User Interface Design of a Driverless Car Tour Guide

COMP 1650

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Contents

User Centred Design of a Driverless Car Tour Guide

1 Introduction

This report will discuss the steps taken to design a user interface for a tour guide driverless car being launched in London. Before the design can be done, current driverless technology will be researched and looked at in depth to see what features may be required and investigate design issues. Next the user groups will be identified through research and statistics. This information will be used to create personas. These will be used to tailor the design for all types of users and each one will be given a different scenario on how they will use the car touch screen to go a journey.

Next is the design stage and good design practices will be considered to ensure that the UI will be usable by adults of all abilities. Firstly, the information architecture of the user interface will be mapped out as a user flow chart for each scenario. Next low-level wireframes will be created for these user flows of the UI in Axure. Colour theory will then be researched to find the best colour scheme for all users, considering people who may be colour blind. Fonts for the screen buttons and information will looked at to find an easy to read style and size. The dimensions of the screen, position and other features like the operating system used and layout of graphics will then be decided. It is important to also consider guidelines and standards. Legal, social and security issues will also be researched for this technology. This research will aid the final design of the prototype. Finally, the finished prototype of the touch screen user interface will be evaluated using various methods to see if it meets requirements and standards and identify any issues.

2 Background

2.1 Research

A driverless car is a vehicle that can be driven without a person operating it. Also known as an autonomous car if fully automatic. Over the years vehicles have become digital with new technology being introduced all the time (Claudel and Ratti, 2015). More recently the technologies have become so advanced that by using a computer and other technology a car can be operated without human control. They can move around by using sensors, video and GPS technology combined with computer software that processes information (Neumann, 2016). The cars computer technology can scan an area and build up a 3D image of it to avoid obstacles and track location. Most driver less cars currently on the road can still be operated by humans and have steering wheels for them to take over control but also have a touch screen Interface to control the car. On some cars only, an automatic parking feature is available, while some can drive themselves along roads monitored by someone in the driver's seat ready to take over in an emergency. Recently new autonomous cars have been released and are being tested with no manual controls at all.

Assumptions of driverless vehicles

Autonomous cars are marketed as being a safer way to travel with less accidents and deaths. However, studies have found that people do not always feel safer in these cars. Media reports of injury and death by these cars due to there being situations that these cars cannot deal with. Having a touch screen only and no steering wheel or driver is a very new concept for car passengers and may make them feel unsafe Kaur, et al. (2018). This must be considered when designing the UI.

It is also assumed that these cars are better for the environment as they are likely to be electric Kaur, et al. (2018). But what happens if power runs out or is low during a journey. From a user design perspective power consumption and the screen UI could be an issue. If the car runs low on power, will the screen still be visible or go to power save mode with a darker screen. The user may want to know the car usage settings on the UI. Such as how much power is used. The speed the car is going. All these things are important to provide the user with a safe, relaxing and enjoyable journey.

Existing driverless car user interface design

Here are some of the current autonomous cars with an overview of their user interface features.

Waymo

The Waymo car (Waymo, 2018) built by Google is fully automated but does also have a steering wheel like a regular car. On the back seats there are two large screens. It has an in-car display. It shows a visual display of the exterior and surroundings of the car from sensors and obstacles to put passengers at ease. and a big start button for them to start journey once comfortable. It also has a pull over button and a customer support button if there is a problem.

Tesla

The Tesla (2016) car is partially driverless. It has a large touch screen in portrait view. Navigation controls at the bottom of the screen for car controls, temperature, wind screen, ventilation and volume control.

Yonda

This talking tour guide car by Yonda (2018) is not driverless but uses technology for talking to passengers as they visit locations through a city. It also offers an online booking feature through their website to book a car journey. This might be easier to do than booking it in the car.

UI Design Issues

There are many design issues that must be considered. The car is likely to have no steering wheel with only a touch screen user interface and this could present design challenges when designing the interface. Responsive or adaptive design may be used depending on the device being designed for (Soegaard, 2018). The UI may only need one fixed size design if on a fixed screen. If it will be displayed on many devices, then a responsive design will be better.

Screen sizes should be large enough for all users to see. If only at the front of the car the back passengers may not be able to read the screen so large fonts could be used. Alternatively, screens could also be placed at the back of the car or at the side so everyone

can view the screen and important information like the Waymo car has. A novice technology user may struggle with using a touchscreen device. It is important to present controls in a familiar way. The use of an icon for a button may not fully explain what the button does. So the button should look familiar to the user or have text on it to explain what it does. It is important to not place design elements too close together especially if the element must be clicked (Horsford, 2016).

2.2 Guidelines and Standards

Guidelines and standards are important to refer to in user centred design. There are many guidelines to choose from. W3C(2018) has published various standards online such as one for Accessibility. Schneiderman, et al. (2017, pp.95- 97) have suggested eight golden rules for designing a user interface that designers should follow and this will be used in the evaluation.

1)Strive for consistency though out the design– It is important to have the same fonts, colour palettes and design elements throughout the UI pages.

2)Universal usability – The UI should be usable by all levels of users from expert to novice users who may not have used a touch screen device before. This should also be accessible to all ages and disabilities.

3) Offer the user informative feedback – keep the user informed of progress. If user clicks something, then they should get a response of some kind wherever it is a noise or new page loading.

4) Design the screen to yield closure - The user should be informed of their progress in completing an action. This can be incorporated into the design by displaying percentage of task completion or how many steps left.

5)Prevent errors on input– The UI should be designed in a way that makes it difficult for users to make a mistake. Especially in form input areas.

6) Allow easy reversal of actions on the screen – If a user enters the wrong destination address then there should be a way for them to go back and undo the action. A back button could help with this.

7) Give the user control – The interface should be designed to make the user feel in control and not the interface in control of them.

8) Reduce short-term memory when completing a task– People can only remember so much information and the least number of steps the better. it is recommended that a process or steps be kept to a maximum of seven. When having lots of pages to go through for setting up a car journey this should be considered.

2.3 Conclusion

In conclusion the background research will enable the designer to identify potential issues and challenges with designing a car UI. Considerations for passenger comfort, safety and usability are important. Looking at existing driverless car features will help aid the design as well as research into design guidelines and standards for touch screen devices.

3 User Groups

To design for different user's, research will be undertaken to discover statistics of technology use to aid with building personas. These personas can help the designer to empathise with users and build a better system (Goltz, 2014). The persona templates will be created based on guidelines for layout on Usability.gov (2018) website.

3.1 Persona 1

Is John a 30-year-old city worker. An experienced tech user having grown up with technology from a young age. It has been found that in a study by Statista (2017) the most common users of touch screen devices are in the 24 – 54-year-old age range, see Figure 1.

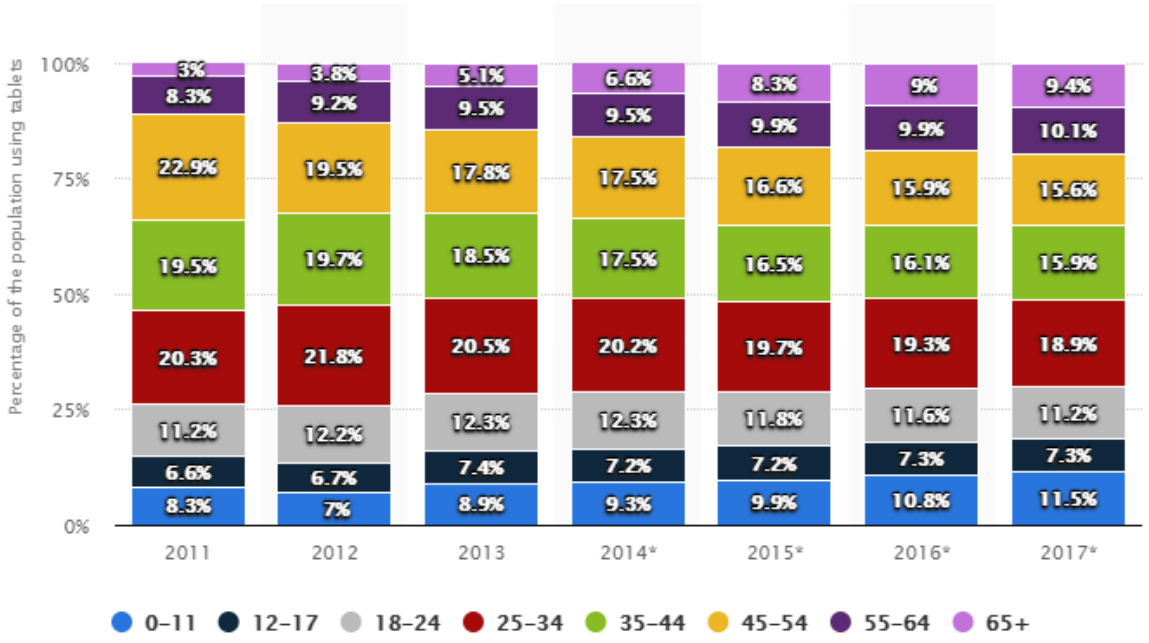


FIGURE 1 - AGE AND PERCENTAGE OF POPULATION USING TABLETS –(STATISTA 2017)

With technology and internet in the work place and at home this age group can easily use apps and computer programs without too much difficulty. This user will be able to explore some of the other features on the UI such as over riding auto settings for settings such as map features, turning on music or fan or other things that can also be controlled manually. However, it has been found in research studies that older adults also known as millennials

do tend to multitask a lot with technology and touchscreens. So, although they appear to be experienced tech users, they may lack the skills or be slow at learning new software due to being distracted (Moran, 2016).

Persona 1 Profile

This persona is for a fictional persona and features an image by RoyalAnwar (2017).

PERSONA 1

Name: John Smith

City worker and experienced technology user

DEMOGRAPHICS	GOALS and TASKS
Gender: Male **Age:** 30 **Location:** London **Job:** Office Manager **Salary:** £60,000 **Experience Level:** Expert technology User	• He uses travels through the city by Tube. It will be a fun way to explore the city on his day off or during a work lunch break • He is looking for new experiences to try in the city • It will provide a more relaxing travel experience and help him to learn more about the city history. • He likes to use touch screen devices to manage his day and leisure activities. • He is interested in new technology and learning how to use it. • He would like to make full use of the car optional settings. • During the journey he will use his smart phone to research points of interest as he passes them.

TECHNOLOGICAL & SOCIAL ENVIRONMENT
He has grown up with technology and uses a mobile phone for managing his diary and other apps. At home he uses a computer for surfing the internet and at work uses one for creating spreadsheets and managing his staff and sending emails. He has a touch screen iPad and used to controlling devices in this way.

Persona 1 Scenario - Taking the scenic route to Buckingham Palace

John is a 30-year-old city worker. He usually travels everywhere by tube. He would like to go to see Buckingham Palace on his day off work. He did not book the trip in advance so must book it in the car using his credit card details. He would like to hear a narration about the local area on route to the destination and have the radio playing the back ground. It is a cold day and he would like the car to be warmer for a more comfortable journey.

Key Activities

- Going to see Buckingham Palace
- Will book the journey in the car with a credit card
- He will manually choose car settings.
- Would like to increase the temperature of the car
- Would like to hear the tour guide
- He would like to turn on the radio
- Then he will start the journey

User Flow 1

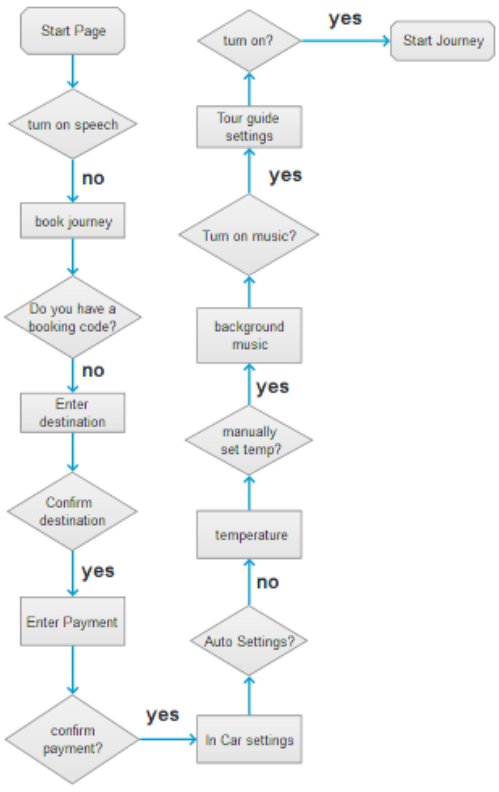
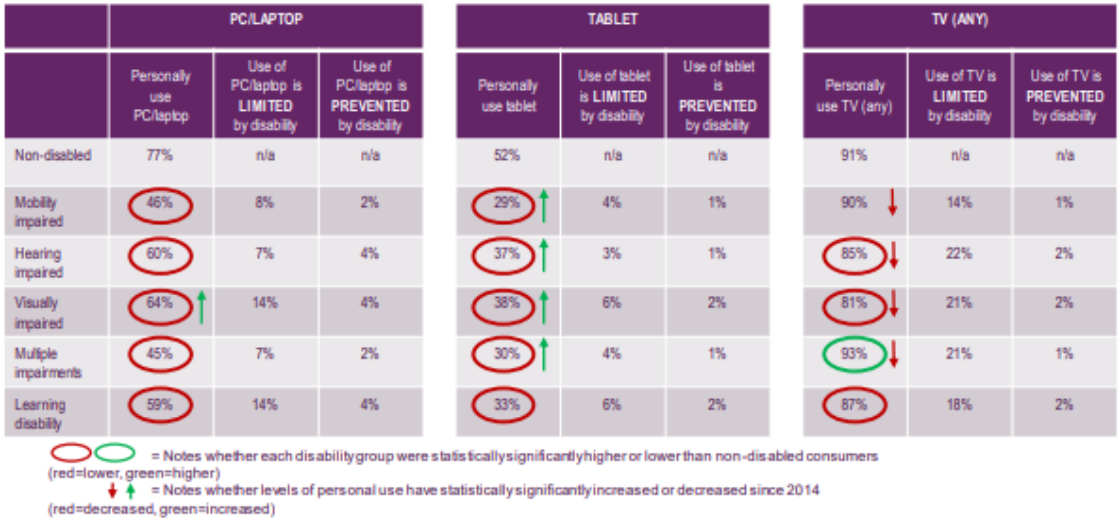


FIGURE 2 - USER FLOW FOR PERSONA 1 SCENARIO

3.2 Persona 2

Mary is a 68-year-old lady from New York visiting London for a holiday. Research has found that in 2017, the over 65's adults are less likely to use a touch screen device (Statista, 2018). With this in mind the first persona will be for and older person with poor vision who may not have used a touch screen device before or computer or may not be as experienced with technology. She might struggle to use a touch screen if the graphics are too small. May find some colours hard to see. It has been found in a study by Ofcom (2016) that having a disability does not have much of an effect on touch screen usage with only 6% of visually impaired users limited from using a device (see Figure 3 below).



	PC/LAPTOP			TABLET			TV (ANY)		
	Personally use PC/laptop	Use of PC/laptop is **LIMITED** by disability	Use of PC/laptop is **PREVENTED** by disability	Personally use tablet	Use of tablet is **LIMITED** by disability	Use of tablet is **PREVENTED** by disability	Personally use TV (any)	Use of TV is **LIMITED** by disability	Use of TV is **PREVENTED** by disability
Non-disabled	77%	n/a	n/a	52%	n/a	n/a	91%	n/a	n/a
Mobility impaired	46%	8%	2%	29% ↑	4%	1%	90% ↓	14%	1%
Hearing impaired	60%	7%	4%	37% ↑	3%	1%	85% ↓	22%	2%
Visually impaired	64% ↑	14%	4%	38% ↑	6%	2%	81% ↓	21%	2%
Multiple impairments	45%	7%	2%	30% ↑	4%	1%	93% ↓	21%	1%
Learning disability	59%	14%	4%	33%	6%	2%	87%	18%	2%

= Notes whether each disability group were statistically significantly higher or lower than non-disabled consumers (red=lower, green=higher)

↓ ↑ = Notes whether levels of personal use have statistically significantly increased or decreased since 2014 (red=decreased, green=increased)

Source: Ofcom research among disabled consumers, using BPS study 2016

FIGURE 3 DISABLED CONSUMERS OF TECHNOLOGY STATISTICS

This persona may also be applicable to other users with or without disabilities who may not be experienced with technology so will benefit from an easy to use system.

Persona 2 Profile

This persona profile is for a fictional person with an image by art250(2015).

PERSONA 2

Name: Mary Walter
Retired tourist has trouble with vision and is new to technology

DEMOGRAPHICS	GOALS and TASKS
Gender: Female **Age:** 68 **Location:** New York **Job:** Retired **Salary:** £20,000 Pension **Experience Level:** Novice Technology User	• While on holiday she would like to explore the city • She would like the journey to be easy to use and relaxing. • She does not get on well with technology so wants an easy to use service • She will pre book the journey with an agent. • She wants to see help and guidance on the car control panel. To tell her what is happening and what to do. • She would like the Car control panel to speak through the set-up process of the journey.

TECHNOLOGICAL & SOCIAL ENVIRONMENT
Mary grow up in a time before mobile phones computers and touch screen devices. She has recently got her first desktop computer to keep in touch with her family. She finds it very hard to learn how to operate it. She owns an old-style mobile phone for emergences with a keypad and no touch screen.

Persona 2 Scenario – Taking a sightseeing trip to the Tower of London

While on holiday in London Mary would like to visit the London Bridge. She previously booked the journey at an agent's office and has been given a booking code to enter in the car interface. She struggles with poor vision when reading so will select the text to speech option to help make the journey. Next, she will confirm her pre-booked journey. She will then choose to keep the car on all automatic settings. The car will confirm the journey details and Mary will be instructed to click the start journey button.

Key Activities

- She would like to visit the London Bridge
- She previously booked the journey with an agent so will enter a booking code
- She has poor vision and will select text to speech
- She will confirm journey details

- She will keep the car settings on automatic mode
- Then she will begin the journey

User Flow 2

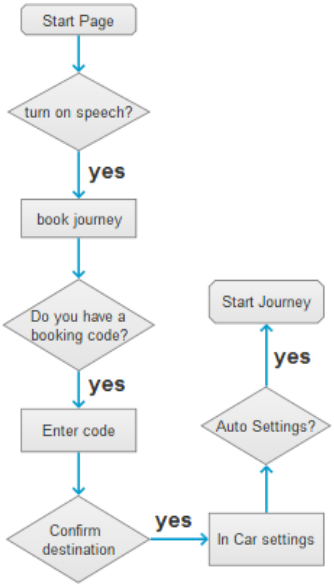


FIGURE 4 - USER FLOW FOR PERSONA 2 SCENARIO

3.3 Conclusion

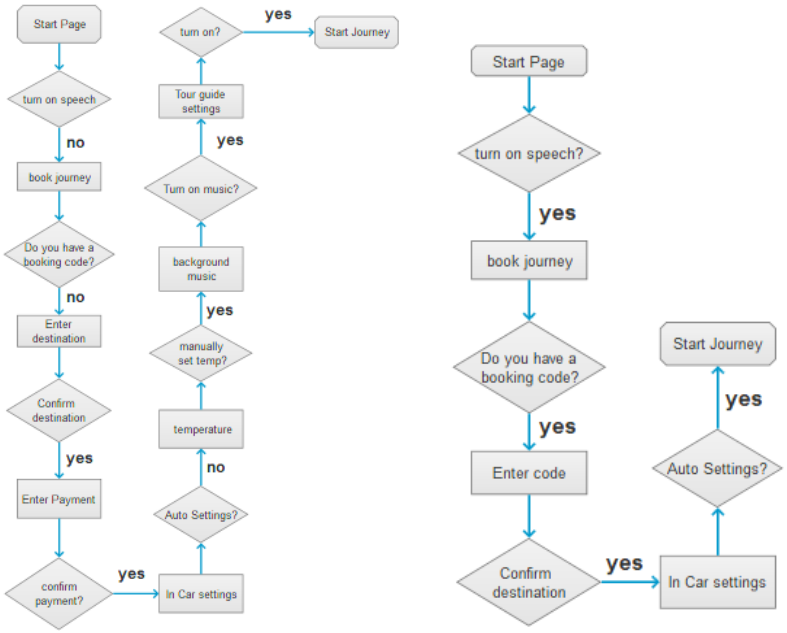
By researching technology users this information has been used to help create two personas for the driverless car. One being a novice tech user and one being experience at using technology. These profiles will help with the design of the product. Ensuring that the UI meets all their needs. Creating scenarios for both will be used as a guide to designing the interface and the functions of it. First user flows were created then the design research can begin.

4 Visual Design

Now that the research has been completed and user personas and user flows created, and UI design issues have been identified the research for the design stage can begin. Looking at colour theory, typography and design elements and patterns that will be chosen for the UI.

4.1 Information Architecture

The previously designed user flow diagrams will be used as a guideline for designing wireframes. The wireframes can be seen in the later chapter 5.1.



4.2 Colour Theory

For the higher-level prototype colours will be added to make the UI more appealing to the eye. All colours have a meaning and it is important to look at this before deciding on a colour scheme.

FIGURE 5 THE LOGO COMPANY (2018)

All colours have a meaning when used in design and this should be considered when designing the UI. As can be seen in figure 5 by the Logo Company (2018) brand colours have a meaning. This interface is for a vehicle that needs to get a user's trust and they will want to feel safe on their journey. Blue is a primary colour and the colour of strength and trust, so it would make a good choice for a main colour. In research blue has been found to be the colour most people like. The colour blue in figure 6 will be used.

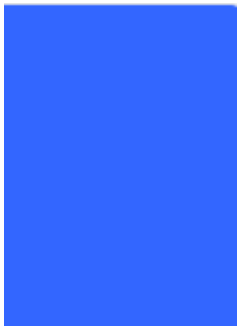


FIGURE 6 - COLOUR #3366FF

The second colour chosen will be a pale yellow (see Figure 7). Chosen for being a complementary colour to blue. As can be seen in Figure 8, most colour blindness can see yellow although the shade may change.

FIGURE 7 - COLOUR #FFFF66

In addition to these colours white will be used for text and gray will be used for the speedometer and thermometer.

COLOUR BLINDNESS

Some people are not able to see all colours due to different types of colour blindness (see figure 8). Blues stays the same colour but changes slightly.

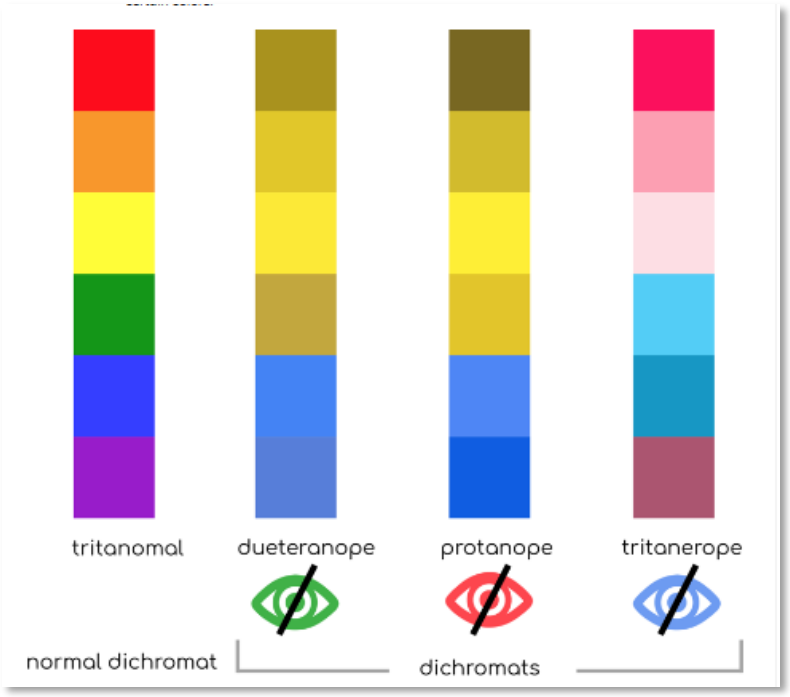


FIGURE 8 - COLOUR BLINDNESS CHART (UXBOOTH 2017)

4.3 Typography

The user interface will need to be accessible to all users including people with poor vision. It is important to choose a font that is easy to read at all sizes. There are different styles of font such as a Serif font that has a serif point at the end of letters. Sans Serif font which has no ending Serif. There are now many more unique fonts to chose from. It has been found in studies by Built With (2018) that the most popular provider of fonts for websites and other technology displays are the Google Fonts (2018). It is used in over 35 million websites and products worldwide. Looking at the statistics for individual use of google fonts the most popular font is Roboto font followed by Open Sans and Lato. In tests performed by Egorina (2018) on the Roboto font with people with visual impairments, it was found that the font performed well, and the letters were still visible although blurry. In figure 5 the results can be seen. This will be used as one of the fonts for the car UI.

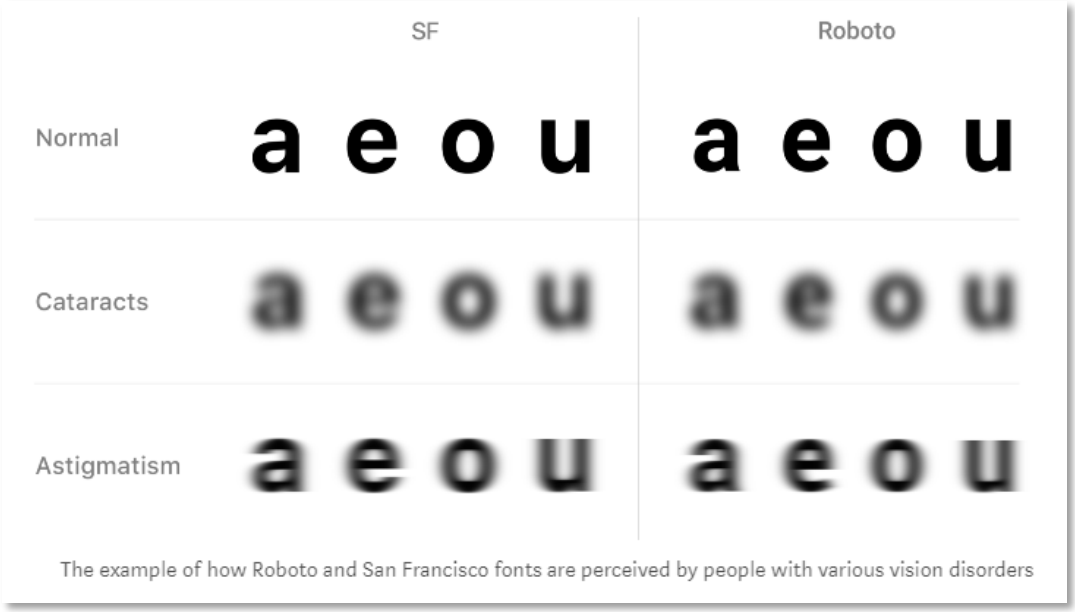


FIGURE 9 TEST OF ROBOTO FONT WITH VISUALLY IMPAIRED (ERORINA, 2018)

The third most popular Google Font is Lato (See figure 7). This font does not have serifs on the end of the letters, so it is a Sans Serif font. It has been found that sans serif fonts are easier to read on websites and touch screen devices. For people with visual impairments this is one of the easiest fonts to read. Sightsavers (2018), a charity that promotes and helps people with sight disabilities, states on its website that they use Lato font for their branding. They have found that it is one of the best fonts for visual impairments.

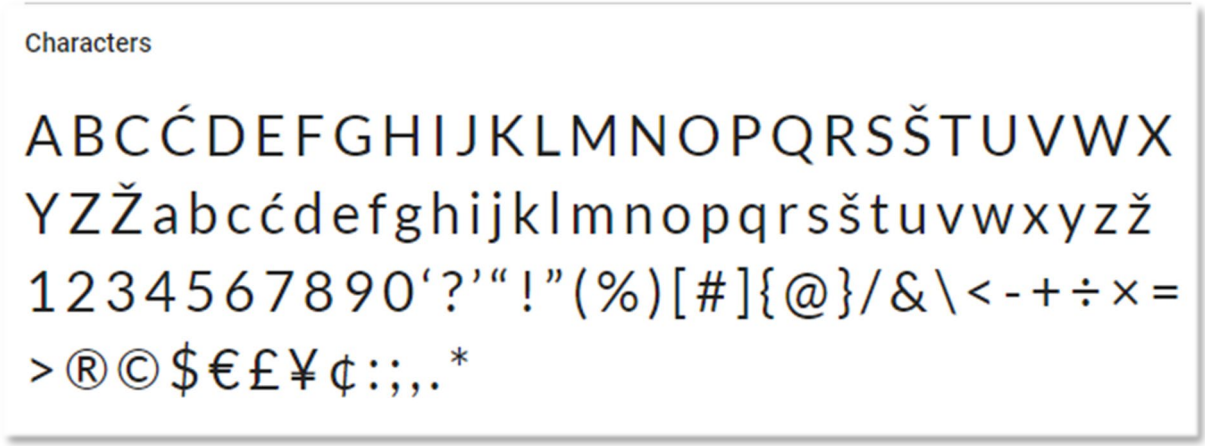


FIGURE 10 - LATO FONT BY GOOGLE FONTS (2018)

Font sizes will be very large and a minimum size of 16px for paragraphs and 20px for text or bigger to enable all see the text.

4.4 Layout Design

The screen UI will be the dimensions of 800px by 500px and will be viewed only in landscape mode.

Design Patterns

User Interface design patterns can help to solve design problems. In this project there will be several patterns in use.

WIZARD DESIGN PATTERN

This pattern can be used to help a user complete steps such as completing a payment or signing up on a website in a user-friendly way (UI Patterns, 2018). The car UI will make use of this feature as it enables users of all skills levels to complete the booking of a journey process. By using back and next buttons or arrows. If user makes a mistake they can return to the previous page.

INPUT PROMPT DESIGN PATTERN

Using an input prompt within a form area can be very helpful to give guidance to a user on what information to enter (UI Patterns, 2018). Or the question could be entered within the input box. On the car UI a destination will be searched for and this is one area where the input prompt could be used.

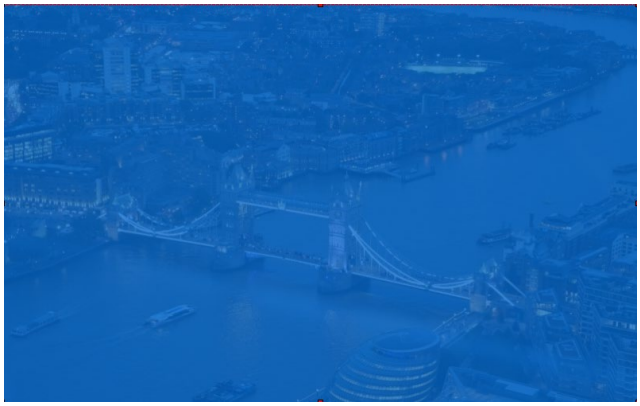
DASHBOARD DESIGN PATTERN

These are used to display multiple information and data on one screen (UI Patterns, 2018). This could be used on the car UI after booking has been completed to show destination and other options chosen. Or for selecting the car settings.

4.5 Graphic Design Elements

IMAGES

The UI background will have a large image by Rathmayr (2018) with a dark blue over lay on top. It has been found by Lighthouse international (Arditi, 2018) that people with poor vision are able to see text clearly if on a dark background.



Car Company Logo

For the company branding an image of map and location pin by (Demarco, 2018) has been used.

FIGURE 11 - PAGE BACKGROUND

BUTTONS

Buttons will be a large size, so they are easy to click with a finger. With white or pale yellow backgrounds and dark blue text for good contrast, so people with visual impairments can easily read the text.

FIGURE 12 - LARGE BUTTONS

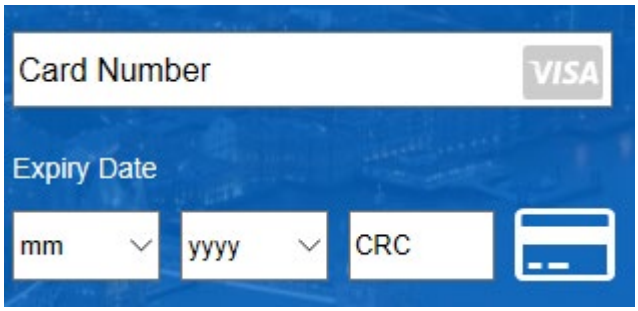
ICONS

Icons will be used through out the design. However, to make it clearer what the image is about text will be added alongside it. The radio icon is by WPZoom (2018), the Bluetooth icon is by Google Material Design Icons (2018) and the musical notes icon is by Lung(2018).

FIGURE 13 - ICONS WITH TITLE

FORM INPUTS

The form inputs have text within the input area or above to keep the design neat and easy to read.



4.6 Conclusion

The choices for colours, typography and graphic elements have all been chosen based on research and design standards. These choices should enable all users to find the UI easy to navigate and people with visual impairments will also be able to use the system. These design elements will be considered when designing the low-level wireframe and high-level prototype.

5 Design of the Prototype

5.1 Low Level Prototypes

The initial wireframe prototypes are created with pencil and paper to show different ideas for the design. This version will feature no graphics or colours and will only show rough examples of features and placement. Two ideas were sketched out based on the user flow diagrams for the two personas.

Version 1

PERSONA 1 SCENARIO 1

9)

Music

Radio
Bluetooth
Car Audio

Exit

10)

Tour Guide Narration

Yes
No

Exit

Dashboard

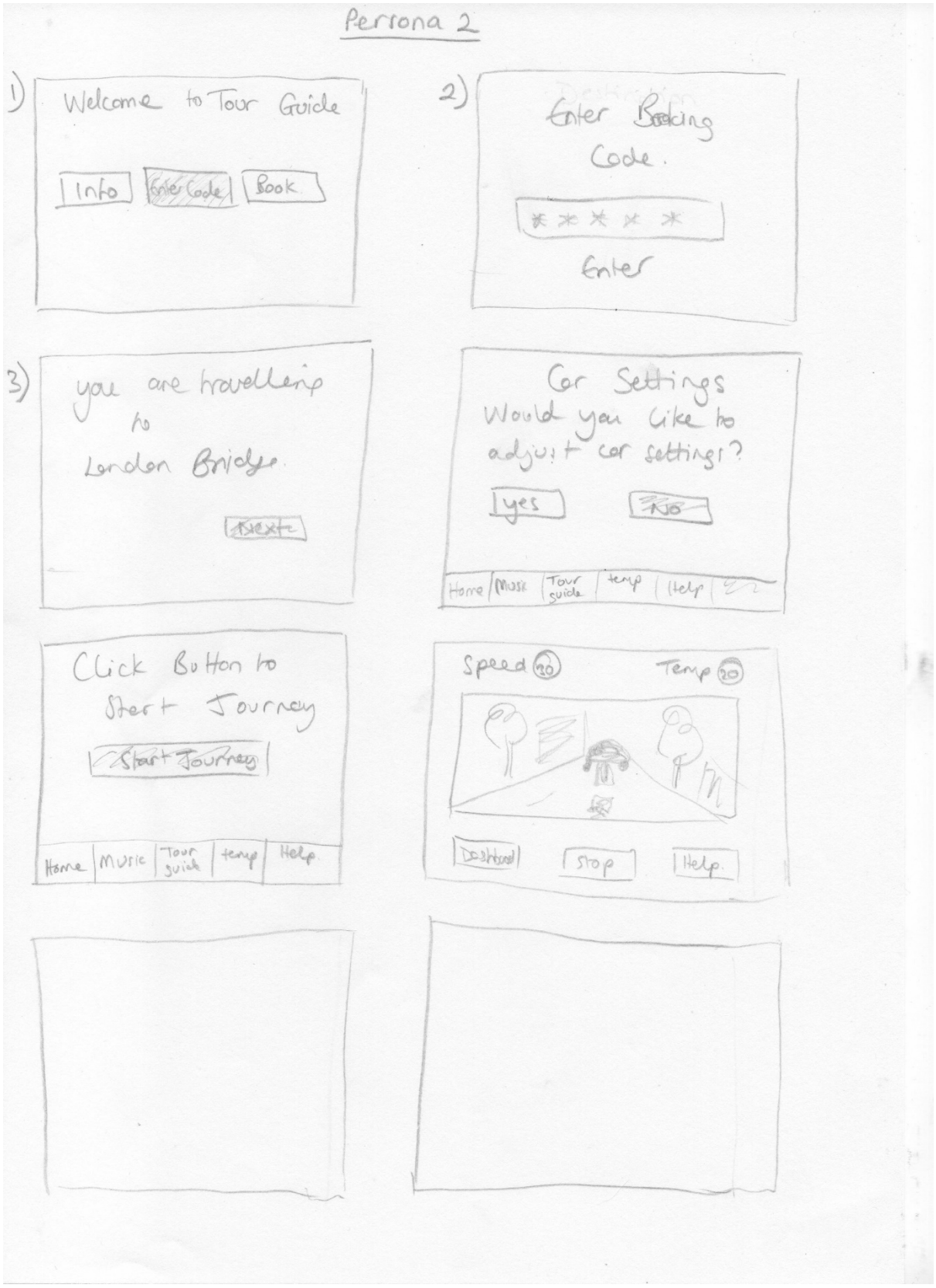
Start Journey

Home | Music | Tour guide | Temp | Help | Stop

Speed 30 Temp 20°

Dashboard | Stop | Help

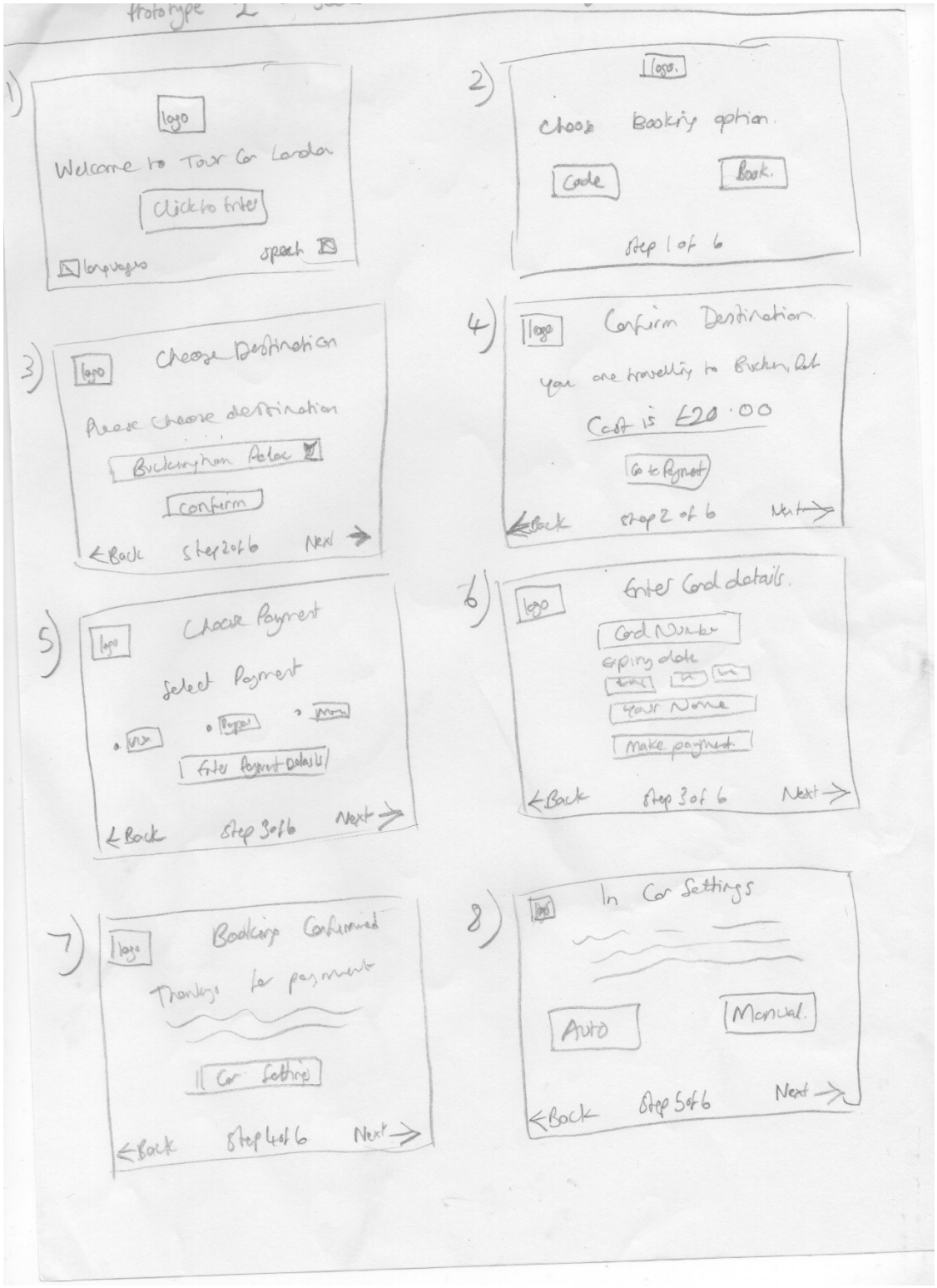
PERSONA 2 SCENARIO 2



Version 2

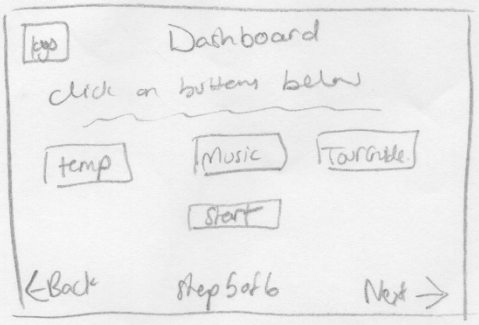
PERSONA 1 SCENARIO 1

This is the wireframe sketch for persona 1 scenario.



Continued . . . . Persona 1 Scenario 1 – Prototype 2.

9)



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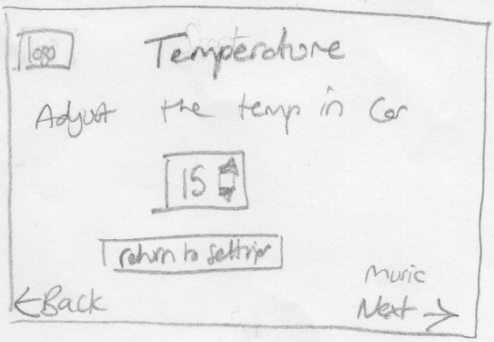

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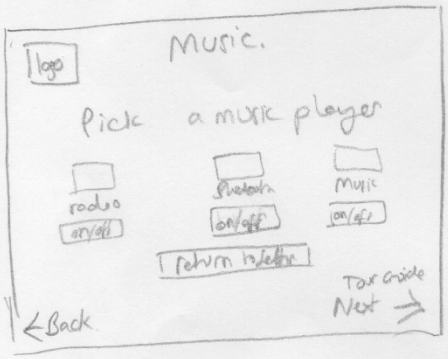

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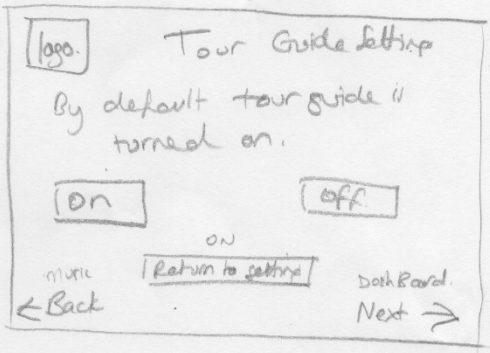

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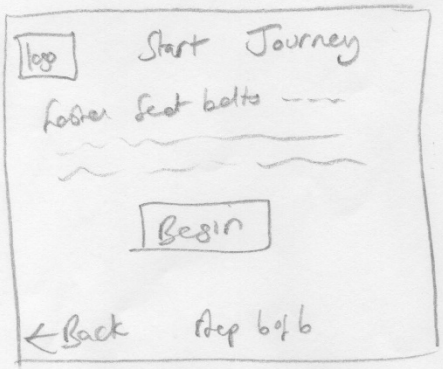

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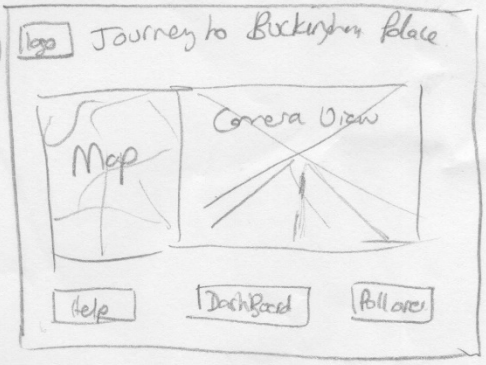
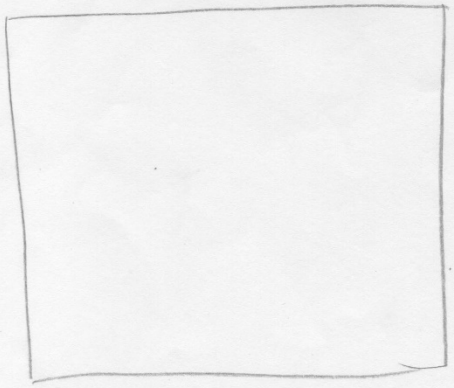
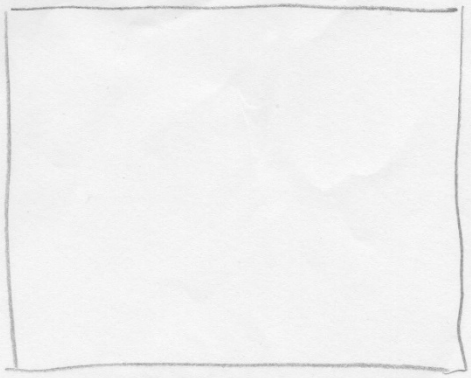


15)

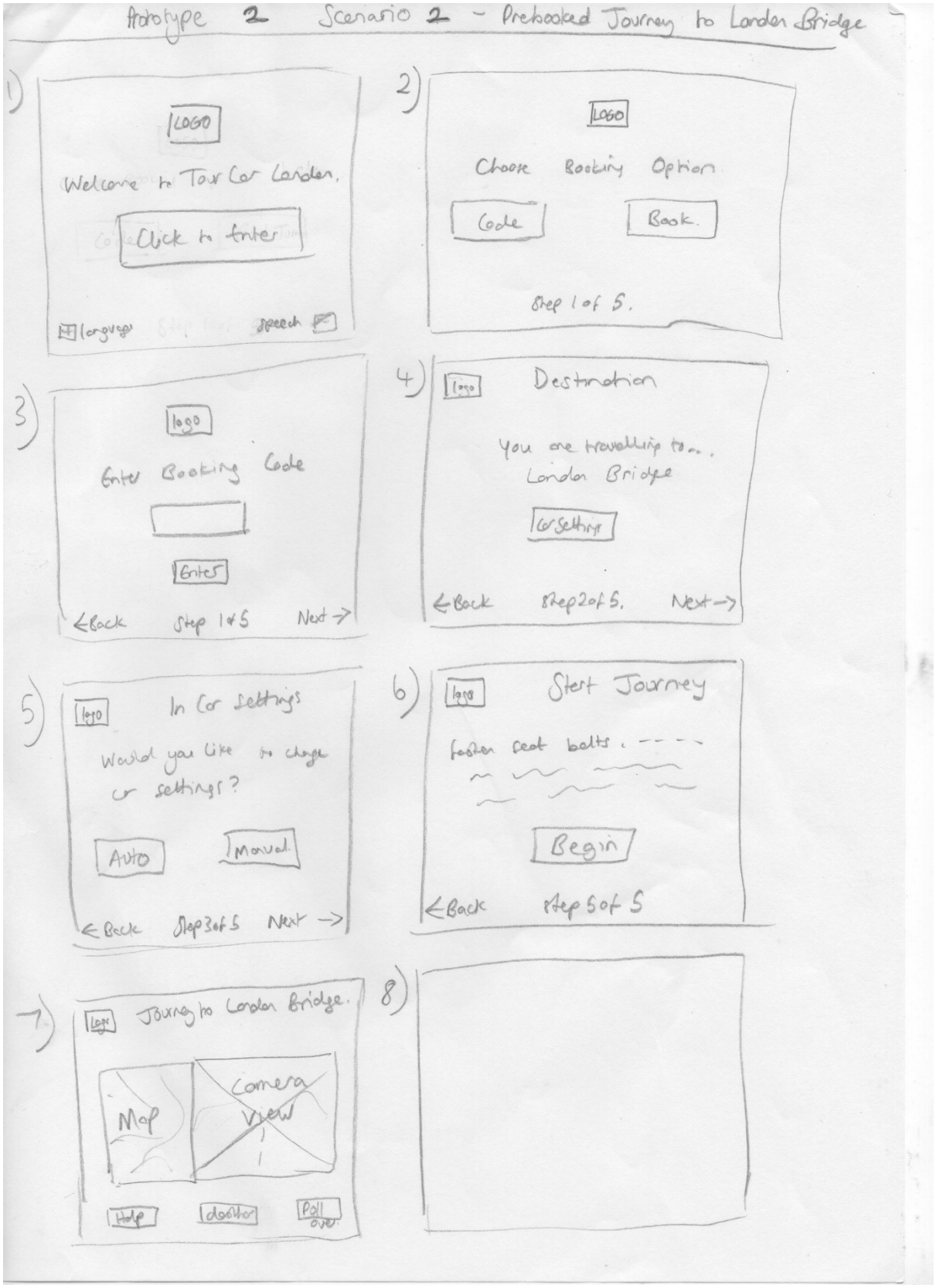


16)



PERSONA 2 SCENARIO 2

This is the wireframe sketch for persona 2 scenario.



Selection Process

Both designs were looked at and it was decided that version 2 would be chosen for the final prototype design. This version meets the guidelines by being more accessible to all users and a simple design being easy to navigate.

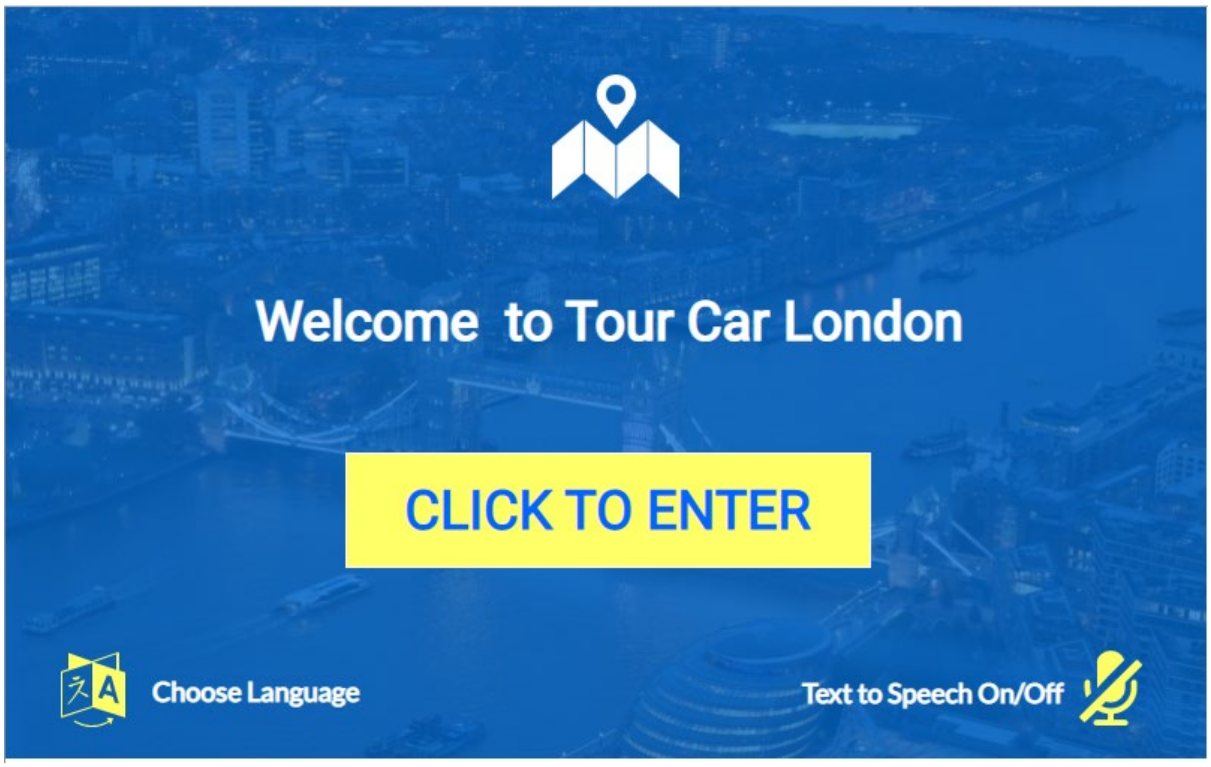
5.2 Final High-Level Prototype

The final prototypes were created using Axure RP (2018). These were created based on the research and planning earlier in the report and designed for each persona / scenario. Using the chosen sketched wireframes as a guide.

Link to the Prototype online: https://1ws0qm.axshare.com/#g=1&p=welcome

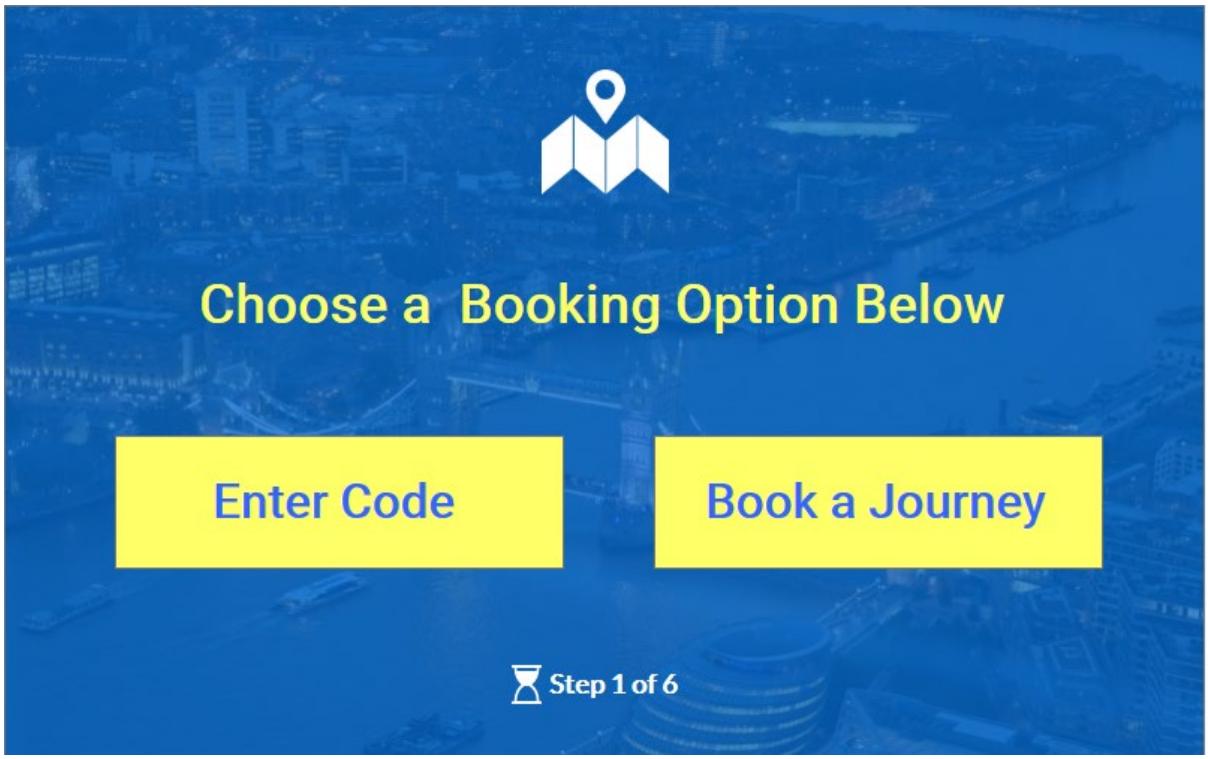
Persona 1 Scenario Prototype

1) WELCOME PAGE



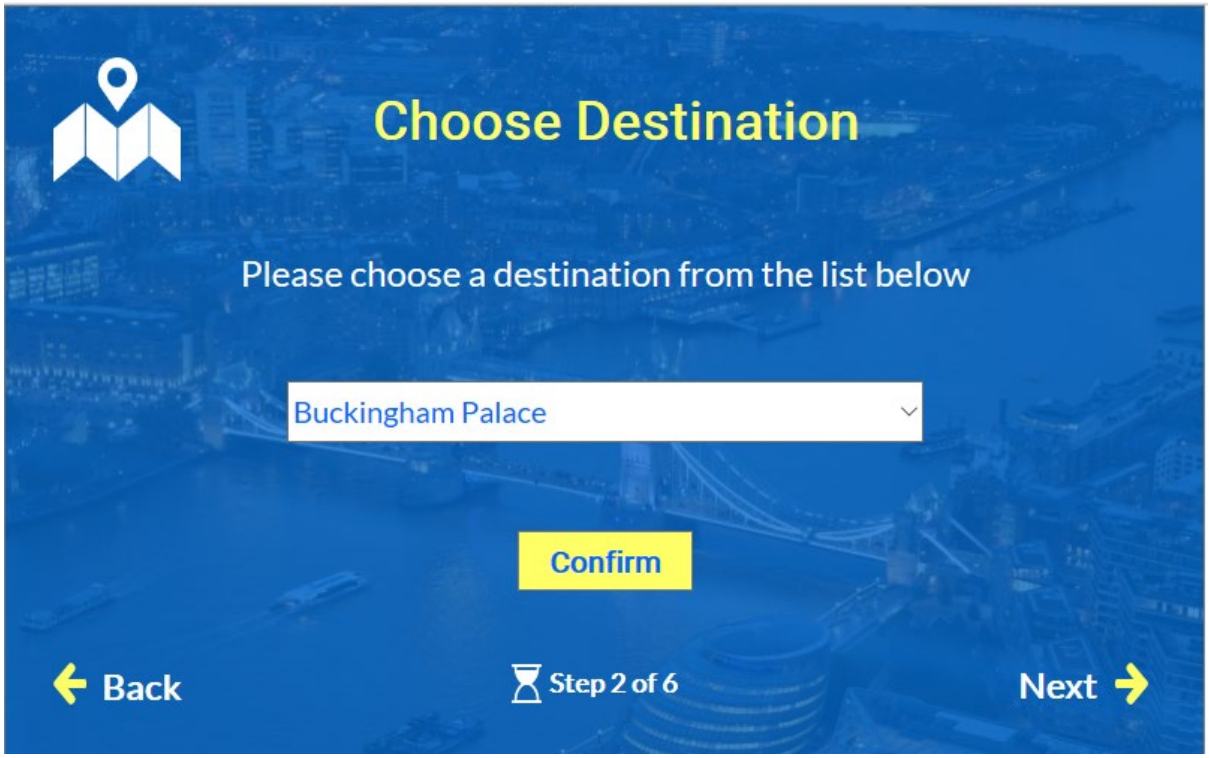
Simple layout. Large button to enter system can be viewed easily by all. Main titles use Roboto font. Text and paragraphs use Lato font.

2) CHOOSE BOOKING OPTION



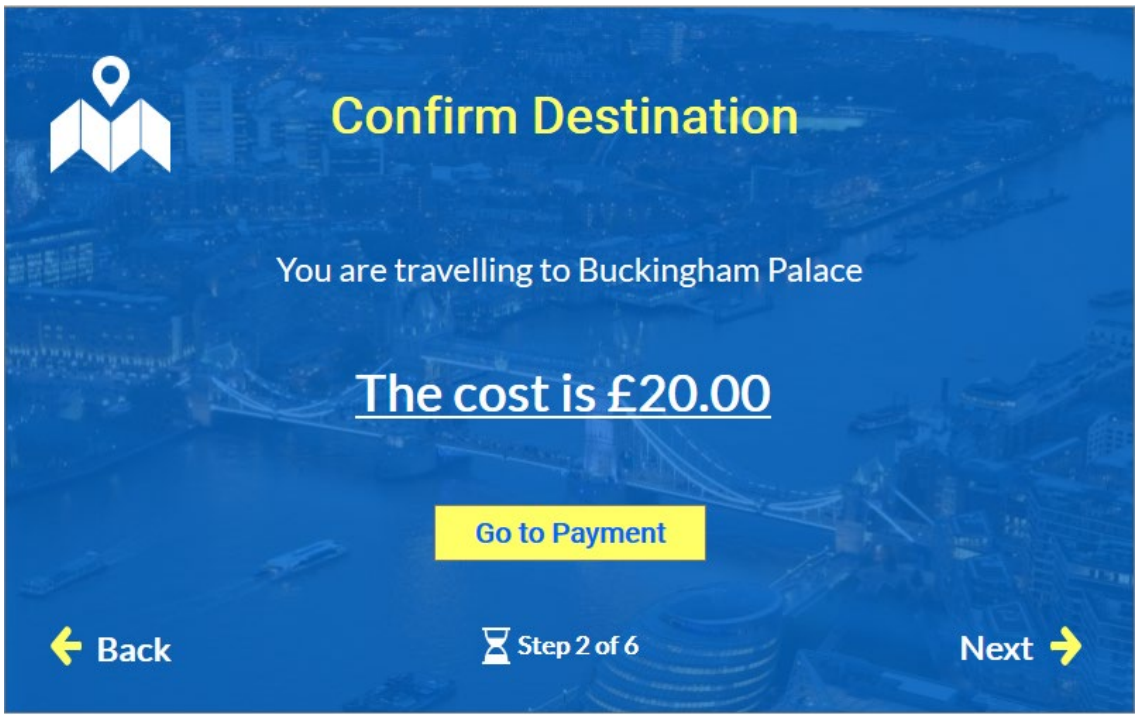
Wizard design pattern used by using step 1 of 6. Simple design for ease of use. Book a Journey will be clicked to load destination page

3) CHOOSE DESTINATION



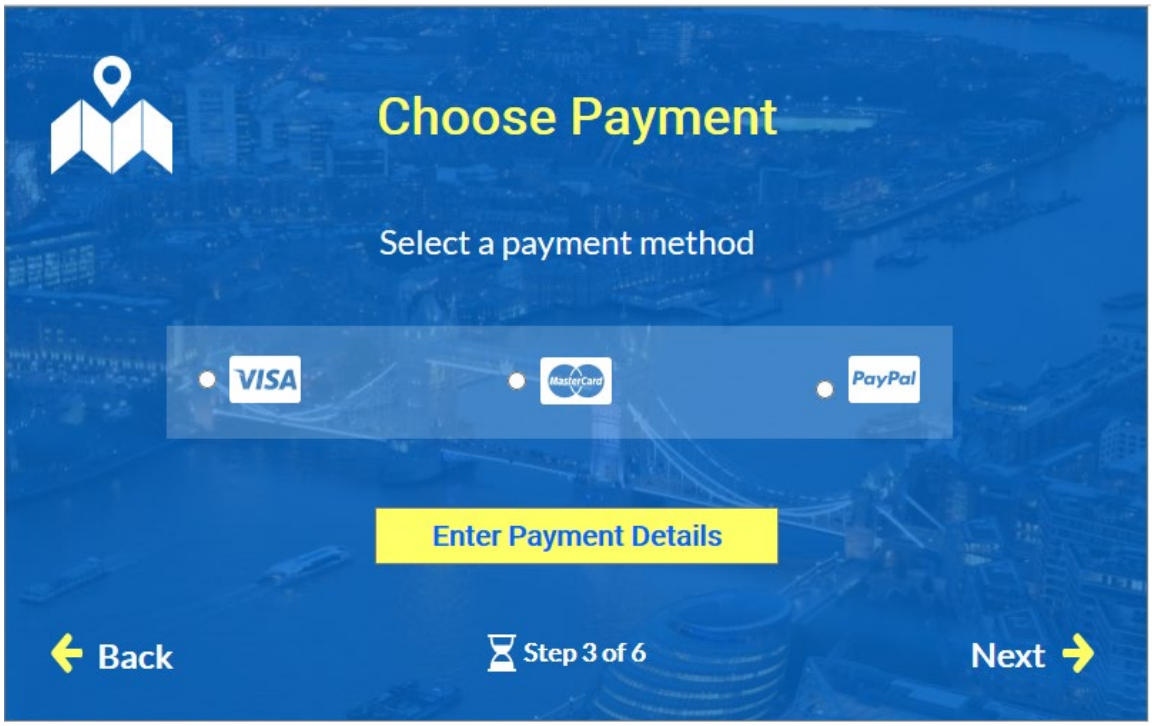
Wizard design pattern with next and back buttons and steps. Locations are in a drop down list no typing, pre-programmed destinations only. Click “confirm” to go to the next page.

4) CONFIRM DESTINATION



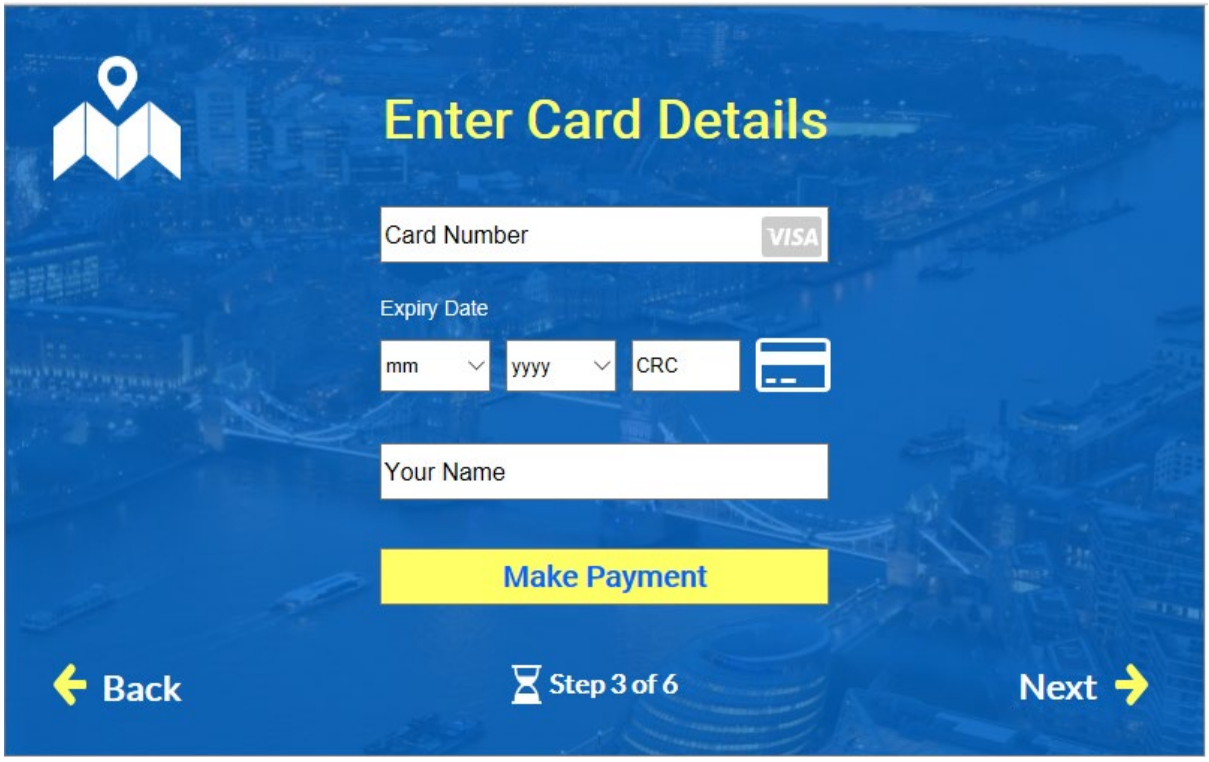
User will click button to make payment. Option to go back if a mistake is made.

5) CHOOSE PAYMENT



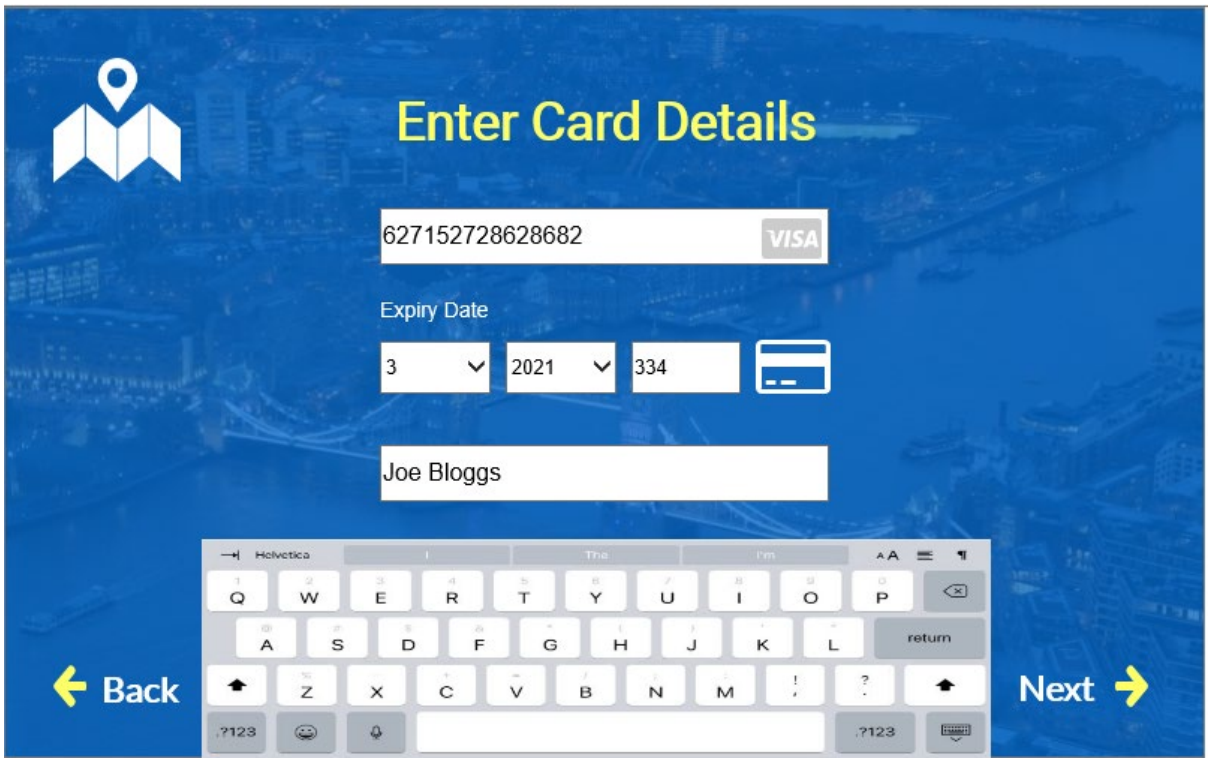
Payment method is chosen then click button.

6) PAYMENT DETAILS



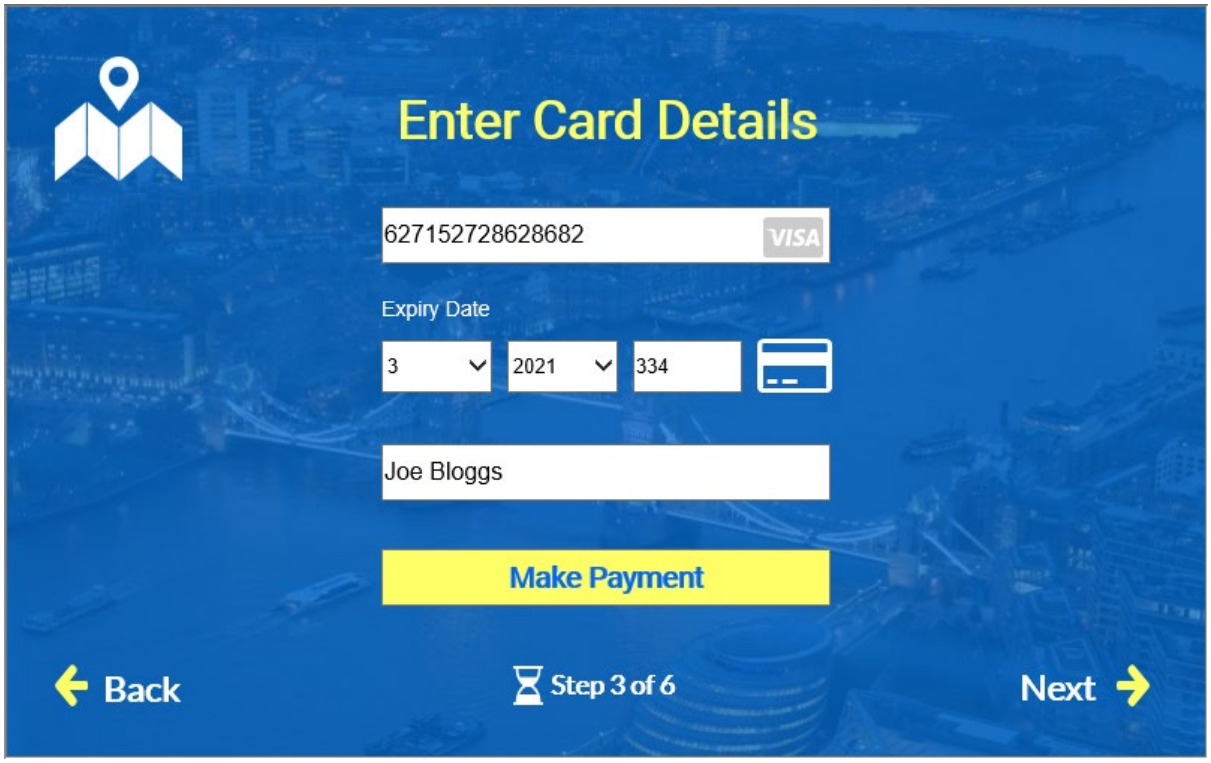
Form input contains helper text on what to write.

7)ENTER CARD DETAILS KEYBOARD



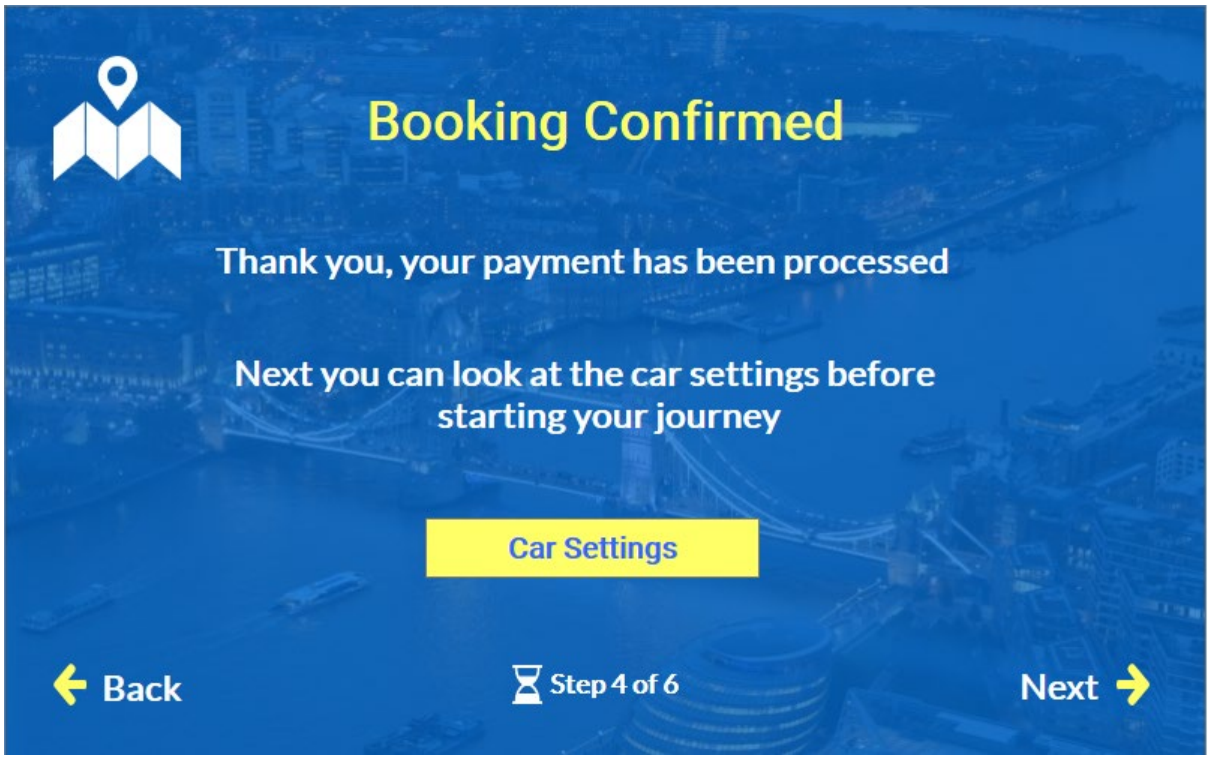
Keyboard pops up to enter details

8)CARD DETAILS ENTERED



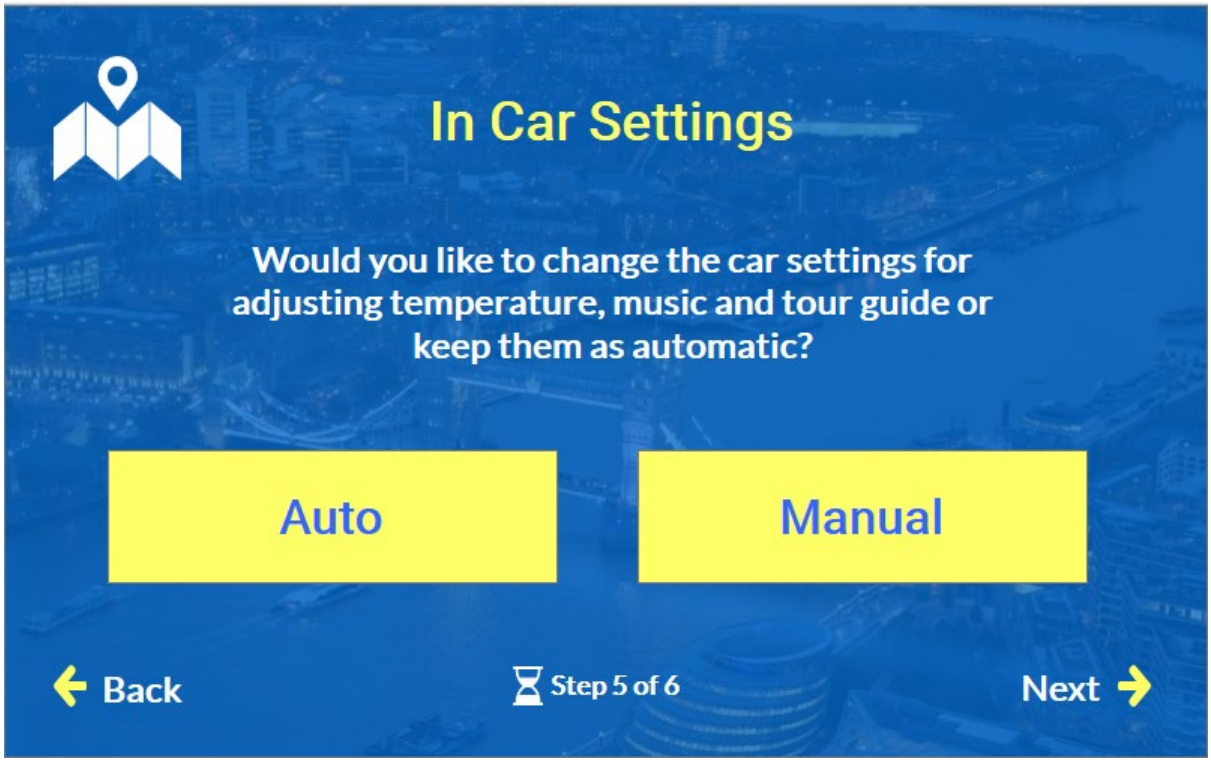
When details are entered payment can be made.

9) BOOKING CONFIRMED



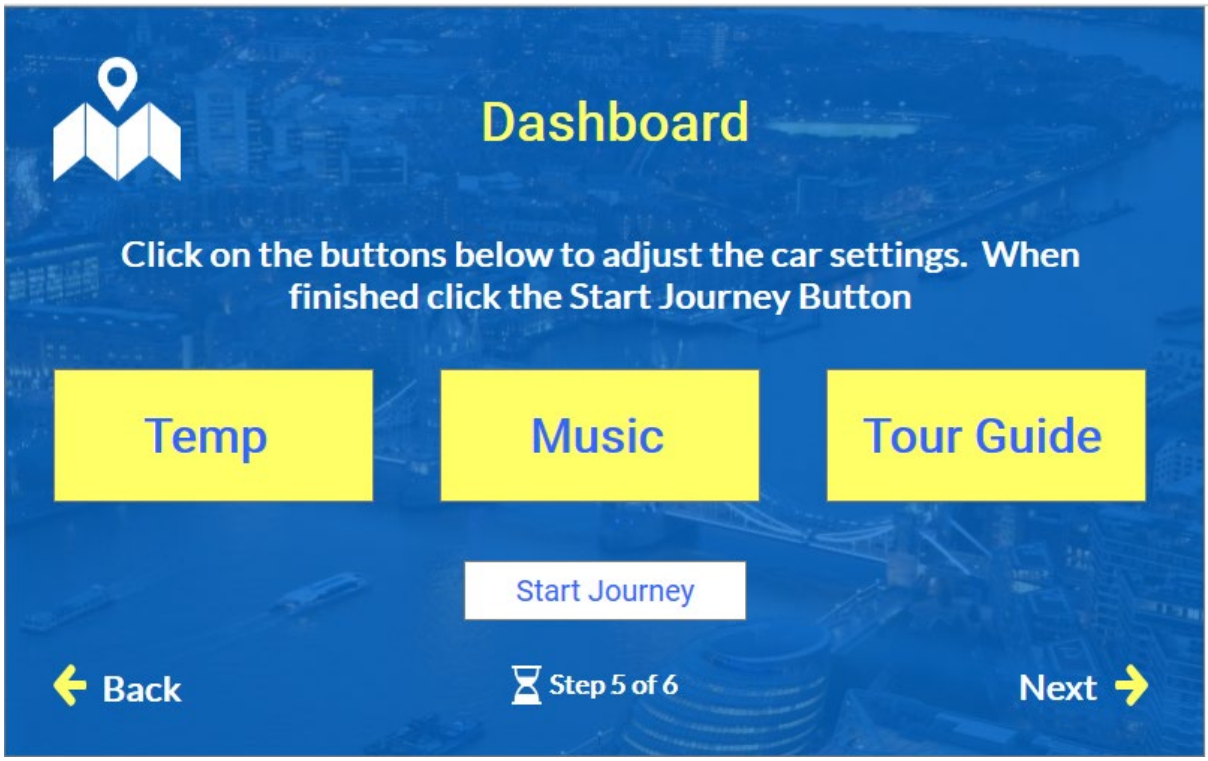
Payment is confirmed. Now Car settings can be adjusted.

10) IN CAR SETTINGS



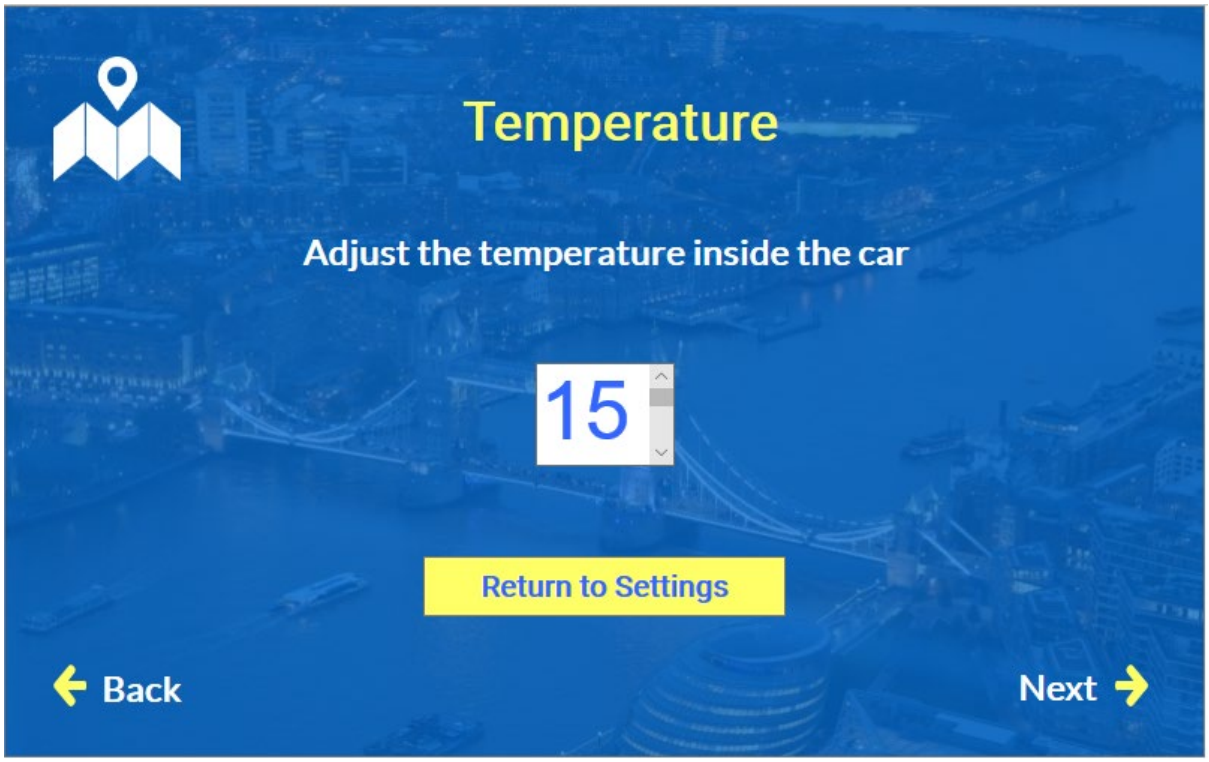
The user will choose manual settings.

11) DASHBOARD

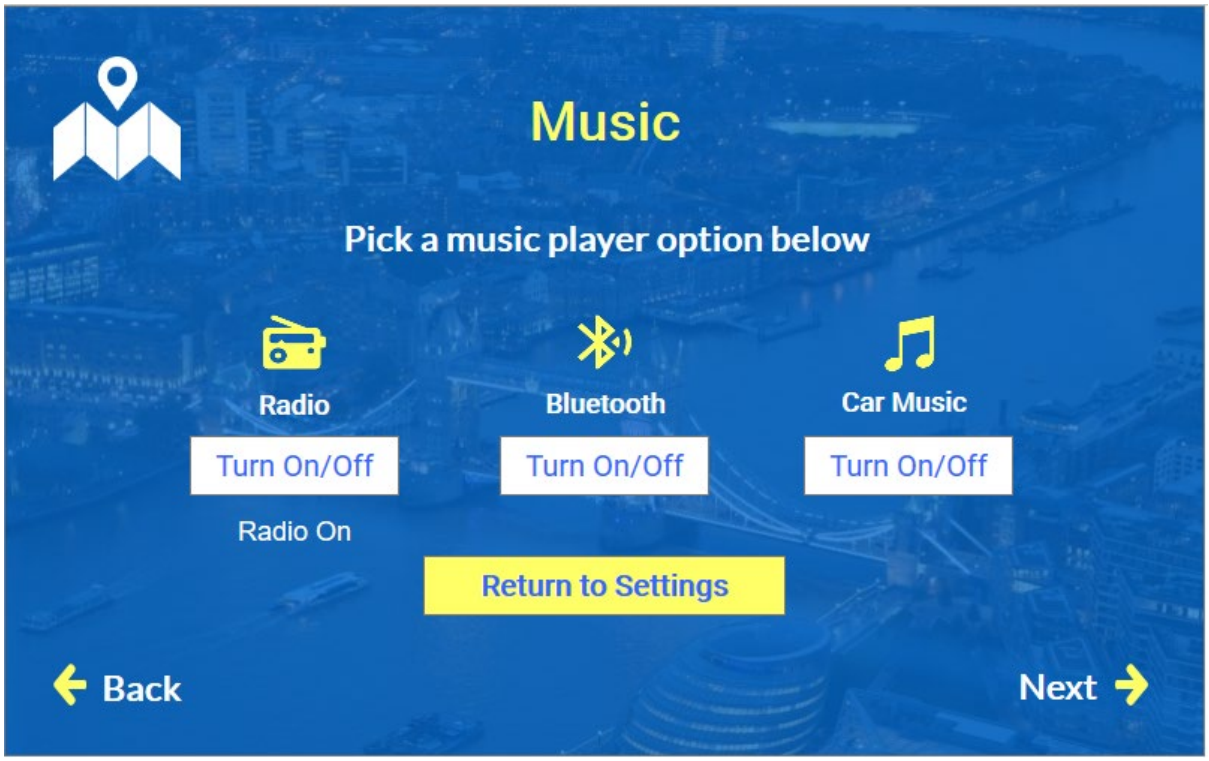


First he will set the temperature

12) TEMPERATURE

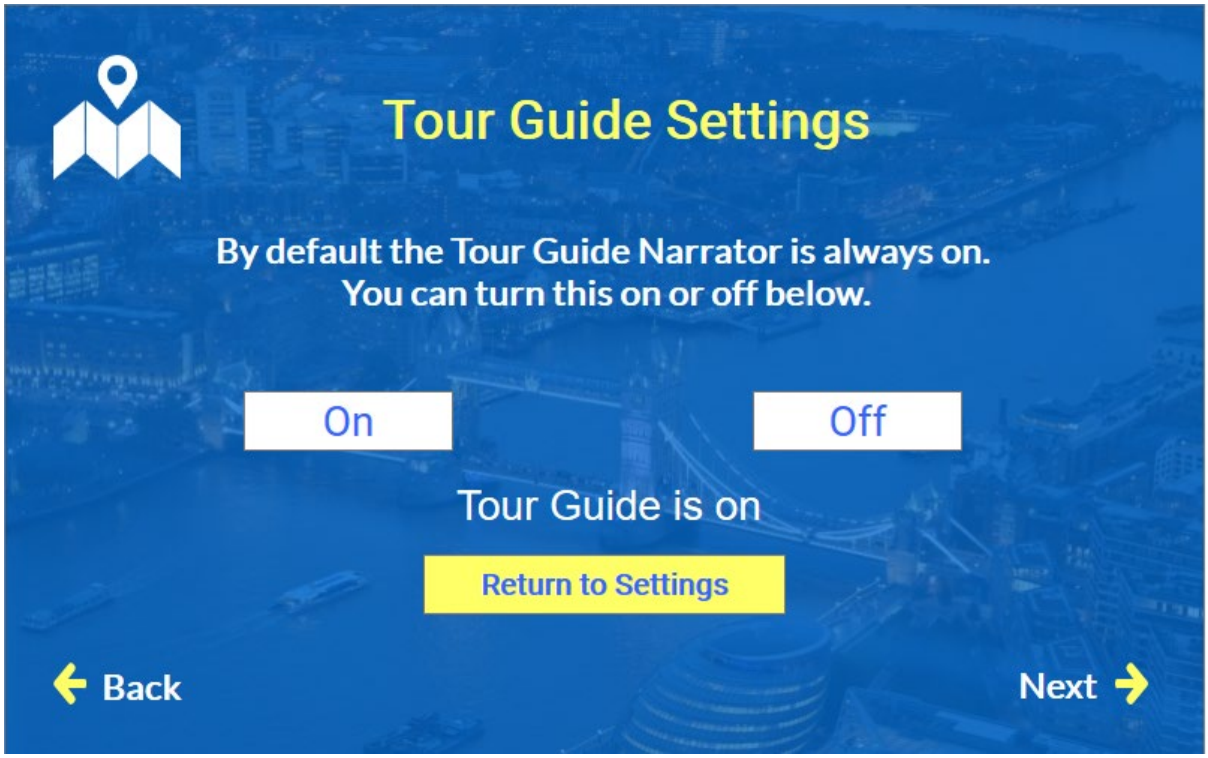


13) MUSIC SETTINGS



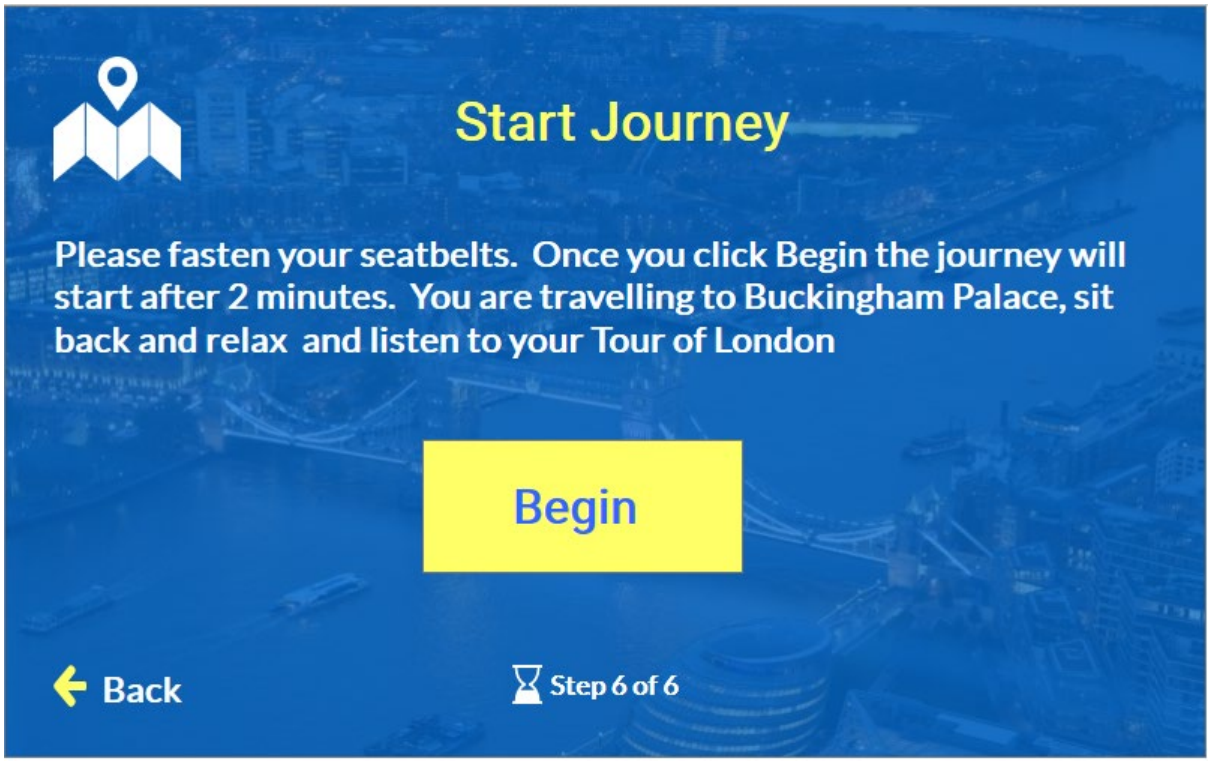
Then he will turn on the radio.

14) TOUR GUIDE SETTINGS



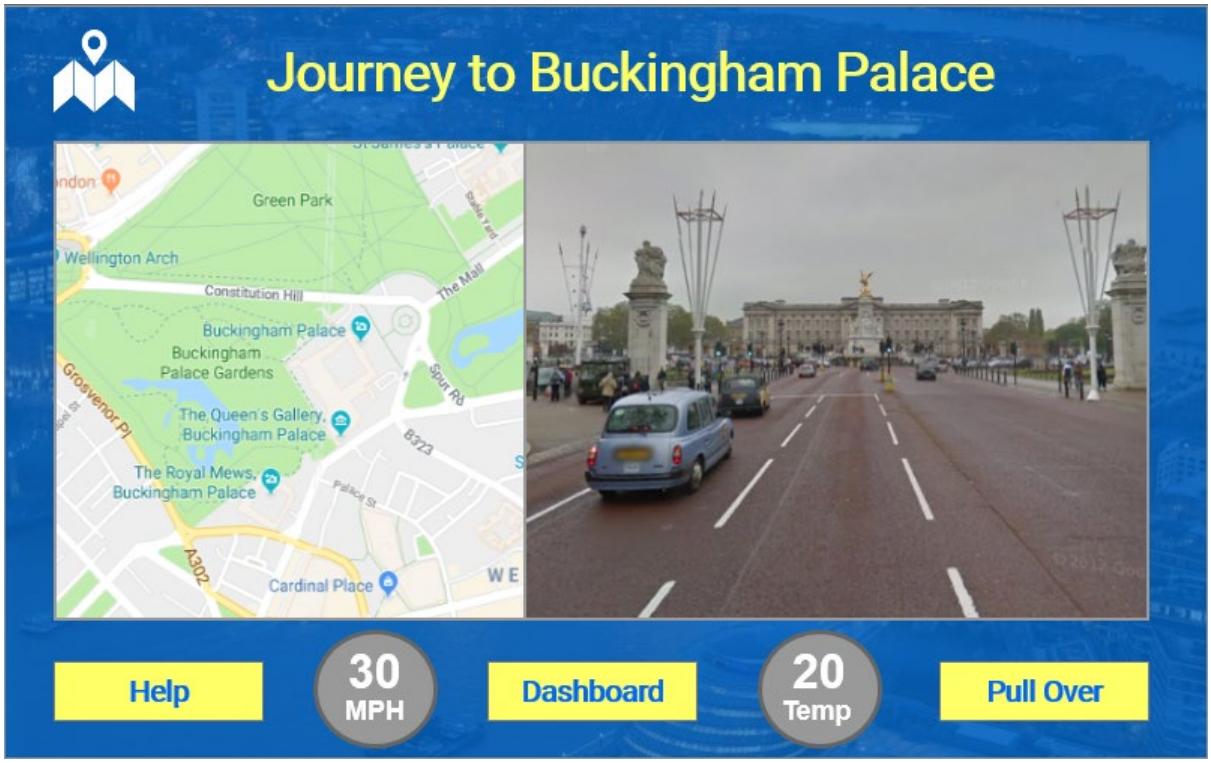
He will keep the tour guide on.

15) START JOURNEY



Then he will start the journey.

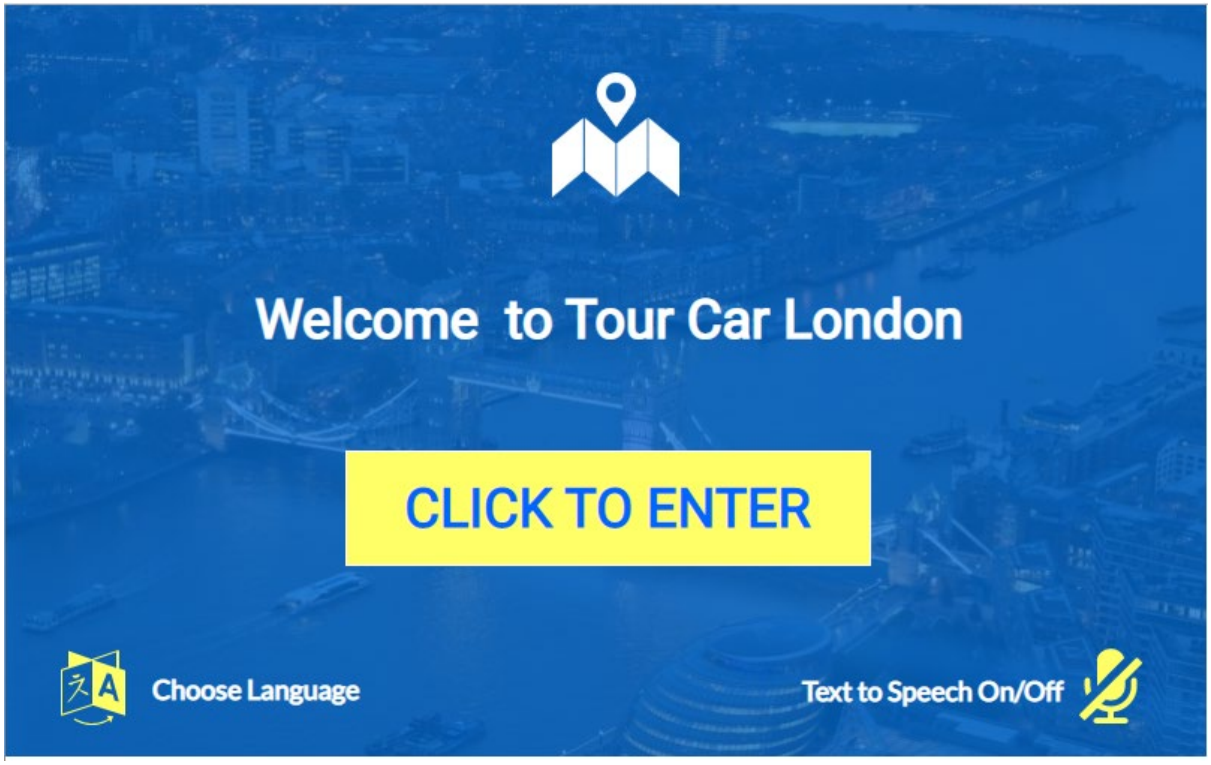
16) JOURNEY



Dashboard displays, miles per hour, temperature, link to dashboard, help and a pull over button for emergency. Map and live view are shown.

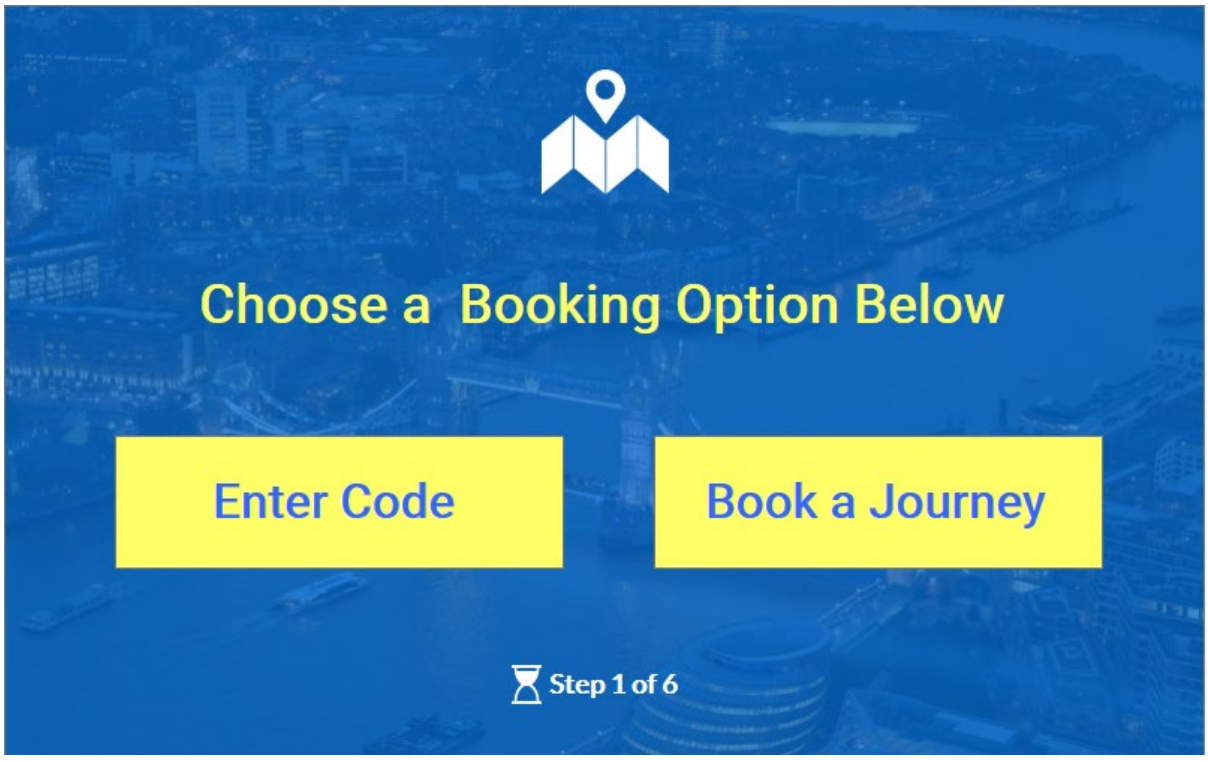
Persona 2 Scenario Prototype

1)WELCOME PAGE



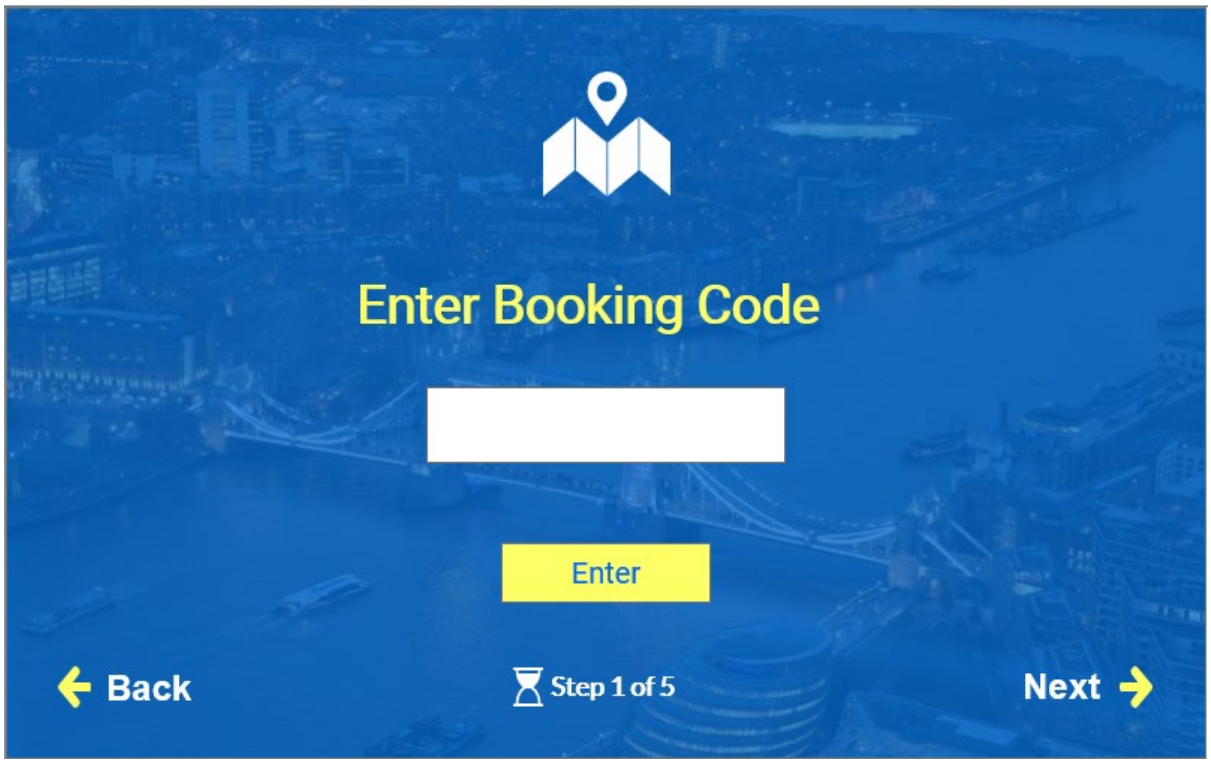
The user will turn on the text to speech button to narrate all the text on the screens.

2) CHOOSE BOOKING OPTION

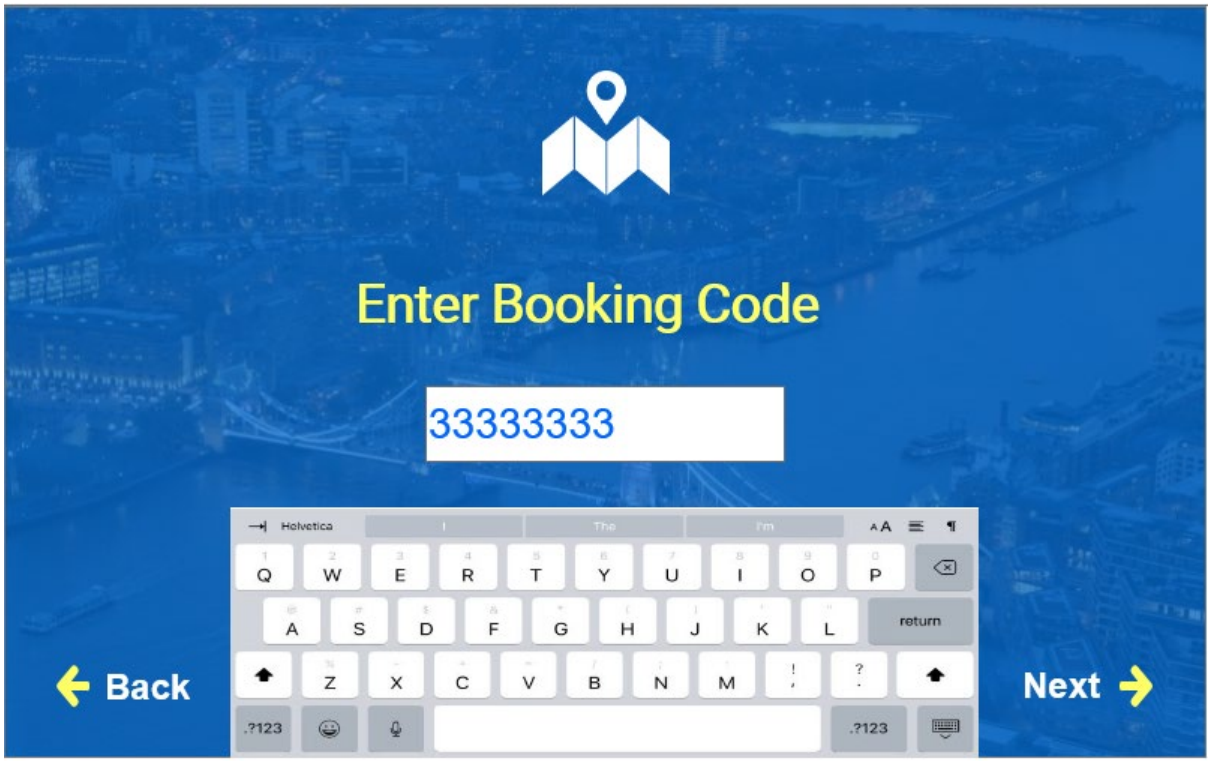


User will enter code

3) ENTER BOOKING CODE

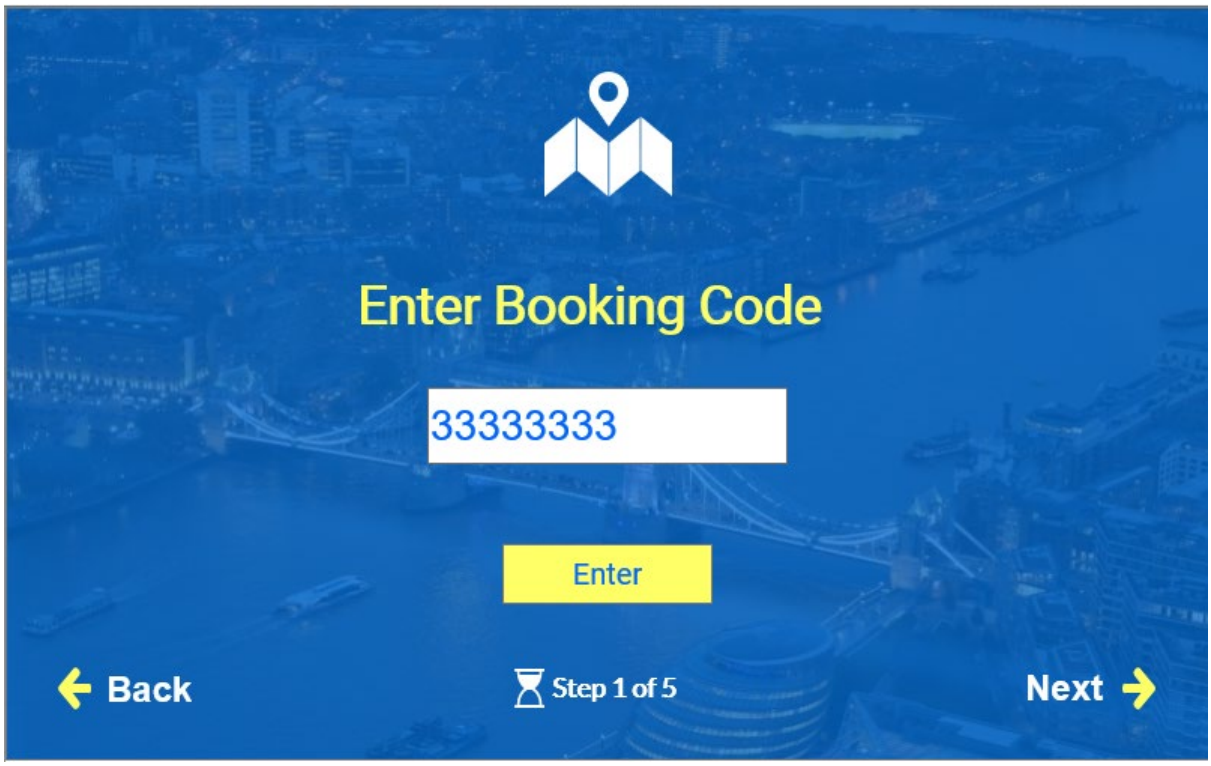


4) BOOKING CODE KEYBOARD



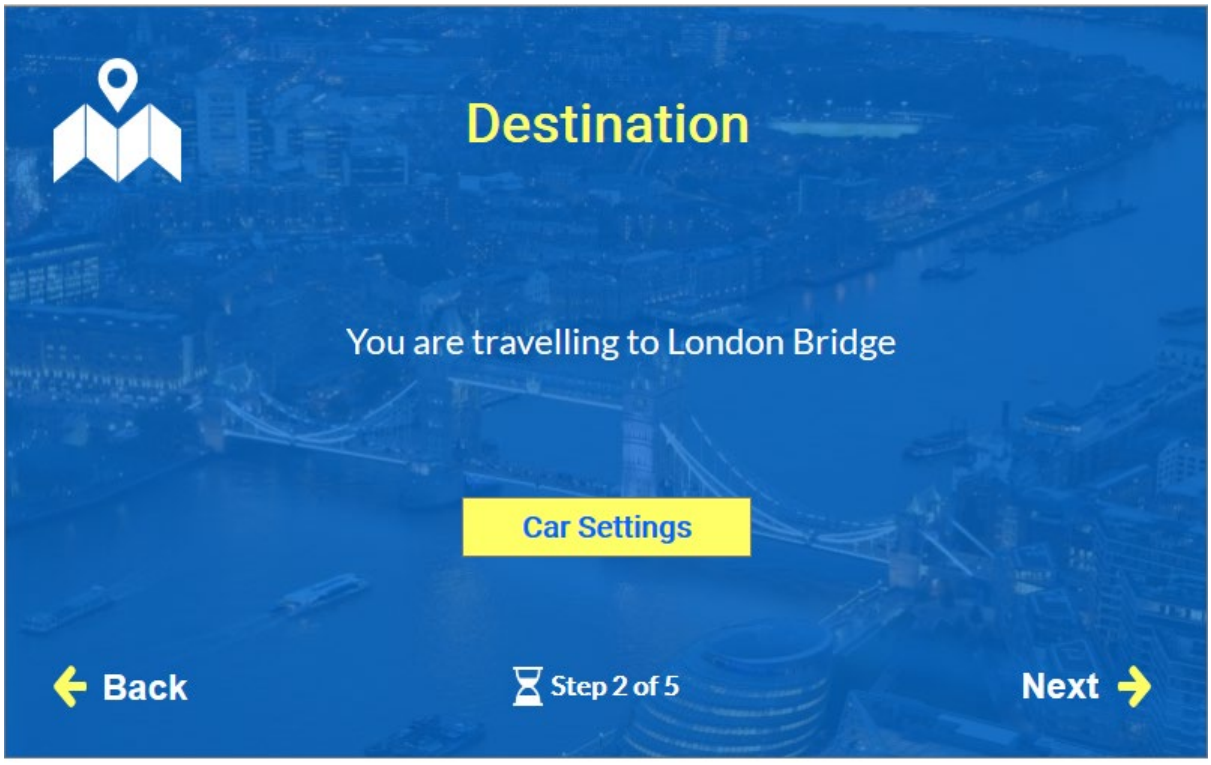
Keyboard pops up

5) CODE ADDED



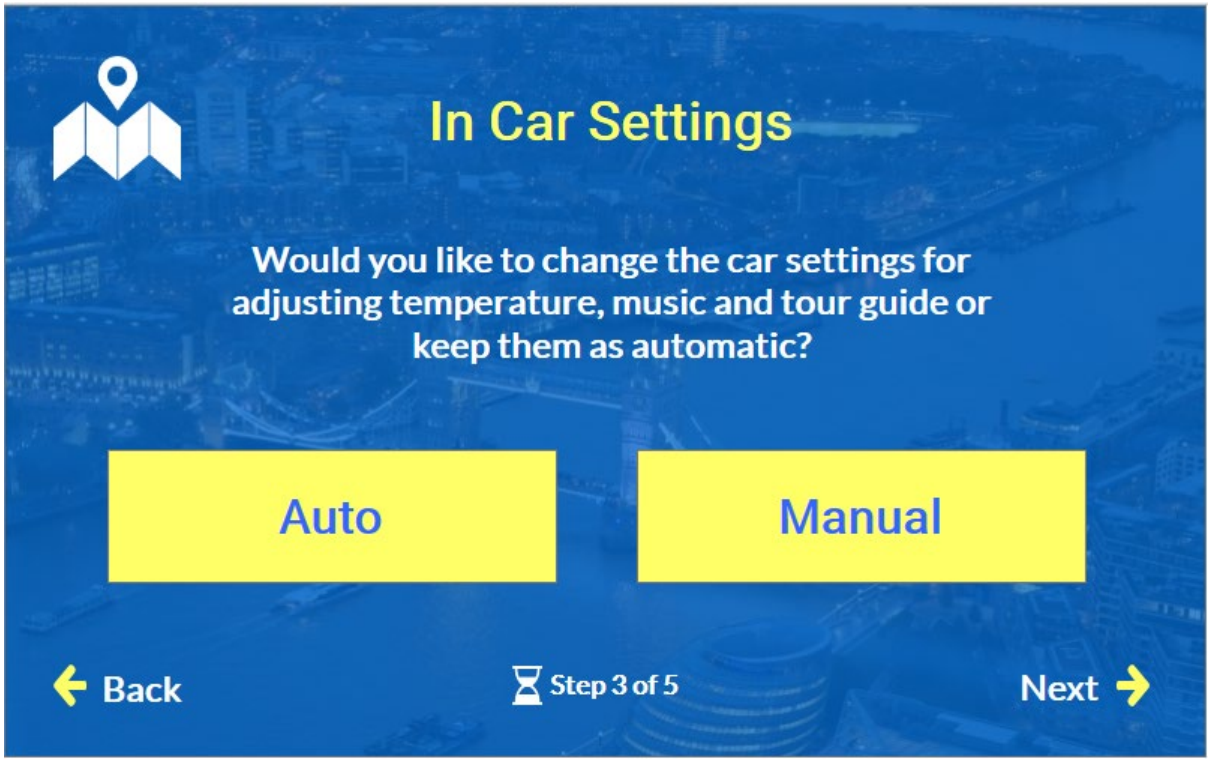
Code is entered.

6) DESTINATION



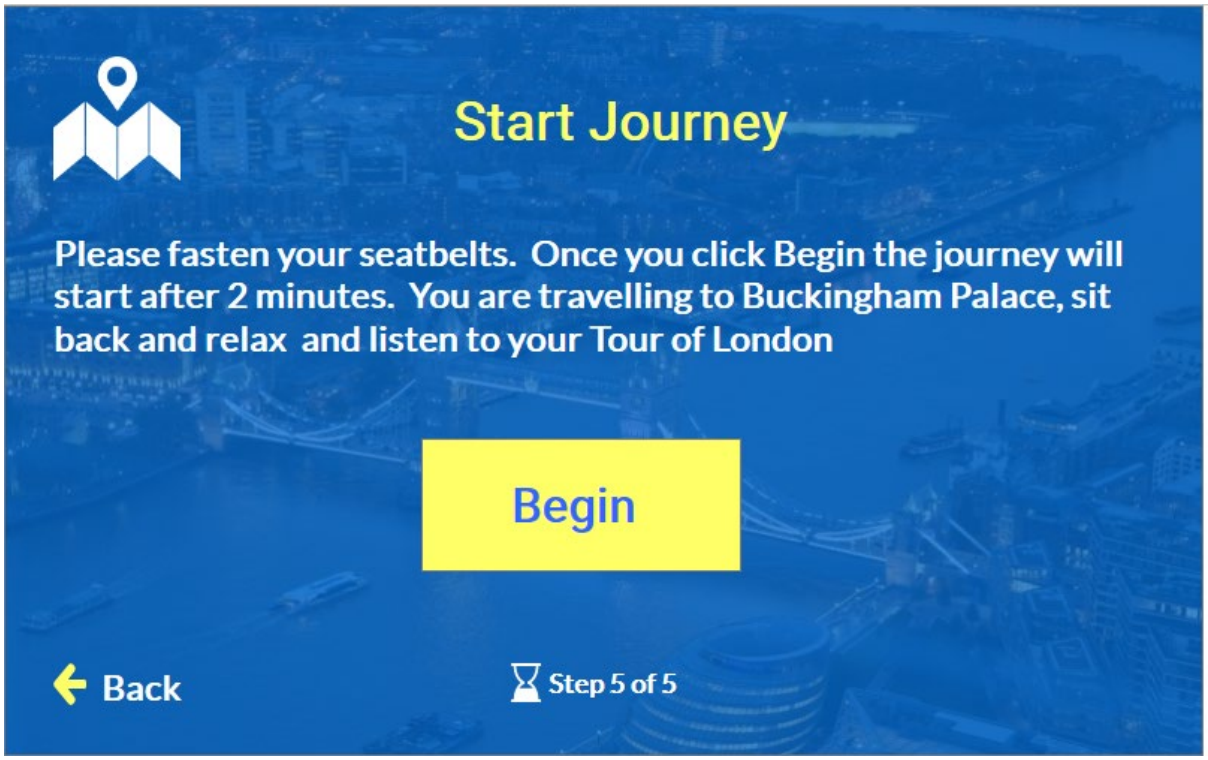
Destination is confirmed.

7) IN CAR SETTINGS



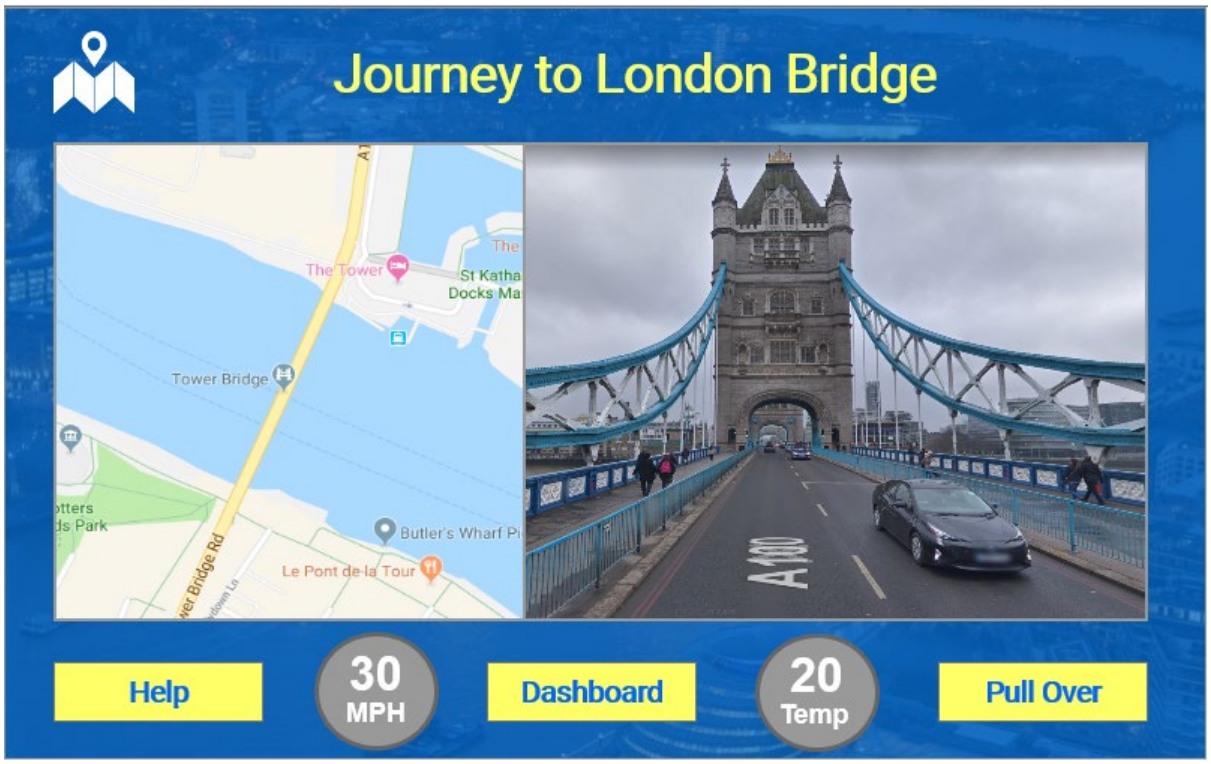
User will choose the auto journey.

8) START JOURNEY



Pre-travel information is given and then the journey begins.

9) JOURNEY



6 Evaluation

To evaluate the finished prototype the previously discussed guidelines by Schneiderman (2016) Will be used. These results will aid the future development of the prototype.

Guidelines	Results	What could be improved
Is the UI design consistent?	The design is consistent, with colour scheme the same on all pages. Font sizes are the same and typography is the same on all pages.	There are slight differences in the widths and padding on the buttons. Padding should be the same on all buttons.
Is the UI universally usable by all abilities and ages	It has been designed for people with visual impairments or novice users. The device does read out the text although this cannot be seen in prototype. It also has a feature for foreign languages. The font is large and buttons are big to make it easy to navigate. Good contrast in	Language option can be developed.

	colours with dark background light text.	
Does the UI offer informed feedback?	When a user clicks on a button a new page loads. If the radio is turned on the page says that the radio is on.	Could make a point appear on screen where user hits screen.
Does it yield to closure?	The booking set up has a steps feature at the bottom of the screen to show how many tasks have been completed and how many are left to do.	
Does it prevent errors?	The input forms have not been set up to stop errors	Form inputs for credit card should be set up so only numbers are accepted. This would be set up when coding it.
Is reversal of errors possible?	Next and back buttons have been created on all of the screens to make it easy for a user to fix a mistake.	
Will user feel in control?	It has been designed in a very simple way to make it easy for everyone to use. So they will feel in control of the system.	It would be helpful to add help feature on all pages if user is not sure what to do.
Will it reduce short term memory load	The previously booked journey is completed in steps as car settings are kept to auto. But it takes a lot more steps if you user needs to book the journey and pay then customise settings	Find a way to reduce the steps taken by using a different design. Instead of having steps, have a dashboard with links to all features and set up.

7 Conclusion

The prototype was designed based on the previous research done on existing driverless cars and user interface design issues. With the help of guidelines and standards to ensure that the design is accessible to all and user friendly. To develop the prototype further, more features could be added to the interface. Better controls and more options for car features such as speed and the distance travelled could be added. The design elements could be made in higher detail with more functionality. The prototype was evaluated, and this should be used as a guide to developing further and fixing mistakes to make it more accessible. Looking at the user scenarios the prototype does meet the requirements for each persona but could be improved upon in the final product. Real user testing of the prototype would also assist the further development of this design.

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