

UAE Assignment 2

by Derek Wayne Carvell

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Module Title:	Usability Engineering (ACCA6017)
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Explanation of chosen public transport public information system and outline of design idea.

Current Display Location

The existing public transport location is shown in Figure 1. It will be noted that the information display is located quite high within the stop.



Figure 1, Local Bus Stop. Source [1]

Furthermore, transport schedule information is at the top of that display, highlighted Figure 2. This is too high to be accessible to wheelchair users and access to the stop is limited.

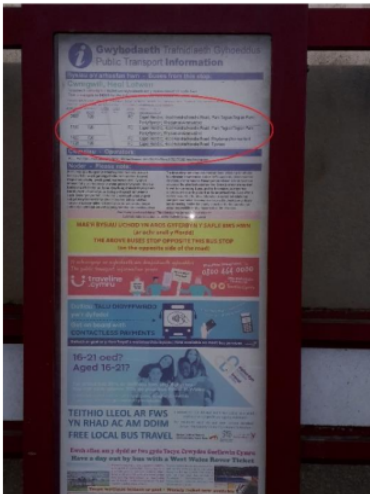


Figure 2, Information Display. Source [2]

The existing display offers no:

- information on delays or due time
- assistance for visually or physically impaired
- route planner

Proposed Public Use Display

The proposed public display addresses these shortcomings and will be fully user inclusive.

Accessibility

By default, it will be lower (Figure 3), enabling easy wheelchair user access and, mounted on a sliding resistance rail allowing movement to a higher location for taller users, before returning to lower position. Entrance widened for easier wheelchair access.

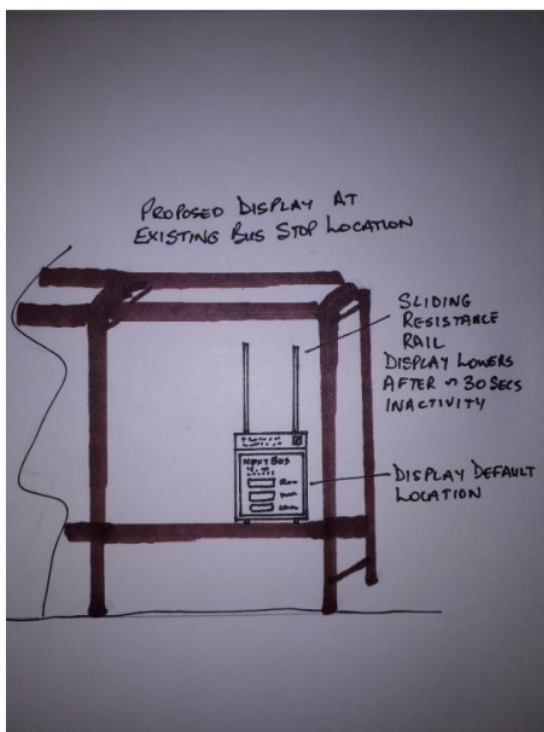


Figure 3, Proposed site of display in bus stop

Human Factors Applied

The design incorporates the following -

Visual Representation

Navigation

Clear, consistent navigation (W3C guideline [3]), using headings, back buttons and links.

QR codes enabling users to access their route plan on personal device. "Multimedia QR Codes are also used to direct users to specific multimedia contents (such as video, audio, images, documents, etc.)" [4]

Navigation to mobile version of the public display, should terminal be offline or connection of user assistance hardware is required (e.g. headphones).

Images

Image Alternative Text [5] used throughout, aiding visually impaired users and screen reading devices.

Suitable image resolutions for use on large and small screen devices.

Visual and Interface Metaphors

The design uses metaphors:

- map images
- clock image for schedules
- bus-stop sign for "Stops Close By"
- on-screen keyboard

Screen and Object Sizing

Responsive design optimises page layout for differing screen sizes, W3C guideline refers [6].

Pinching and spreading gestures [7] to enlarge (zoom in) and shrink (zoom out) the map and other objects.

Human Reasoning and Memory

Current time and estimated bus arrival, in minutes, is displayed. Including bus cancellation and delay, with revised arrival times. An article on memory recognition, Bidiu summarises "Showing users things they can recognize improves usability" [8].

Common map and application icons will be utilised, "icons, being pictorial, are easier to understand than text" [9], and map legend provided. Assisting those with reading difficulty or visitors from overseas, "A picture can in effect ground the meaning to an object or concept in the real world and act as a convenient bridge over language barriers." [10].

Shortcuts - Being a public display an individual's privacy is a major concern. Therefore, no history or shortcuts are retained on the public display. A personalised version of the application is offered, via QR code, where shortcut information can be viewed and stored for later use.

Affordance

Common objects - sliders, buttons. Buttons will have a 3D ("can be pressed") effect.

Mandatory fields are highlighted.

Assistive Technologies

Connectivity of assistive devices such as hearing aids, keyboards, etc. provided with connection instructions, via QR code.

Bluetooth beacons [11] assisting the visually impaired to connect screen reading devices.

Paper prototype design sketches are below, outlining main system features.

523 Words

Welcome Screen with Connectivity Instructions

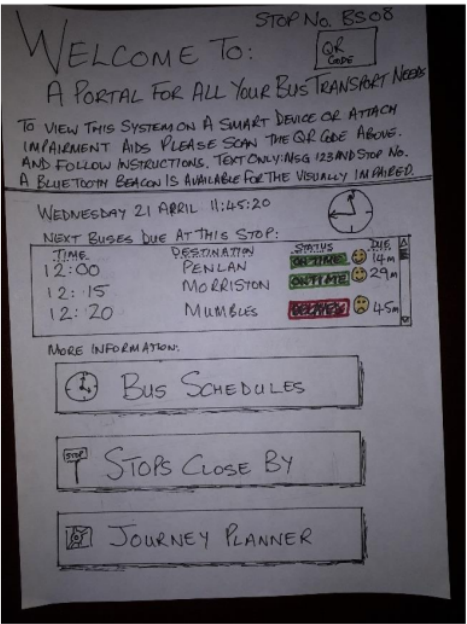


Figure 4, Welcome screen

Bus Schedules

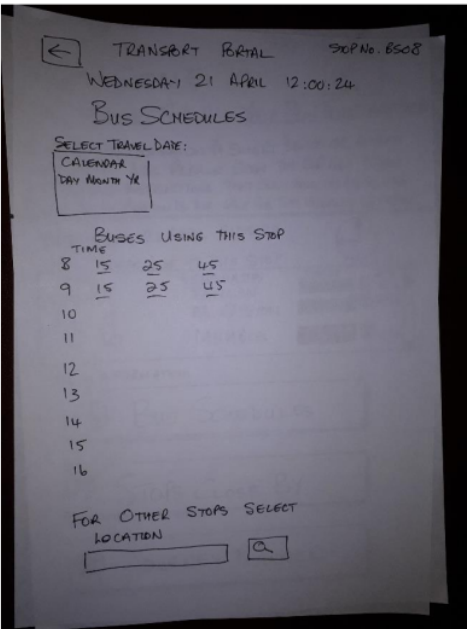


Figure 5, Bus schedules

Bus Stops Close By

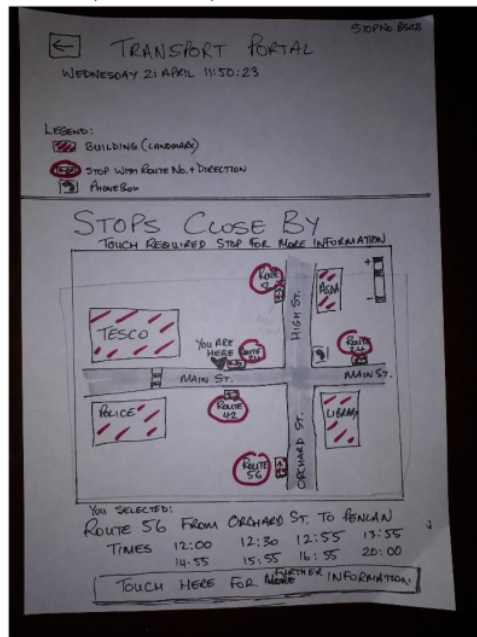


Figure 6, Bus stops close by

Route Planner

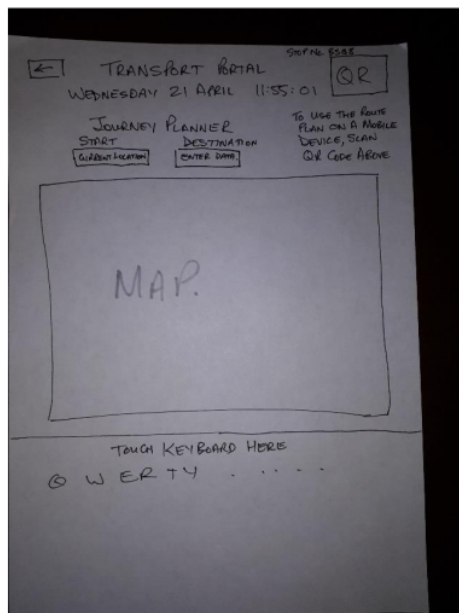


Figure 7, Route planner

Usability Guidelines and Accessibility Applied to P

Part A

Selected Usability Guidelines

Consistency

“Standardizing the way information is conveyed ensures users are able to apply knowledge from one click to another;” [12] states Schneiderman’s first golden rule.

This guideline is very effective, through supporting user familiarity with any application from first use, with the user applying knowledge gained from use of other applications.

Such familiarity encourages user confidence and desire to experiment.

Consistent and familiar icons, menu hierarchies, user flow, etc. are used in the design with familiar search capabilities, on-screen touch keyboard, buttons and sliders.

Shortcuts

“With increased use comes the demand for quicker methods of completing tasks” [12], states Schneiderman’s second golden rule.

This guideline has some usefulness, depending on the context of the application’s location. For a public design, an individual’s privacy MUST be preserved. Displaying user travel search history, via shortcuts, is not advisable. Shortcuts have not been used for public design.

The personal smart map application, however, utilises shortcuts to reduce user typing for repeat destinations.

Informative Feedback

“The user should know where they are at and what is going on at all times” [12] states third golden rule. This guideline is highly relevant, especially for mapping applications.

The proposed design provides feedback on:

- bus arrival - informing user of estimated waiting time
- bus delays - providing user choice to wait or seek alternative route
- bus location - informing user of where they are in their journey
- System feedback - for searches and standard use.
- Bus arrival at required destination - informing the user when to leave the bus to continue journey.

Dialogue

“Don’t keep your users guessing.” [12] fourth golden rule.

Notifying the user, at appropriate times, they have completed an event, transaction or journey is vital.

The proposed design provides messages confirming searches and route planning have completed (Yielding Closure [12]). Also informing users that “You have reached your destination” and need to leave the bus. Not informing the user to leave the bus, would be a negative user experience!

Simple Error Handling

The design offers user intuitive feedback, when required, highlighting fields requiring user input.

Part B.

Accessibility

Web accessibility guidelines published by W3C, fundamentals [13] and principles [14], provide a good basis for advice, understanding of and standard for, accessibility.

The guidelines, however, do not cover such scenarios as application environment.

For example, guidance is provided on hearing, relating to controlling sound volume or turning sound off. It does not cover connectivity, for external user-assistive aids to hear sound or interact with the display, or positioning, not so high that it cannot be accessed by wheelchair users. These factors are addressed in the design.

It could be argued that it is not the remit of W3C to provide environment guidelines for application use and, therefore, a specialist set of guidelines for public use displays is required. But, there is opportunity to include accessibility relevant information, within existing W3C guidance, thereby extending their usefulness and enhancing user inclusion.

487 Words

A Usability Evaluation Strategy for a project implementing your proposed Public Transport Information System

Evaluation Strategy

Having an effective evaluation strategy throughout project development is vital to informing design and build stages. Failure to get this right results in delayed or non-delivery of the required product, and potentially wastes money.

A sketch of the strategy is provided below.

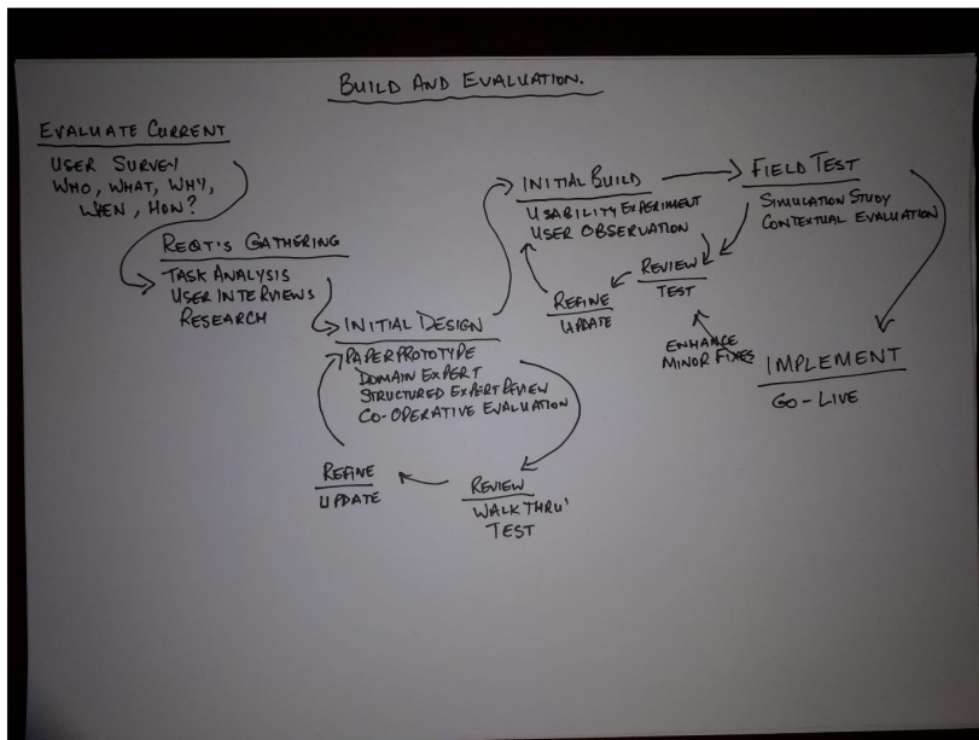


Figure 8, Evaluation strategy sketch

Evaluate Current

User Surveys – Provide questionnaires to bus users. Gather an understanding of what their needs are, opinions on what is currently available, when they want and need to use additional information.

Who is using the current displays, in what context, what difficulties do they experience, would they prefer to access this information elsewhere and at differing times?

The survey must involve those who experience accessibility and usability problems. How do they currently surmount them, what would they need to assist their use of public transport?

A structured survey will allow large amounts of data to be gathered, analysed and categorised, feeding into requirements gathering.

Requirements Gathering

Task Analysis – utilising information from the user survey a task analysis can be constructed, providing focus on those key requirements identified as being of most importance.

User Interviews – provides thorough understanding of user experience – good and bad, in greater detail.

Research – information gathered above may require research into new methods of user interaction, and connectivity, with public displays.

Design

Paper prototype – an extremely cheap but highly effective and fast means of design evaluation.

For evaluation of this prototype the assistance of a domain expert would be sought. Not domain from technical or product perspective, but one familiar with usability for the physically/cognitively impaired and knowledgeable of the physical aids that may be available.

A study by Folstad determined that “domain experts identify fewer but more severe usability problems compared to usability professionals with no domain expertise.” [15]. Using an Iterative Elicitation collaboration approach, as described by Culiana [16], the domain expert would also assure design conformance with the Equality Act 2010 [17].

Structured Expert Review, Co-operative Evaluation and direct observation will be used and assessed to improve the user interface specification, usability and accessibility - identifying problems within the earliest stages of development.

The above provides ample opportunity to explore and improve design decisions, avoiding potentially expensive later re-work and re-design.

Build

Usability Experiment - Throughout the Design, Build and later stages, review (testing) and refine (updating) iterations with small user groups providing incremental improvements and requirements adherence assurance.

Field Test

Finally, a contextual and cooperative evaluation will be performed involving users with, and without, physical impairments in their natural environment, so that issues with noise, light, privacy can be properly assessed.

This interaction with the design in its intended environment should, ideally, provide the final confirmation that the research, iterative development and testing have delivered the complete product.

Ideally, this simulation will be accompanied with running commentary so that the user thought and use process can be understood.

Findings from this exercise may require limited re-visit to the build stage for adjustments.

Implement

Go-live. Later enhancements and minor fixes may be required.

499 words

Analysis of map usability in your proposed Public Transport Information System

Usability Challenges.

The Map

Nivala et al's [18] study "Usability Problems of web map sites" highlighted map size as an issue. Personally, I've found Google Maps' constant display of sound, compass direction, etc. options, gives map readability issues on smaller devices.

Nivala also found "Use of colours was not always the most efficient" [18]. Rivers and motorways have similar blue shading, presenting difficulties. Quote heard from journey made by relatives who had become lost on their way to London - "That's the River Thames not the M4!".

Map Tools

"No legend for maps, or participants not able to find it" [19], can be an issue for those unfamiliar with mapping symbology.

Limited shortcut information – I've first-hand experience of using a postcode shortcut that, because of scant information provided, was not the destination I wanted.

Map Sketch

Proposed public display in use on mobile device:

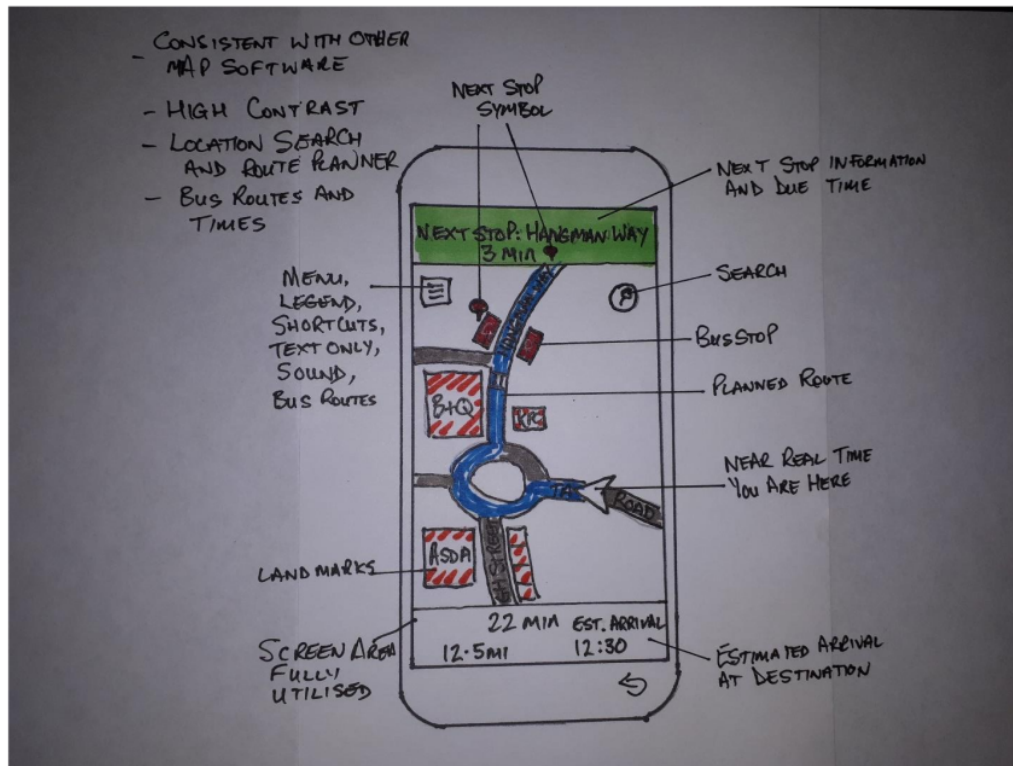


Figure 8: Map based interface sketch. Source [20]

Design Choices

Journey detail – including next stop, due time, estimated arrival time to destination. Providing up-to-date user information to track progress. Provide route and timing assurance to the traveller, with landmarks and points of interest.

Menu provided, de-cluttering the screen, improving map readability on smaller screen devices with:

- legend (map symbols)
- shortcuts (improving repeated usability)
- sound controls
- bus route planner and schedule information
- documentation on application features – how to zoom in/out of map.

Text only interface option for screen readers or low-tech devices.

Near real time feedback of bus location in relation to surrounding area, with road and landmark information displayed.

Map Usability Guidelines Analyses

Kuparinen et al's [21] proposed guidelines are relevant and extremely useful, providing focus and guidance for mapping functionality that has somewhat different usability requirements to other software function, such as email, spreadsheet or word processing. Those software formats rely heavily on textual input and output, whereas mapping software is heavily reliant on providing users visual output.

The proposed design provides:

- Contextual map function visibility – providing near real-time information updates.
- Menu driven functionality - allowing whole screen space to be utilised for map display.
- Clear indication of current location and, when close by, destination. Visual representation of landmarks and surroundings supplied to user, assisting location orientation. Information updated throughout journey.
- Full user control over other device functions - design allows mobile device functionality and application notifications to interrupt the mapping application.
- Consistency with other mapping applications - enabling user functionality (e.g. search, zooming, panning) to be familiar and accessible. Map symbology (icons) mirrors that used by other mapping technologies, paper and digital.
- Ability to save location shortcuts, Points of Interest.
- Scalability - across a range of mobile device screen sizes.
- Intuitive design - with simple, straightforward use and informative feedback the user documentation need is much reduced.
- Low resolution imagery for slower connections/devices.
- Downloadable route maps for poor connectivity.
- Touch screen capability with on-screen keyboard.
- Use of line dashing and symbology to aid colour blind users.
- Connectivity of user assistance devices.

Kuparinen's guidelines are entirely achievable and have been applied throughout the proposed design.

490 words

References CHECK THESE AND FINAL READ THROUGH

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UAE Assignment 2

GRADEMARK REPORT

FINAL GRADE

78/100

GENERAL COMMENTS

Instructor

Effective analysis of existing transport info.

1. Analysis and Design

Effective analysis of existing transport info.

An effective choice of Usability theory topics were applied and some excellent analysis applied to your solutions shown. This results in well thought out designs that would improve the passenger experience. 22/25

2. Guidelines and Accessibility

A concise analysis is given, with good examples from your resources. Accessibility issues are considered and the interesting question of how far we can generalise guidelines is briefly addressed. 19/25

3. Evaluation Strategy

The sketch of usability evaluation activities in the project lifecycle is a very useful addition. A sensible strategy is presented, with good application of examples from research and I suspect your own experience.

20

4. Map Usability

Map usability challenges are outlined with references to relevant research. A very effective map is presented with great features for bus users compared to general purpose maps and explanation in terms of Kuperinen's guidelines. 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. See comments above.

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