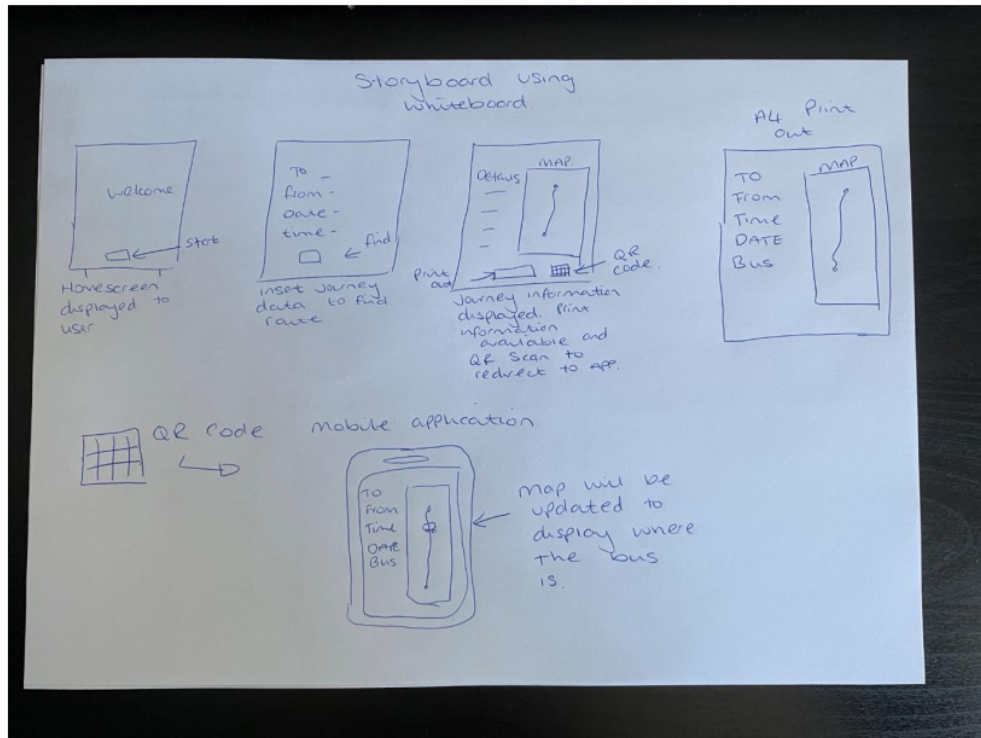
[1]

A small icon in the bottom left-hand corner of the board will allow the user to change the settings to display information at the right eyelevel. A metaphor has been used to display a wheelchair icon. This will allow the board to be compatible with all user heights [4].

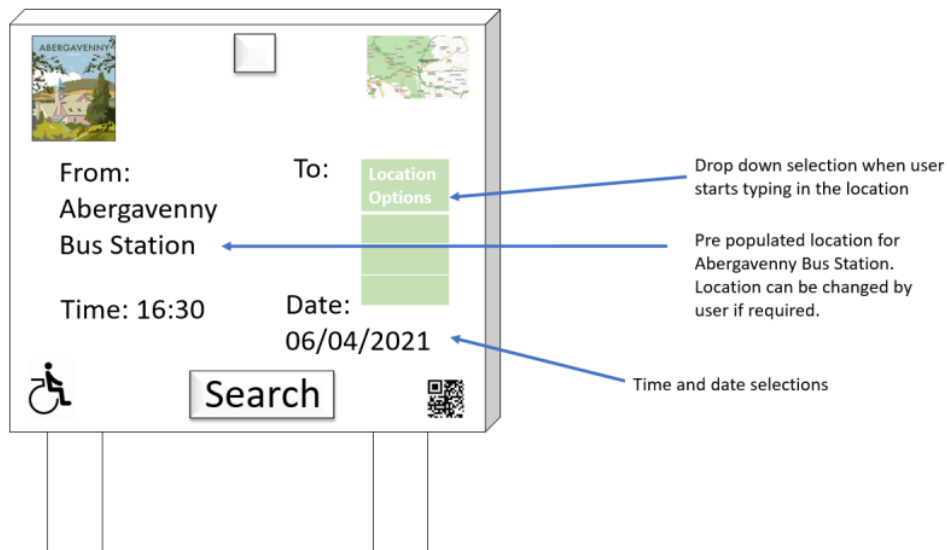
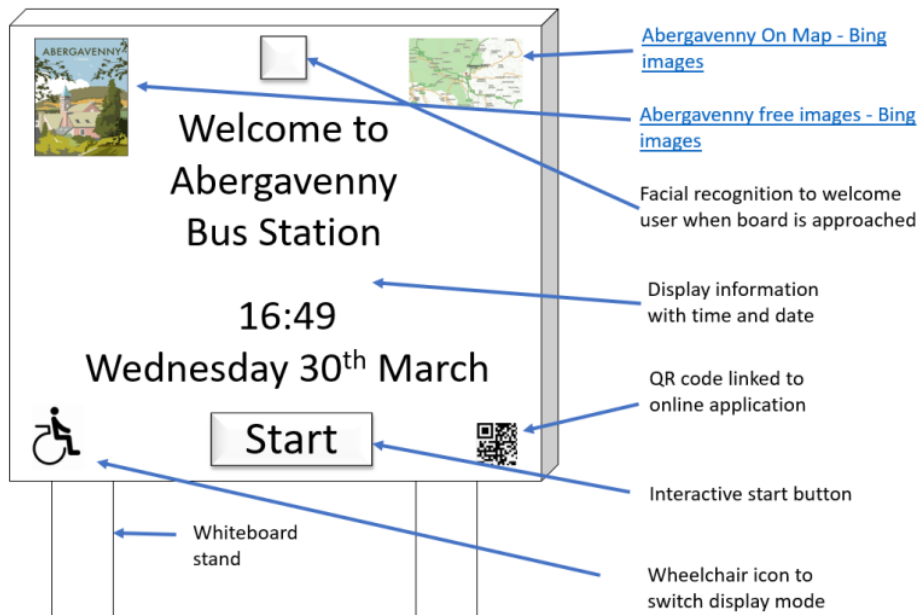
Facial recognition will enable the board to interact with the user. Promoting touch and speech recognition will encourage human reasoning [5].

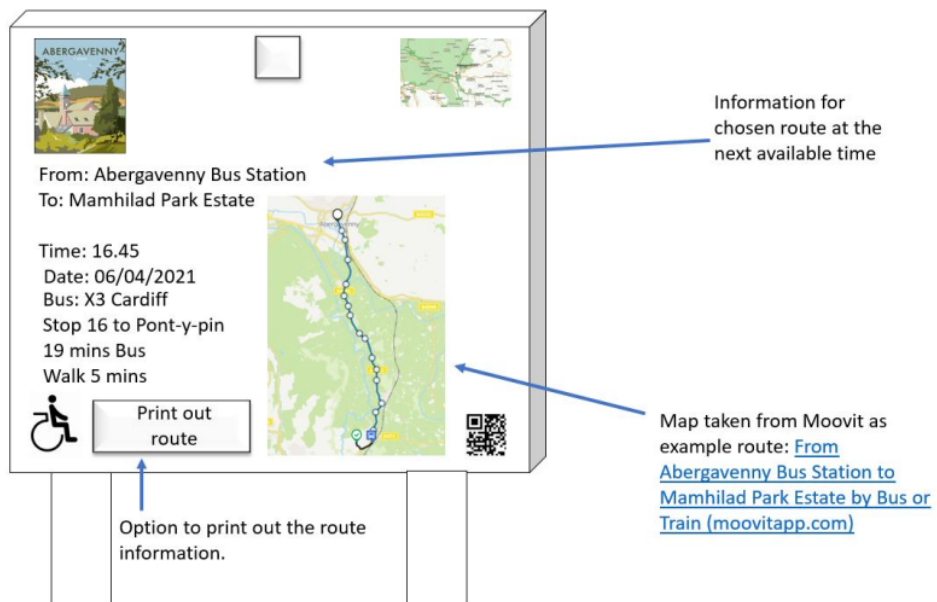
A QR code can be scanned to direct users to a mobile application. The application allows the user to track the journey and inform them of any route delays, journey updates and track their location. An additional function is the printout journey summary. This is to ensure information is accessible for users who do not have a mobile phone when travelling.

The purpose of the board is to display bus route information. The board will calculate the information and display the journey options. Affordance factors have been considered which has made the design on the board simple to understand [6]. The use of a map to display the route allows the user to understand the steps required for their journey using an image.



Prototype:





2 Usability and accessibility guidelines

Research has been conducted on different usability guidelines. Dix's theory concentrates on three principles-learnability, flexibility, and robustness. There will be different system knowledge between different target market groups. Less technical users may not understand all the available icons, such as the QR code.

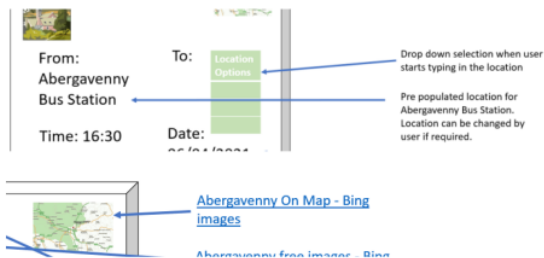


The flexibility of the board will be demonstrated here. Some users will only want to see their specific journey information, which the system provides. The board is flexible for technical users by linking the mobile application for tracking, displaying maps, and allowing the printout of information. The robustness of the board has been considered and incorporates wheelchair icons to allow the height and interaction of information to be changed to the right eye level.



The phone service to support visually impaired users may not work smoothly. This is down to human resource being required which doesn't promote Dix's theory on robustness [7].

Shneiderman has eight golden rules for interface design. These include- consistency, shortcuts for frequent users, informative feedback, closure/ error/ action messages and reduce the users short term memory load. Many of these principles have been incorporated in the new design. Consistency has been provided by using familiar icons, menu options and action buttons to promote affordance and metaphors.



Being consistent allows the user to relate and reduces their short-term memory load. Shortcuts can be used and saved via the QR code.



Users have the option for information to be fed back if they wish to use the QR code or print out the journey. Basic action buttons have been used to detail what the button intends to do so the user feels in control of the process [8].



Comparing the two theories against the proposed design, both guidelines are incorporated. For a technically advanced user the theories are valid from both. Considering a different target market with not as much experience using interactive boards or applications, it will be more difficult to fulfill Dix's theory, as the user will not be interested in all available functions.

Guidelines set out on the W3C website identify some examples of accessibility. It details the use of text for images as an alternative, for the public transport display this will not be applicable as the user will not have the option to turn off images on the board. There will however be an audio option where the user can choose to speak to an advisor. Under guideline 2.2- enough time, it details the factors to include. Should the inactivity last longer than a minute the home screen will be displayed. This time span requires usability testing and trials to ensure it is fit for real time scenarios and different environmental factors [9]. Not all guidance provided by W3C is applicable to the display board as its use is intended in an outdoor environment for the public.

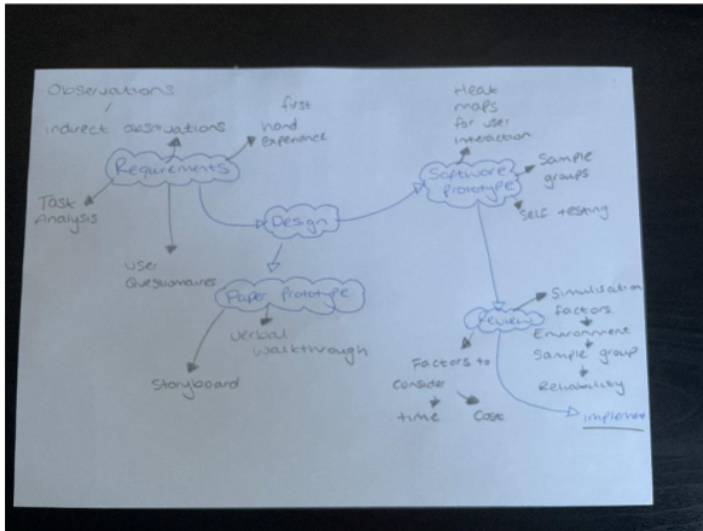
Additional guidance needs to be taken from the government bodies to comply with their regulations. The accessibility requirements (September 2018) require the application to be perceivable, operable, understandable, and robust to meet public sector accessibility [10]. These requirements support Dix's and Shneiderman.

The design of the whiteboard incorporates Dix's, Shneiderman theory and government regulations. W3C guidelines have been considered however not all comply with the board requirements. The main guideline to be considered from W3C is enough time. This will be incorporated into testing strategies.

3 Usability evaluation strategy

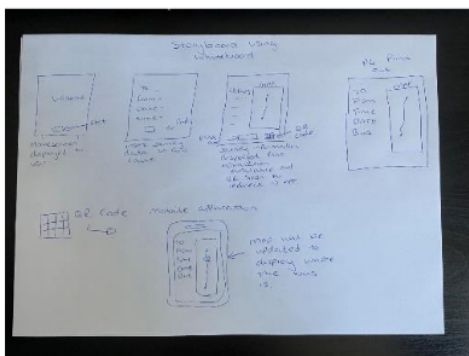
Usability evaluation techniques are required throughout all stages of development.

Proposed strategy:



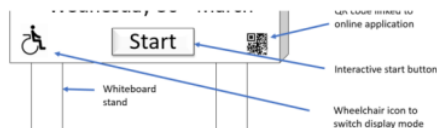
Requirement analysis which include, observations on what is already available at the bus station and how users interact with the system can be conducted through indirect observation of users. Direct observation may give false results. If users are aware, they are being observed they may change their travel routines or use the systems differently. Indirect observation will allow users to carry on with their journey without thinking about the process they follow. This will give real life feedback on how information and users use the bus station. User feedback is also crucial at this stage. Questioning the users on their planned journeys and how they know what travel route to take will provide a larger scale outcome as some users may have researched their journey before attending the bus station or on their mobile. This may not be picked up by indirectly observing the user. First-hand experience of using public transport to get to various destinations will allow the researcher to think about what aspects are beneficial and what can be improved with the existing process [11]. Creating a task analysis will centre the user's requirements at the earliest design stage.

For the initial paper design, a verbal walkthrough can be completed. Storyboards can identify different user scenarios which may identify gaps in the process. This can easily be added without major delays or financial impacts.



Software prototyping can perform benchmark testing. Heat maps on the software can identify where the users interact most. The usability factors such as the height of the board has been considered to allow all users to be able to interact and see the information. To ensure the size is appropriate user testing can be conducted. As the design incorporates accessibility, representation of these users is required. Mitigating usability issues when selecting the wheelchair icon to change display.

Self-testing can be conducted on early prototyping through using a sample group and using real users who regularly use the bus station [3]. Self-testing is beneficial and easily accessible; however, independence is required for testing to ensure results are transparent.



As the display board is outside, simulation factors need to be considered. Environmental factors will impact the use of the system. On a cold and wet day users will use the board differently to when it is dry outside. Consideration has been made for the board to be weatherproof and reduce glare on sunny days. The system will need to be tested within the real environment to get true results. Consideration needs to be taken on when these tests are conducted [12]. A variety of tests need to be conducted on different age groups with different software knowledge and with different environmental factors as these may all play a part in how the user interacts with the software. Should the groups not incorporate different technical knowledge, the results will not cover the target market.



Cost, time, and participation will need to be considered throughout the evaluation stages. It is important to evaluate early on and make changes to the prototype before system development commences [13]. First has experience of working within a software development team backs up the above approach and supports the Agile methodology [14].

4 Map Usability

A variety of factors need to be considered when using a map for a public transport display.

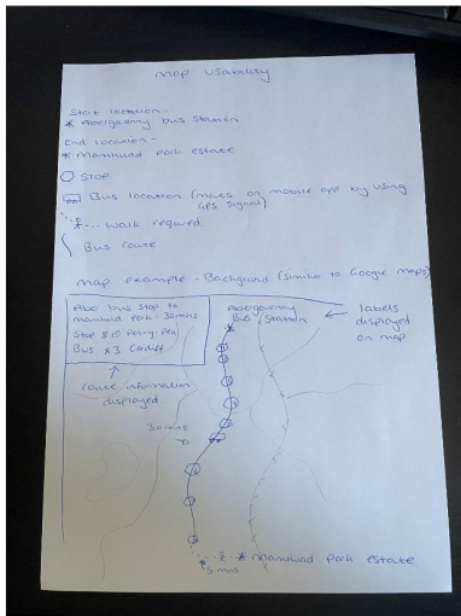
Some of the challenges that need to be considered are [15]:

- Location and access of map- display board and mobile application.
- Style- many users understand different styles of maps which makes it harder to select one to suit all.
- Infrastructure- store the map and ensure it is up to date may be costly and encore copyright issues.
- Personalisation of route information required.

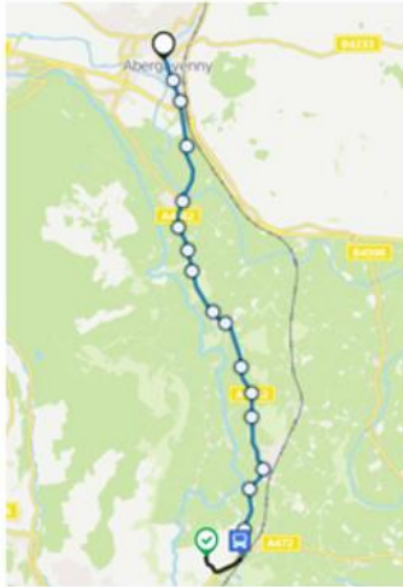
As detailed in Kuparinen et al, the following techniques can be considered to mitigate some of these challenges [16]-

- Visibility – users interacts in a reasonable amount of time.
- Surroundings- location points and up to date information.
- Control- map is still available when other applications are open.
- Consistency- use relatable symbols.
- Error free- ensure the map can inform the user correctly.
- Recognition- display key information the user recognises.
- Flexibility- save searches and enable shortcuts.
- Simplistic design- clear visual images should be used.
- Recovery- ensure error messages are displayed in plain text.
- Offering help- map should be easy to navigate however additional support should be provided.

Nielsen details that around 71% of websites identified in their research contains a site map, identifying maps allow information to be displayed on one page and provides a simple view for the user. This is important to use within a public transport display as the purpose of information is location based. Nielsen argues maps help users at a critical time, this needs to be considered as the target audience are looking for travel information. Nielsen concludes maps don't hurt but they do help a few and incur very little cost [17]. With this in mind, a sketch of a public display map is detailed below.



The above map should integrate with an online application such as google maps. This map is widely used and provides up to date information.



A key to display information on the map is required. This allows the users to associate the symbols and promote user affordance. Labels on the map display the route journey for the user ensuring they understand the information, promoting Kuparinen's theory.



The map will be displayed on the white board. This will be an integrated map but will not be interactive. It will be for personal route information only.



The mobile application map will be interactive. The map will update should the user agree for GPS to be used. This ensures the location of the bus is displayed and highlights their location.



Using an interactive map on a smart phone will come with some additional challenges. The display of the map will be smaller. However, as the design is simple and only provides required information this should not be an issue. Should the user wish to see additional information the zoom function is available. Mobile swipe ambiguity will need to be considered. According to Nielsen, swipe ambiguity has been present since iOS 7, allowing the user to easily interact with the map [18].

5 References

- [1] "Abergavenny Bus Station," [Online]. Available: http://s0.geograph.org.uk/geophotos/04/52/26/4522654_ffa95092.jpg. [Accessed 26 04 2021].
- [2] Moovit, "Moovit," [Online]. Available: https://moovitapp.com/index/en-gb/public_transportation-Mamhilad_Park_Estate-Wales-site_33961241-2107. [Accessed 21 04 2021].
- [3] N. D. Authority, "Ensure that displays are within sight of people of all heights and people sitting in a wheelchair or buggy," National Disability Authority, 2020. [Online]. Available: <http://universaldesign.ie/Technology-ICT/Irish-National-IT-Accessibility-Guidelines/Public-Access-Terminals/Public-access-terminals-Priority-1/1-2-Ensure-that-displays-are-within-sight-of-people-of-all-heights-and-people-sitting-in-a-wheelchair-or-buggy/>. [Accessed 24 04 2021].
- [4] L. Devices, "Metaphor," Literary Devices, [Online]. Available: <https://literarydevices.net/metaphor/>. [Accessed 04 05 2021].
- [5] I. Murnaghan, "How Human Reasoning Works," About Intelligence, 2 01 2013. [Online]. Available: <http://www.aboutintelligence.co.uk/how-human-reasoning-works.html>. [Accessed 04 05 2021].
- [6] Interaction-design, "Affordances," Interaction-design, [Online]. Available: <https://www.interaction-design.org/literature/topics/affordances#:~:text=Affordances%20are%20properties%20of%20objects%20which%20show%20users,why%20affordances%20are%20key%20to%20users%E2%80%99%20desired%20actions..> [Accessed 04 05 2021].
- [7] B. Webb, "HCI Lecture 1," [Online]. Available: http://www.inf.ed.ac.uk/teaching/courses/hci/1011/lects/1_principles.pdf. [Accessed 26 04 2021].
- [8] E. Wong, "Shneiderman's Eight Golden Rules Will Help You Design Better Interfaces," Interaction Design Foundation, 08 2020. [Online]. Available: <https://www.interaction-design.org/literature/article/shneiderman-s-eight-golden-rules-will-help-you-design-better-interfaces>. [Accessed 23 04 2021].
- [9] W3C, "Guideline 2.2 – Enough Time," W3C, 2019. [Online]. Available: <https://www.w3.org/WAI/WCAG21/quickref/#enough-time>. [Accessed 19 04 2021].
- [10] C. D. a. D. Office, "Understanding accessibility requirements for public sector bodies," Central Digital and Data Office, 18 05 2018. [Online]. Available: <https://www.gov.uk/guidance/accessibility-requirements-for-public-sector-websites-and-apps#meeting-accessibility-requirements>. [Accessed 25 04 2021].
- [11] T. Mandel, "Usability Evaluation," Science Direct, [Online]. Available: <https://www.sciencedirect.com/topics/computer-science/usability-evaluation>. [Accessed 19 04 2021].
- [12] M. Thomas, "SIMULATION THEORY ASKS ARE WE LIVING IN A COMPUTER SIMULATION?," Built In, 01 04 2021. [Online]. Available: <https://builtin.com/hardware/simulation-theory>. [Accessed 06 05 2021].
- [13] U. Gov, "Usability Testing," Usability Gov, 30 09 2020. [Online]. Available: <https://www.usability.gov/how-to-and-tools/methods/usability-testing.html>. [Accessed 18 04 2021].
- [14] A. d. community, "Agile methods: an introduction," Agile Methodology, 27 07 2016. [Online]. Available: <https://www.gov.uk/service-manual/agile-delivery/agile-methodologies>. [Accessed 06 05 2021].
- [15] R. J. R. JR., "4 Data Mapping Challenges and How to Overcome Them," Exterro. E-discovery, privacy and IG software., 28 10 2020. [Online]. Available: <https://www.exterro.com/blog/4-data-mapping-challenges-and-how-to-overcome-them>. [Accessed 06 05 2021].
- [16] L. Kuparinen, "Validation and Extension of the Usability Heuristics for Mobile Map Applications," Research Gate, 06 2016. [Online]. Available: https://www.researchgate.net/publication/304783525_Validation_and_Extension_of_the_Usability_Heuristics_for_Mobile_Map_Applications. [Accessed 25 04 2021].

- [17] J. Nielsen, "Site Map Usability," Nielsen Norman Group, 01 09 2008. [Online]. Available: <https://www.nngroup.com/articles/site-map-usability/>. [Accessed 20 04 2021].
- [18] R. Budi, "iPhone X: The Rise of Gestures," Nielsen Norman Group, 03 12 2017. [Online]. Available: <https://www.nngroup.com/articles/iphone-x/#:~:text=Swipe%20ambiguity%20means%20that%20users%20have%20to%20learn,present%20in%20all%20iOS%20versions%20since%20iOS%207..> [Accessed 24 04 2021].

Usability Assignment 2-1809781

GRADEMARK REPORT

FINAL GRADE

73/100

GENERAL COMMENTS

Instructor

1. Analysis and Design

Good and thoughtful analysis of existing transport info provision.

Good research demonstrated, in this assessment using bullet points in places for brevity works well. Note that other assessments will need you to write in paragraphs, check with the tutor. You have taken the scenario seriously and considered the needs of those travelling to your workplace well. You've provided well thought out designs that would improve the usability of info systems. 20/25

2. Guidelines and Accessibility

Good use of examples from your designs to illustrate well chosen guidelines for Shneiderman. Accessibility issues are briefly considered with the key points of images timings mentioned. Do the guidelines apply well to these public displays? 18/25

3. Evaluation Strategy

The sketches of usability evaluation activities in the project lifecycle and proposed resources are a good way to explain choices. Useful recommendations for evaluation with practical considerations addressed.

18

4. Map Usability

Map usability challenges and guidelines are outlined are with references. An effective map is presented with useful features for bus users compared to general purpose maps and explanation in terms of theory. How well do the guidelines work for your example?

17

Overall excellent application of Usability Theory to produce and analyse an excellent resource for bus users. To get an even better marks you could have

provided more in the way of evaluation of the guidelines/techniques used. Well done!

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