

**User Experience Design**

**Web Evaluation Report**

**Katie Yiu**

## Contents

<b>Introduction .....</b>	<b>3</b>
<b>Research .....</b>	<b>3</b>
• Competitor Analysis .....	3
<b>Expert Review .....</b>	<b>5</b>
• Findings .....	6
<b>Empathize .....</b>	<b>7</b>
<b>Personas .....</b>	<b>7</b>
<b>Storyboards.....</b>	<b>9</b>
<b>Create .....</b>	<b>12</b>
• Design Theories.....	12
• Design Requirements .....	12
• Low Fidelity Prototype.....	14
<b>Testing .....</b>	<b>19</b>
<b>Final Iteration.....</b>	<b>20</b>
<b>Conclusion.....</b>	<b>21</b>
<b>References .....</b>	<b>22</b>
<b>Appendices .....</b>	<b>24</b>
• Appendix A – Heuristic Evaluation.....	24
• Appendix B – Cognitive Walkthrough .....	27
• Appendix C – Test Plan .....	28

## TransPennine Express Mobile App

### Introduction

The TransPennine Express mobile app (First/Keolis TransPennine Limited, 2021) is used to view train times and destinations, and to purchase and access digital tickets for their trains. The app also has an onboard entertainment service, 'Exstream.'

One of the main issues expressed in the customer app reviews (Google Play, no date) was the accessing of purchased tickets. The design of this section of the app has negatively impacted users on their train journeys.

The aim is to re-design this section, so the important features are more visible and therefore easier to access, this would allow users to have a smoother experience when using the app on their train journeys.

### Research

- **Competitor Analysis**

The team gathered data from direct and indirect competitors. The positive and negative features were summarised. The features that provide a positive user experience for the competitor may be incorporated into the TransPennine Express prototype.

Competitors		
1.	<b>Trainline</b> - <a href="https://www.thetrainline.com/">https://www.thetrainline.com/</a> Website + mobile app for Android and iOS devices. Plan journeys and purchase tickets for train and coaches provided by multiple operating companies.	
	Good Key Features	Bad Features / Features Requiring Improvement
	<ul style="list-style-type: none"><li>-Able to use tickets without internet access after they have been purchased and downloaded.</li><li>-The user journey is fast and easy, which is effective for when the users need to quickly access tickets.</li><li>-On the page of purchased tickets, the user can clearly differentiate each ticket due to the design (text font/size, different colours and icons)</li><li>-Shows live status of incoming trains: train on-time or delayed, changes in platform, if the train is crowded or if changing trains is required.</li><li>-No jargon, simple, easy-to-understand language.</li><li>-Simple, cohesive, minimalistic design. Follows a logical order.</li><li>-Easy to rectify mistakes. Error messages are clearly shown in red. "Back" button is available.</li><li>-The manual is accessible from the home page, with a question mark icon, although this is very small compared to the other icons.</li></ul>	<ul style="list-style-type: none"><li>-Charge an admin fee when buying tickets</li></ul>

2.	<b>Northern Rail</b> - <a href="https://www.northernrailway.co.uk/">https://www.northernrailway.co.uk/</a> Website + mobile app for Android and iOS devices. Plan and purchase tickets for Northern Rail trains	
	<b>Good Key Features</b>	<b>Bad Features / Features Requiring Improvement</b>
	<ul style="list-style-type: none"> <li>-Ticket purchasing is easy. The app opens straight onto the search page. Here, users choose the destination they are going from and to, type of ticket the of travel, number of passengers and railcards.</li> <li>-Available live times of any trains going from and to any destination.</li> <li>-Finding purchased tickets is simple as there is a 'My Tickets' tab at the bottom which takes users to a page where they can see their active tickets as well a tab at the top which allows users to see any expired tickets.</li> <li>-Simple, cohesive, minimalistic design. Follows a logical order.</li> <li>-No Jargon has been used so it's easy to understand for all users.</li> </ul>	<ul style="list-style-type: none"> <li>-Viewing purchased tickets is a long process. Press view ticket &gt; download &gt; activate &gt; activate (again)</li> <li>-Unable to save payment details for faster checkout.</li> <li>-QR code small, unable to enlarge or zoom in.</li> </ul>
3.	<b>LNER</b> - <a href="https://www.lner.co.uk/">https://www.lner.co.uk/</a> Plan journeys and purchase tickets for LNER trains.	
	<b>Good Key Features</b>	<b>Bad Features / Features Requiring Improvement</b>
	<ul style="list-style-type: none"> <li>-Simple, cohesive, minimalistic design. Follows a logical order.</li> <li>-Saves statistics of the user (trips taken, miles, locations visited)</li> <li>-No booking fees</li> <li>-Easy to rectify mistakes. Back" button is available.</li> <li>-Loyalty scheme, discounts on the app</li> <li>-Able to reserve a seat up to 5 minutes before the train departs</li> </ul>	<ul style="list-style-type: none"> <li>-When purchasing tickets, it only shows the dates, and not day.</li> </ul>
4.	<b>Stagecoach</b> - <a href="https://www.stagecoachbus.com/">https://www.stagecoachbus.com/</a> Website + mobile app for Android and iOS devices. Facilitates the purchase and use of bus tickets, journey planning and tracks bus journeys live.	
	<b>Good Key Features</b>	<b>Bad Features / Features Requiring Improvement</b>
	<ul style="list-style-type: none"> <li>-Has a separate tab for active tickets and purchased tickets, making it more difficult to open an expired ticket by mistake.</li> <li>-The type of ticket is described clearly without using abbreviations.</li> <li>-Live countdown timer allows the user to see when the ticket can no longer be used.</li> <li>-QR Code is available without having to click on the ticket and open another page</li> <li>-Purchased tickets can be sent to another user.</li> </ul>	<ul style="list-style-type: none"> <li>-Could have the exact expiry date and time alongside the countdown.</li> <li>-No button to return to the home page.</li> <li>-Tickets can only be accessed online.</li> </ul>
5.	<b>National Express</b> - <a href="https://www.nationalexpress.com/en">https://www.nationalexpress.com/en</a> Website + mobile app for Android and iOS devices. Buy and use tickets for coaches, live coach tracker, view timetable.	
	<b>Good Key Features</b>	<b>Bad Features / Features Requiring Improvement</b>
	<ul style="list-style-type: none"> <li>-Track coaches in real time</li> <li>-The user journey is fast and easy, which is effective for when the users need to quickly access tickets.</li> <li>-Share feature – able to share booking details on messaging apps or email.</li> </ul>	<ul style="list-style-type: none"> <li>-Does not keep previous bookings</li> <li>-If logging into your account from a different device, the purchase history is not transferred.</li> </ul>

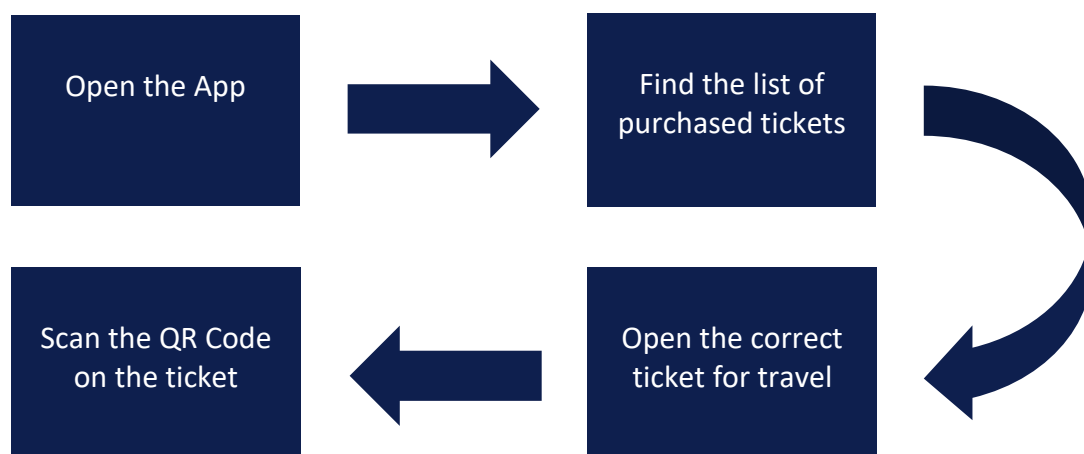
### Expert Review

At this stage, the app is inspected by the reviewer, rather than a real user (Harley, 2018). An advantage of using this method is that it is cheap and does not require a lot of resources, so issues can be found quickly (Bligård and Osvalder, 2013).

The team conducted a heuristic review (Appendix A) following Nielsen's Heuristic Principles (Nielsen, 2020). This task is performed by having individuals use the interface and assess it according to certain defined criteria.

The team also carried out a cognitive walkthrough of the TransPennine Express app, shown in Appendix B. This process involves going through the "Happy Path," which shows the tasks and user flow leading to the desired output (Bligård and Osvalder, 2013). Each stage of the "Happy Path" is inspected to see if it complies with or hinders the user's progress towards their goal. In this case, the user has purchased the train tickets, and needs to open the correct one to pass the ticket barrier or to show for ticket inspection.

### The Happy Path



- **Findings**

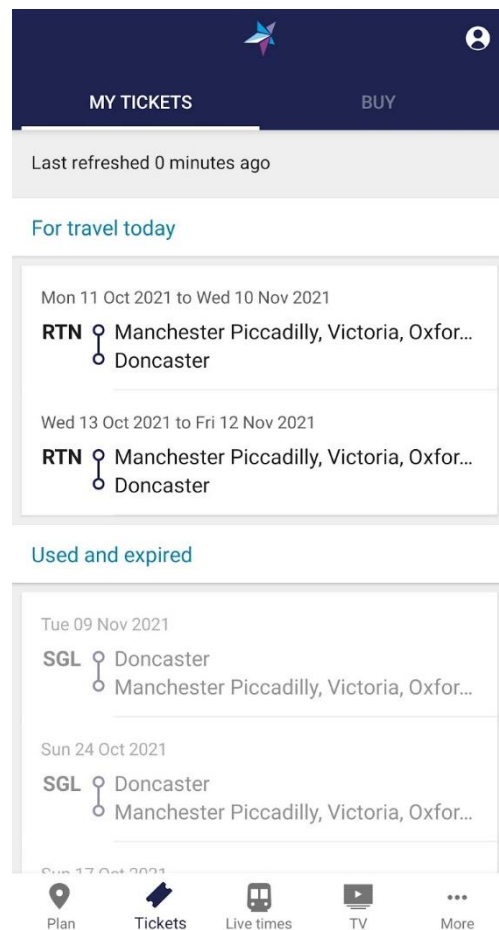
From completing the heuristic evaluation and cognitive walkthrough, the team agreed that the overall design of the app is clean, simplistic, and the user flow is logical. Most of the main issues were found in the 'My Tickets' page.

The design of the tickets on this page is unappealing, they are mostly comprised of text with no contrasting features. There is no variation in colour or font size. At first glance, the user may find it difficult to tell the tickets apart, or they might mistake two tickets next to each other as one. The thin line that separates each ticket is barely visible.

The expired tickets are placed below the valid tickets as unlikely to be viewed again after use. The separation is good as the user can locate the valid tickets at the top easier. However, the expired tickets still look similar to the valid ones, and so they could be accidentally clicked on. Another issue is when the user opens an expired ticket, there is no message to alert the user of this. The user needs to check the date of the ticket to see if it has expired.

Those who are not frequent users of this app may struggle to understand the three letter abbreviations on the left side of the ticket (RTN and SGL), as this is not commonly used elsewhere. The user will still need to open the ticket to find details on the type of ticket, especially. For example, there are several types of RTN (return) tickets, so the user will always need to open the ticket to check the full details.

There is no download ticket feature on this app. If for some reason the user cannot access the tickets on the app during their journey, they would not be able to pass the ticket barriers or they could be fined during ticket inspections. The user could access the tickets on their email confirmation, but this would not be possible without an Internet connection. Furthermore, would make the task more complicating as they would need to use a separate application to achieve the desired goal, which means the app has failed to deliver on its purpose.




## Empathize







### Personas

The team conducted research into the target audience of train travel to create the three personas. They are meant to cover a wide age of ranges, careers, lifestyles, and reasons for train journeys. The Department for Transport (2020) states that in England, 54% of train journeys were for commuting, with 26% for leisure. All personas of live and work in the North of England, and travel on train routes where TransPennine Express operates.

**Persona 1** – Karen lives a busy lifestyle and is career focussed, working in a senior position. As she uses the trains for commuting, it will likely be busy, therefore the process for finding the ticket to scan needs to be as smooth as possible.



NAME <b>Karen</b>		TYPE <b>Rational</b>	
	<b>Goals</b> Karen's goal is to use the Transpennine Express application on her phone to get through ticket barriers quickly and show to conductors without hassle.		
	<b>Quote</b> “ I travel on a train more than any other mode of transport, it's my route to and from work. I want a quick and hassle free experience. ”		
	<b>Background</b> Karen makes on average 200 small rail trips per year, it is her mode of transport to get to her office for work and back home again. She travels 5 days a week travelling from the outskirts of Manchester into the city centre. Karen has a busy life working as a regional manager at a large company. She uses the Transpennine Express mobile app as she doesn't have enough time to buy physical tickets and the e-tickets speed up her journey. As she travels to work in the early morning and into the evening hours she wants her trip to be as fast and efficient as possible.		
<b>Demographic</b> Female 28 years Manchester Single Regional Manager High income bracket		<b>Motivations for using the app</b> Can access and purchase tickets faster on the app Allows her to have multiple active tickets at once	<b>Frustrations</b> Karen gets frustrated when accidentally opening the wrong ticket and getting stuck at ticket barriers.

**Persona 2** - Dean represents someone who is well into their career and has a family. Due to Dean's income (Payscale, no date), he and his family can live comfortably, however, he needs to find more time for leisure.

NAME Dean		TYPE Artisan	
		<b>Goals</b> Be able to travel cheaply and conveniently. Spend more time with his wife, going to events with his friends, and other activities that he enjoys, rather than wasting time on work.	
		<b>Quote</b> “ I like to keep things simple and easy to understand. This includes train travel. ”	
<b>Demographic</b> Male 44 years Liverpool Married IT specialist - mainly work from home £40,000		<b>Background</b> -Highly competent in IT, app and web. -Enjoys going to the pub and other social events with his friends from Liverpool. -Thinks that luxury products are pointless. Prefers function over fashion. -Simple and straight to the point. -Likes to watch tech-reviews and keeps up to date with new tech releases, with no intention of buying the products. Dean uses the train to commute to and from his work at the Manchester office once a week. He prefers to work from home full-time, as the lack of commute means that he will have more free time. This means that on the day he has to travel to work in Manchester, he would like the journey to be quick and hassle-free. As soon as Dean finishes work in the evening, he spends time with his family. Occasionally, he travels to nearby towns and cities with his family or friends for leisure. Dean's salary means that he lives a comfortable life. He owns a car but he still uses the train when travelling to city centres, as he dislikes being stuck in traffic and finding parking spaces.	
<b>Technology</b>    		<b>Motivations</b> Stay up to date in his fast-growing industry of tech. Save up money for early retirement, so he can do the things he enjoys.	
<b>Browsers</b>  Google Chrome		<b>Frustrations</b> Although he likes his salary, he does not like spending his time working, or commuting.	
<b>Current Experience with App</b> Loyal customer of TransPennine Express, due to the train route and lack of service fee when paying for tickets using their app. Dean's knowledge of IT means that he can navigate the app easier than most, however, he believes improvements can be made, by making the ticket information more clear, so he spends less time reading the page. The use of abbreviations on the page of purchased tickets annoys him, as he has to spend time opening the ticket to find out what they mean.			



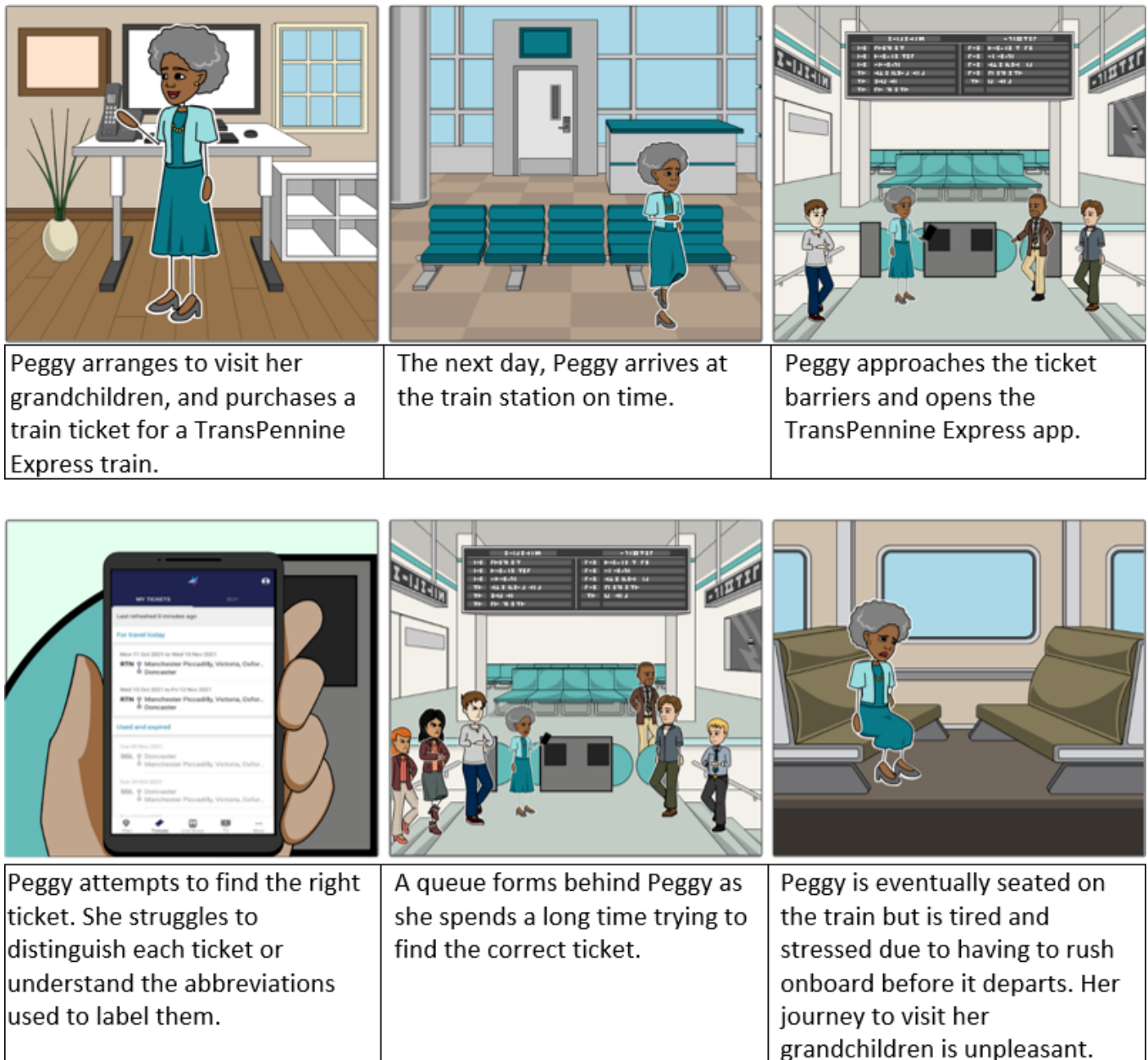
**Persona 3** – Peggy is retired and uses rail journeys for leisure and family visits. She is visually impaired, which is common for older adults (Swenor et al., 2020). Because of this, accessible design options need to be considered so that she can see, understand, and use all of the app features and functions without difficulty.

NAME <b>Peggy</b>		TYPE <b>Guardian</b>
	<b>Quote</b> <i>I want an easy and enjoyable time when traveling on public transport</i>	<b>Technology</b> 
	<b>Goals when using the app</b> Using the Transpennine Express app to access tickets bought and display them to conductors/ticket barriers	
<b>Demographic</b> Female 72 years Manchester Pensioner Pension	<b>Background</b> -Makes on average 5 trips per year via train -Commutes using trains for leisure and visiting family and friends -Travels during the day -Doesn't have to much of an active lifestyle -Isn't good at multitasking, attempts to tackle tasks one at a time -Has to wear glasses to read -Values human interaction, is more likely to be satisfied with punctuality Peggy only travels on average 5 times per year on trains. She lives in Shrewsbury and sometimes travels to Wolverhampton to see her family/friends. She travels during the day and often in the late morning to make more use of the day. Peggy doesn't have to much of an active lifestyle and due to her age has lost strength in her muscles meaning it can be difficult to get around. As well as finding it difficult to multitask she wears glasses to tackle poor eyesight. Peggy values human interaction and is more likely to be satisfied with her journey due to good punctuality and employee interaction. Peggy has and uses a mobile phone for simple tasks such and phone calls and messages and sometimes uses media apps such as Facebook. This means she has access to the transpennine express app to display her rail tickets, and does so as her family/friends have recommended it as an easier way to travel. Peggy sometimes gets confused by terminology featured on the application and can find it difficult to differentiate between different types of tickets.	
	<b>Why they use the app</b> -The website tells users to use the application to access tickets purchased -Told by family/friends to use the app -Somebody has bought them a ticket using the app	<b>Frustrations</b> -Potential to get confused -Doesn't understand some terminology featured on the app -Finds it difficult to differentiate between the types of tickets -Poor eyesight makes small text difficult to read

## Storyboards

Storyboarding is used to visually represent the linear flow of scenes. This is commonly used in the film industry to illustrate the character's movement and camera angles (Shaw et al., 2020). In this section, the storyboards will be used to illustrate how the app design can affect the user experience for one of the personas.

### Storyboard 1 - depicts how the current app design affects Peggy on her train journey.



**Storyboard 2 - depicts how the reworked app design affects Peggy on her train journey.**



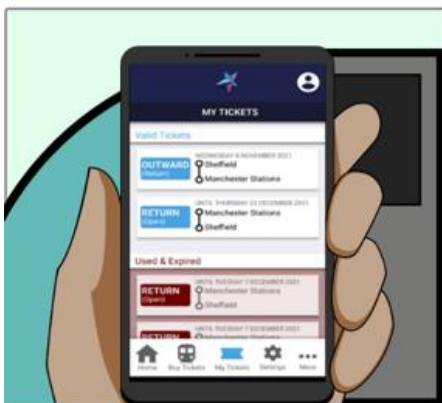
Peggy arranges to visit her grandchildren, and purchases a train ticket for a TransPennine Express train



The next day, Peggy arrives at the train station on time.



Peggy approaches the ticket barriers and opens the TransPennine Express app.



The design of the app is more accessible, and Peggy manages to find the correct ticket quickly.



Peggy manages to pass the barriers with ease and continues towards the train platform.



Peggy boards the train in good time. Her train journey to her grandchildren is stress-free.

These storyboards demonstrate the importance of designing the app so that it is accessible to all audiences. By displaying the information in a clearer manner, users will be able to find the correct ticket easier, which will be especially helpful during peak times when the train stations are more crowded. This will also improve the experience of other rail passengers, as it could lower the time for them to pass ticket barriers.

## Create

- **Design Theories**

The TransPennine Express app utilises the Gestalt Principles throughout its design. These describe how people perceive the objects to be part of a group, or how they recognise and for patterns with those objects (Malinauskas, 2018). In the app, the valid tickets are grouped together by colour (black text) and proximity. The expired tickets are grouped together and have grey text.

This technique is not used to its full effect, as the tickets in their grouped sections are not separated well, making it more difficult for the user to scan for information. Johnson (2014) suggests that the way that information is structured affects how users read and remember it. Also, there is a lack of colour contrast between the two groups of tickets, so they can be mistaken for each other. From this, one of the requirements for the app is to increase contrast between the two groups, making it easier for the user to separate the two sections.

- **Design Requirements**

Having completed the research, the team identified the issues and design requirements, along with the solutions for each. Changes which would improve the accessibility of the app were given higher priority, as this would affect a large portion of the app experience.

Priority	Requirement / Issue	Design Solution
Must	Improve the layout of the “My Tickets” so that it is easier to tell each ticket apart and not open the incorrect ticket by mistake.	Increase the space between each ticket. Utilise contrasting colours and font sizes.
	Add a feature which allows the user to download the ticket as a PDF file onto their mobile device.	Add a download button onto the ticket. Include a notice after the ticket has been downloaded to the device.
	Remove jargon / confusing terminology.	Replace the jargon with clear symbols or simple terminology.
Should	Quick access to the “My Tickets” page.	Place the “My Tickets” section in the navigation menu at the so that it can be quickly accessed from other pages on the app in one click.
	Re-organise the “Ticket Information” page so it is less cluttered.	Delete any information that is repeated on the page. Sort out the remaining information into the appropriate categories with the headings “Ticket Details” and “Journey Details”

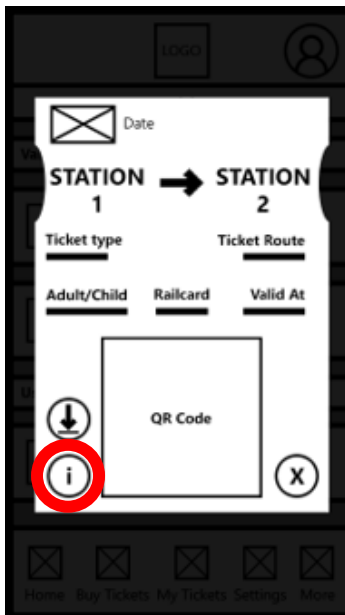
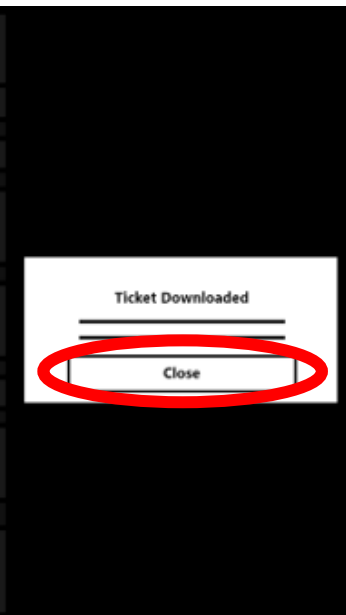
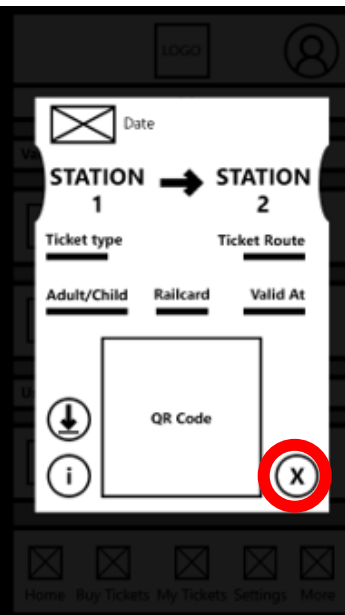
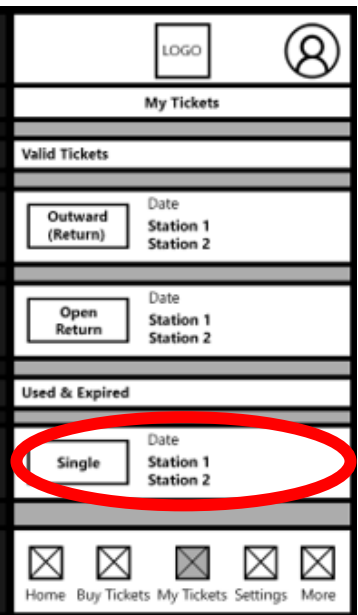
		Display the information on cards and space them further away from each other.
	Make the QR code more visible, allowing for easier visibility and access.	Increase the size of the QR code on the ticket.
<b>Could</b>	Further reduce the probability of opening an expired ticket by accident.	Move the expired tickets to a separate page / tab.
	Feature allowing tickets to be sent to other users.	Create a new function which would allow users to transfer purchased tickets to others.

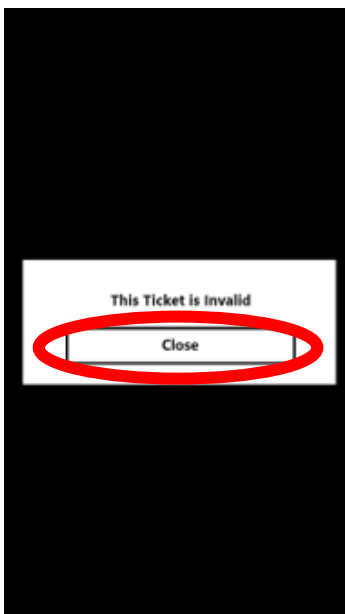
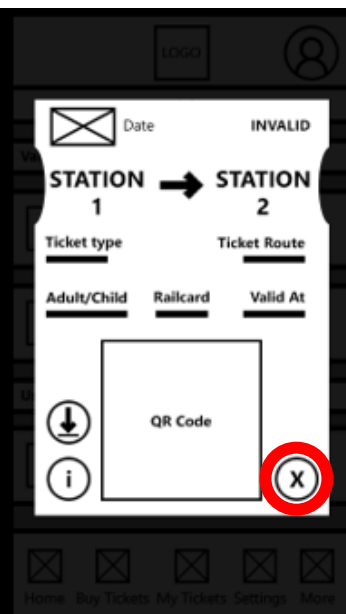
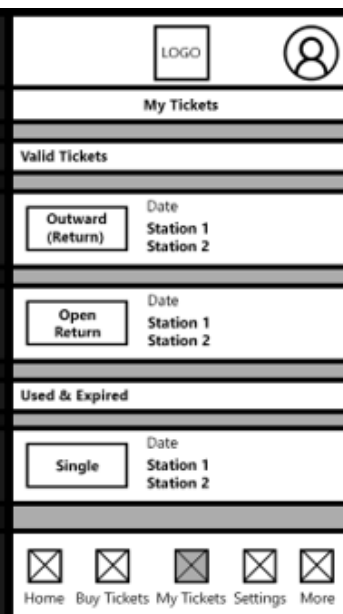
- **Low Fidelity Prototype**

During the initial stages of designing an interface, a low-fidelity prototype is created. This is meant to show the functions of the interface but has a simple design (Kaya, 2018). This can be achieved via sketching or digital design or prototyping software. This prototype was created digitally for better image clarity.

<p>The homepage is similar to the original app design. It is now called 'Home' instead of 'Plan' as it contains several features, some of which are related to journey planning, including "EXSTREAM," which is their onboard streaming service.</p>	<p>Valid tickets are displayed at the top, with expired tickets at the bottom. The tickets on this page now have spaces between them, plus icons on the left side which include a label to show the ticket type. This is to make it easier to distinguish between each ticket.</p>	<p>The design of the ticket is similar to the original, however the icons at the bottom have been enlarged, so the user can see the icons inside them, and they would be easier to click. A download button has been added to the ticket to allow the user to download it to their device, in case the user cannot access the ticket via the app later on.</p>	<p>This page displays extra information about the journey and the ticket. Unlike the original design, the information has been organised, labelled and separated into cards, making it easier to search for specific information.</p>



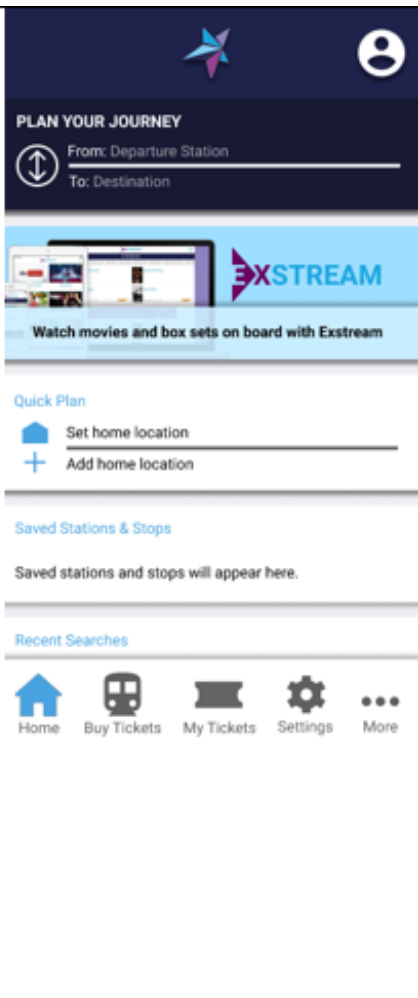
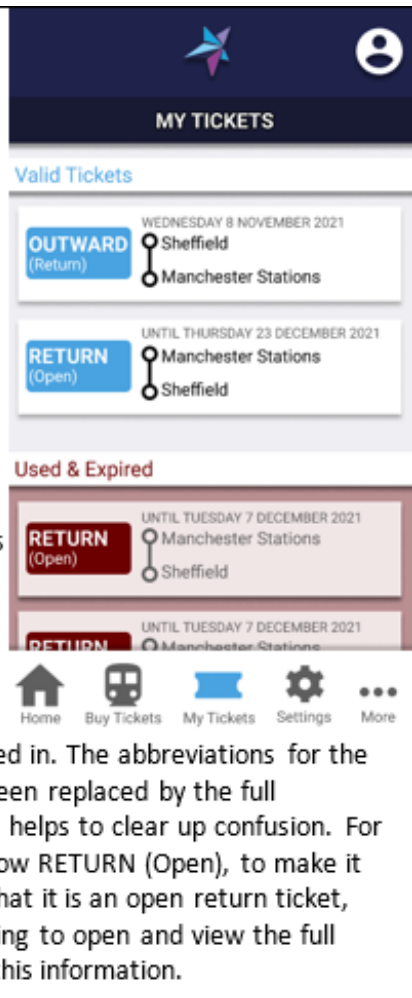
			
<p>Closing the tickets information page takes the user back to the ticket.</p>	<p>Clicking the download icon above the 'info' button downloads the ticket to the user's device. If the app fails to work, the user can still access the ticket from their device files.</p>	<p>Once the user closes the download notice, they are taken back to the ticket.</p>	<p>Clicking the 'X' icon closes the ticket and takes the user back to the 'My Tickets' page.</p>

		
<p>The user still has the option to view expired tickets. This notice is displayed as soon as it is opened.</p>	<p>An invalid ticket looks and functions like a valid ticket, apart from the QR code. There is an 'Invalid' notice on the top right corner to remind the user that the ticket is no longer scannable.</p>	<p>Closing the invalid ticket takes the user back to the 'My Tickets' page.</p>

- Digital Prototype

**Link to prototype:**

<https://www.figma.com/proto/OACEuSceApVasfmdx3u6nP/TransPennine-Express?node-id=10%3A37&starting-point-node-id=10%3A37>

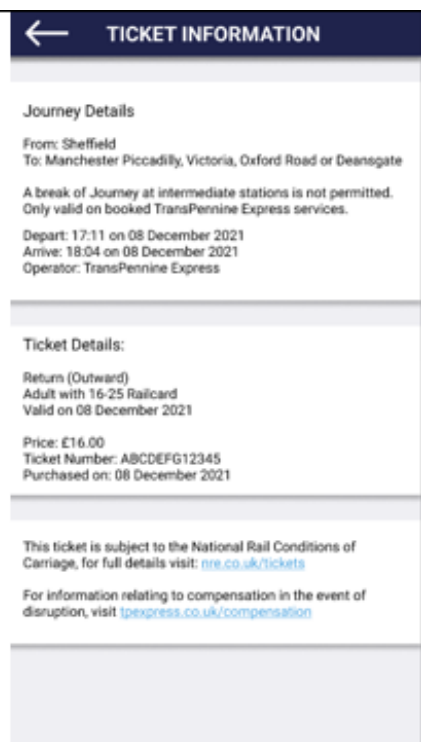
<p>The contents on the homepage of the app remains the same, with a few changes made to the navigation bar at the bottom. The “My Tickets” tab is now on the navigation bar, which allows the user to access their purchased tickets in one click. Previously, the user <u>has to</u> go to the “Tickets” page then the “My Tickets” tab.</p>		<p>Each ticket is on a white card, separated by space. The left side of each ticket has a coloured rectangle icon. Valid tickets are blue whilst expired ones are red. There is also a red background for the expired tickets. This allows the user to easily differentiate between each individual ticket and the section that they are placed in. The abbreviations for the ticket type have been replaced by the full description, which helps to clear up confusion. For example, RTN is now RETURN (Open), to make it clear to the user that it is an open return ticket, without them having to open and view the full ticket to find out this information.</p>	
---	--	---	--



The sizes of the buttons on the ticket have been increased for improved accessibility. A download button has been added, allowing users to save the ticket to their device. This allows them to access the ticket if they are unable to access them via the app, for example due to technical errors or no internet connection.

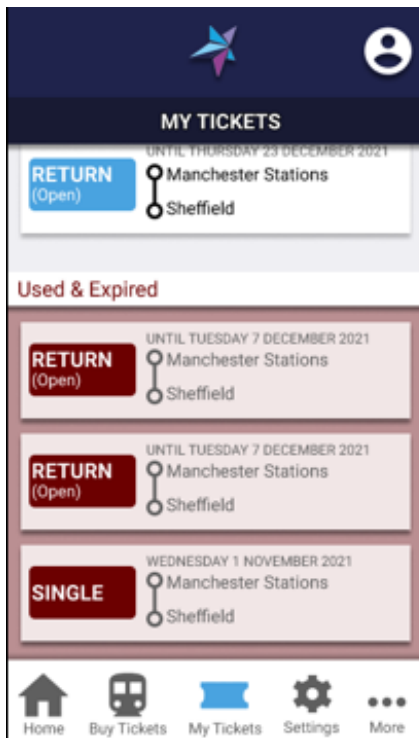


The text from the original information page has been re-ordered and arranged into different sections. The information is placed onto separate cards instead of being separated by a thin line. This means that the information is more and allows. Some of the original text has been removed due to some of it being repeated. This has made the information concise and more organised the user to find the relevant information faster.



When the user downloads the ticket, this notice appears afterwards, informing them that it is ready to view, and provides its location.





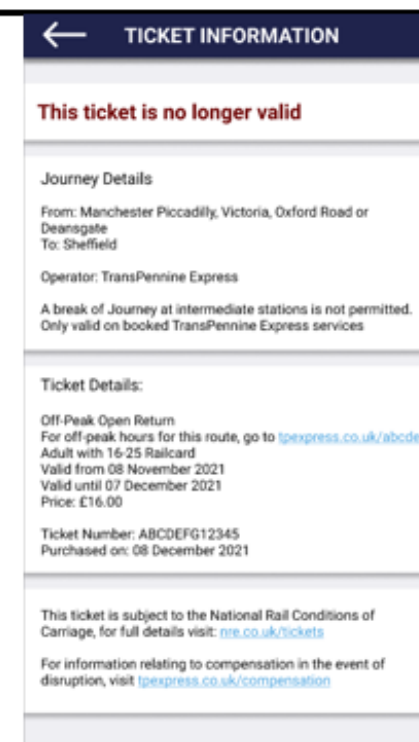
The expired tickets can be viewed by scrolling down the "My Tickets" page.



The design does not restrict user freedom and allows them to open an invalid ticket. This notice appears to notify the user that the ticket is unusable.



Invalid tickets have a red background, so users are kept informed that the ticket no longer works.



The download and ticket information button still functions on invalid tickets; however, they will have a notice in red text.

The user is constantly notified throughout in case they are intending to use a valid ticket, but have opened an invalid one by mistake.

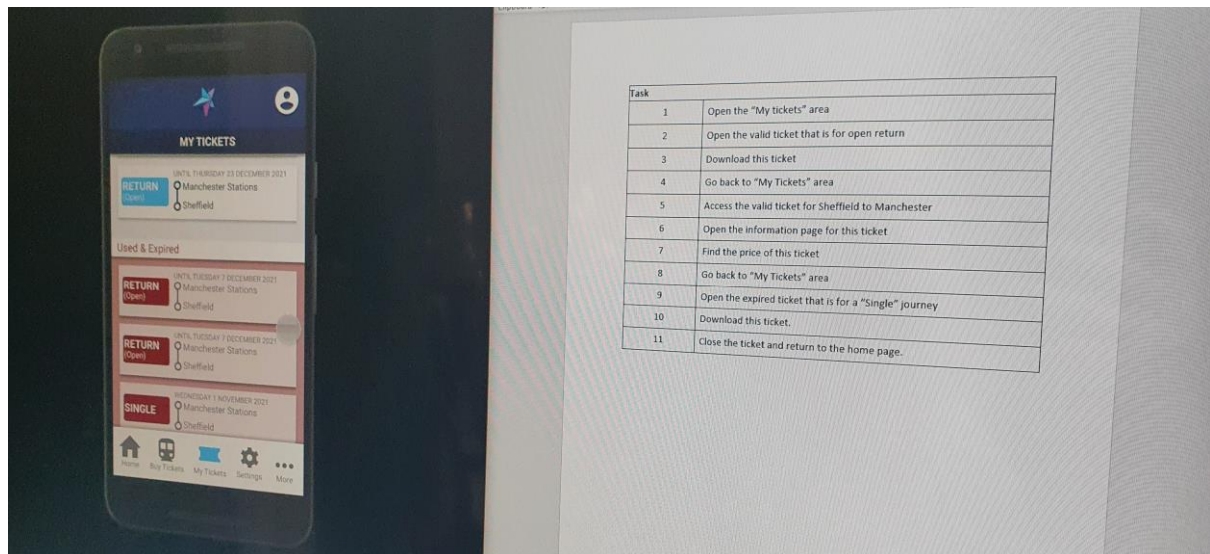
## Testing

Nielson (2012) states the suitable number of participants required for user testing is 5. This is because most of the issues can be detected with only 5 people, and any additional testers may repeat the same insights. The test plan is shown in Appendix C.

All testers were informed about the task and were given an opportunity to ask further questions about the test, before signing a consent form. They were given a link to the prototype and had to carry out tasks, whilst being timed. Afterwards, they commented on the difficulty of completing the tasks, which aspects of the design was good and what hindered them. The table shows the results of the testing carried out by the 5 participants.

Prototype Test Results				
Task		Task Completed?	Completed within 25 seconds?	Errors
1	Open the "My tickets" area	5/5	5/5	x
2	Open the valid ticket that is for open return	5/5	5/5	x
3	Download this ticket	5/5	5/5	x
4	Go back to "My Tickets" area	5/5	5/5	x
5	Access the valid ticket for Sheffield to Manchester	5/5	5/5	x
6	Open the information page for this ticket	5/5	5/5	x
7	Find the price of this ticket	5/5	5/5	x
8	Go back to "My Tickets" area	5/5	5/5	x
9	Open the expired ticket that is for a "Single" journey	5/5	5/5	x
10	Download this ticket.	5/5	5/5	x
11	Close the ticket and return to the home page.	5/5	5/5	x

## Image of user testing:

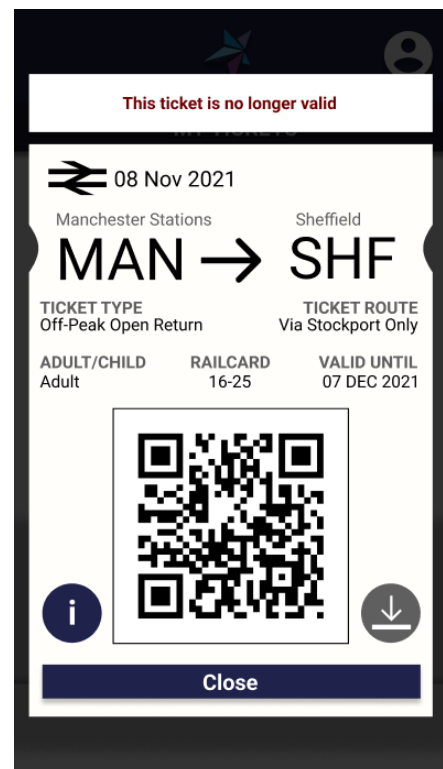


## Final Iteration

### Improved valid ticket



### Improved invalid ticket



After receiving feedback from the user testing phase, changes were made to the second prototype. One of the points raised by the testers was that the size of the QR code was small. To improve this, the ticket length was extended to provide space to expand the QR code, without having an impact on the buttons next to it. Enlarging this section makes it more visible, therefore making it easier for ticket barriers to register, and train conductors can locate and scan it quicker.

Another issue raised was the closing of the ticket. Testers stated that first, this process took longer, as the “close” button same size and shape of the other two buttons and time was spent identifying their functions. This was improved by updating the look of the “close” button, so it does not look similar to the other two on the ticket, making it more visible. It is now a bar at the bottom of the ticket, with the word “close” so the user understands its function immediately. Additionally, the user can now close the button by pressing anywhere outside of the ticket, as they may find this more convenient than the close button.

There was also the suggestion to change the design of invalid tickets. Users stated that the red background seemed overbearing, as if there was an error with the app, and did not match the aesthetic of the rest of the app. The new version no longer has a red background, and instead has a banner at the top with a reminder which alerts the user that the ticket is no longer working.

### **Conclusion**

In order to improve the design of the TransPennine Express mobile application, the team had to conduct research on the app in its current state, and its competitors. Customer personas had to be created, which allowed the team to observe the situation from a user perspective, to ensure that the modifications would meet their requirements.

## References

Bligård. L-O., Osvalder. A-L. (2013) 'Enhanced cognitive walkthrough: development of the cognitive walkthrough method to better predict, identify, and present usability problems.' *Advances in Human-Computer Interaction*, 9, January, p. 9.

Department for Transport. (2017) *Rail Passengers Fact Sheet*. Unknown place of publication: Department for Transport. [Online] [Accessed on 5<sup>th</sup> January 2022] [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/590562/rail-passengers-factsheet-2016-revised.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/590562/rail-passengers-factsheet-2016-revised.pdf)

Department for Transport. (2020) *Rail Fact Sheet*. Unknown place of publication: Department for Transport. [Online] [Accessed on 5<sup>th</sup> January 2022] [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/942425/rail-factsheet-2020.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/942425/rail-factsheet-2020.pdf)

First/Keolis TransPennine Limited. 2021. *TransPennine Express* (version 4.25.0) [Mobile App] [Accessed 17<sup>th</sup> November 2021]

Glassdoor (2022) *IT Specialist Salaries*, [Online] [Accessed on 7<sup>th</sup> January 2022] [https://www.glassdoor.co.uk/Salaries/it-specialist-salary-SRCH\\_KO0,13.htm](https://www.glassdoor.co.uk/Salaries/it-specialist-salary-SRCH_KO0,13.htm)

Google Play (no date) *TransPennine Express: Train tickets, travel & times* [Online] [Accessed on 15<sup>th</sup> December 2021]

Harley. A. (2018) *UX Expert Reviews*. Nielson Norman Group. [Online] [Accessed on 5<sup>th</sup> January 2022]

Johnson. J. (2014) *Designing with the mind in mind: simple guide to understanding user interface design guidelines*. Amsterdam: Morgan Kaufmann.

Kaya. E., Alacam. S., Findik. Y., Balcisoy. S. (2018) 'Low-fidelity prototyping with simple collaborative tabletop computer-aided design systems.' *Computers & Graphics*, 70, February, pp. 307-315.

Malinauskas, J. (2018) *Evolution of Gestalt Principles in Cotemporary Graphic Design*. Serbia: University of Novi Sad, Faculty of Technical Sciences, Department of Graphic Engineering and Design.

Nielson, J (1994) *How to Conduct a Heuristic Evaluation*. Nielson Norman Group. [Online] [Accessed on 16<sup>th</sup> December 2021] <https://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/>

Nielson, J. (2012) *How Many Test Users in a Usability Study?* Nielson Norman Group. [Online] [Accessed on 16<sup>th</sup> 2021] <https://www.nngroup.com/articles/how-many-test-users/>

Nielson, J (2020) *10 Usability Heuristics for User Interface Design*. Nielson Norman Group. [Online] [Accessed on 16<sup>th</sup> December 2021] <https://www.nngroup.com/articles/ten-usability-heuristics/>

Office of Rail and Road (2021) *Passenger Rail Usage 2021-22 Quarter 1*. Unknown place of publication: Office of Rail and Road. [Online] [Accessed on 5<sup>th</sup> January 2022] <https://dataportal.orr.gov.uk/media/2010/passenger-rail-usage-2021-22-q1.pdf>

Payscale (no date) *Average Information Technology Specialist Salary in United Kingdom*. [Online] [Accessed on 5<sup>th</sup> January 2022] [https://www.payscale.com/research/UK/Job=Information\\_Technology\\_Specialist/Salary](https://www.payscale.com/research/UK/Job=Information_Technology_Specialist/Salary)

Shaw. N., Sigmann. S., Richard. L. (2020) 'The Research Storyboard: Ideas for Cultivating Safe, Engaged, and Empowered Undergraduate Research Students.' *Journal of Chemical Education*, 98(1) pp. 167-174

Sorbo. A., Panichella. S., Alexandru. C., Shimagaki. J., Visaggio. C., Canfora. G., Gall. H. (2016) 'What would users change in my app? summarizing app reviews for recommending software changes.' In *Proceedings of the 2016 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering*. Seattle, 13 - 18 November 2016. New York: Association for Computing Machinery, pp. 499-510.

Swenor. B., Lee. M., Varadaraj. V., Whitson. E., Ramulu. P. (2020) 'Aging With Vision Loss: A Framework for Assessing the Impact of Visual Impairment on Older Adults.' *The Gerontologist*, 60(6) pp. 989–995.

## Appendices

- **Appendix A – Heuristic Evaluation**

### TransPennine Express App Heuristic Evaluation -Using Nielson's Heuristic Principles

#### 1. Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

The navigation along the bottom keeps users informed on which section they are visiting. When accessing the ticket area, two headings at the top are used to differentiate between tickets already bought and the buy section.

#### 2. Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

Abbreviations are used, which may be difficult to understand for those without prior knowledge of industry terminology. The tickets are labelled with SGL (single) and RTN (return) on the tickets list. It is unclear what SGL and RTN mean as it is not explicitly defined anywhere on the app and this is not commonly used in the real world.

The design of the ticket, once opened, is conventional and resembles a physical train ticket, containing the QR code and the same details, including stations, ticket type, rail card and expiry date. The terminology here matches real world and that of competitor applications.

#### 3. User control and freedom

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

There is the option to go back on every page. If the user opens the wrong ticket, they can exit by clicking on the x button, but it is very small.

#### 4. Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

The appearance of the app is consistent. The banner colours, lettering and logo, and other symbols follow the same style.

The wording is inconsistent. The tickets are labelled with SGL (single) and RTN (return) on the tickets list. It is unclear what SGL and RTN mean as it is not clearly defined anywhere else on the app.



## 5. Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

The user can close the ticket by pressing the x button, or “back” button on the phone’s UI. The ‘X’ button is at the bottom left. Could be larger and / or in a more obvious place. At first glance, the icon is small not very easy to read.

When opening an expired ticket there is no difference to when opening an active ticket. The user has to read all the relevant details shown on the ticket to determine whether or not it has expired.

## 6. Recognition rather than recall

Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

The tickets look similar to each other. It is difficult to differentiate between each ticket as the designs are text-based with the same colours. To tell the tickets apart, the user has to look for a thin grey line or the space between each chunk of text.

On the ticket, the “close” button and “info” button look very similar (same size and colour). It is difficult to differentiate between the two buttons, especially as they are both very small. The user has to roughly remember where the buttons are positioned on the ticket to tell them apart.

There is no way to verify the validity of the ticket once it has been opened. The user needs to close the ticket then re-read the dates before reopening it to make sure it has not expired.

## 7. Flexibility and efficiency of use

Accelerators - unseen by the novice user - may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

The user journey to access the tickets is short. It is the same for experienced and inexperienced users.

Open app > Tickets > My Tickets

OR

Open app > My account > My tickets

## 8. Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

The design is too minimalistic to the point where it can be difficult for the user to understand and navigate the app. It is difficult to tell which ticket is which unless the user reads the details. They use the same font style, size and colours.

Two small buttons at the bottom of the online ticket, one which is an exit and another which is an information button. These are both the same so users may confuse them. They are also extremely small, so they break accessibility rules.

## 9. Help users recognise, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

If the user opens a ticket that has expired, there is no warning or error message for this. The user has to read all of the details on the ticket (e.g date and time) to verify if the ticket is valid or expired. The other way for the user to recognise the issue is to close the ticket and double check if the ticket is under the “valid” section and then re-open the ticket.

## 10. Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

The app manual is located under More > Info. The “More” section only has two options: “Info” and “Settings” with a lot of white space underneath. Once you click on “Info,” there are more options and they are much bigger and visible, due to larger and bolder fonts and icons, and more space between each option. This is inconsistent as the overall style of this page is much different to the previous.

- **Appendix B – Cognitive Walkthrough**

#### **Cognitive Walkthrough – TransPennine Express App**

##### **Open the App**

- 1. Will the users try and achieve the right outcome? Is the user goal the same as action?**  
Yes for both.
- 2. Is the correct action visible to them?**  
Yes, although this depends on where the user places the app on their device.
- 3. Will the user associate the action with the outcome they expect to achieve?**  
Yes
- 4. If the correct action is performed will the user see that progress is being made towards their intended outcome?**  
Yes, the TransPennine Express app will be opened.

##### **Find the list of purchased tickets**

- 1. Will the users try and achieve the right outcome? Is the user goal the same as action?**  
Yes for both.
- 2. Is the correct action visible to them?**  
Yes, the tickets page is on the navigation bar at the bottom. Once opened, the user can see the “My Tickets” tab at the top, and then select this.
- 3. Will the user associate the action with the outcome they expect to achieve?**  
Yes.
- 4. If the correct action is performed will the user see that progress is being made towards their intended outcome?**  
Yes, the user can view the navigation bar to check where they are on the app. Once they reached the “My Tickets” page, they will be able to see the list of purchase tickets.

##### **Open the correct ticket for travel**

- 1. Will the users try and achieve the right outcome? Is the user goal the same as action?**  
The user’s actions may not lead to the goal by selecting either the wrong active ticket or an expired one.
- 2. Is the correct action visible to them?**  
The correct ticket is visible but may not be obvious at first glance, as the user may have to read the details of every ticket.
- 3. Will the user associate the action with the outcome they expect to achieve?**  
Yes, the user would associate this action with the use goal.
- 4. If the correct action is performed will the user see that progress is being made towards their intended outcome?**  
Yes, if the user opens the correct ticket, the details will be matching the ones required for travel. (For example, correct date and time). If the wrong ticket is opened, the user has to work this out for themselves.

##### **Scan the QR code on the ticket**

- 1. Will the users try and achieve the right outcome? Is the user goal the same as action?**  
Yes, the user knows they must show the ticket QR codes to pass the barrier or for ticket inspections.
- 2. Is the correct action visible to them?**  
Yes, once the ticket is open, there is a QR code.
- 3. Will the user associate the action with the outcome they expect to achieve?**  
Yes.
- 4. If the correct action is performed will the user see that progress is being made towards their intended outcome?**  
Yes, the QR code will be scanned, and the user will be able to pass the ticket barriers / the train conductor will not give the user a penalty fare.

- **Appendix C – Test Plan**

<b>Usability Test Plan</b>
<b>Scope:</b> Testing: TransPennine express mobile application prototype. The test will cover purchased tickets section of the prototype.
<b>Task:</b> The tester will be given a list of tasks to complete on the prototype. They will be timed for each task.
<b>Equipment:</b> Mobile device (stopwatch), laptop or computer with internet access, pen and paper
<b>Participants:</b> 4-6 A mix of experience relating to mobile applications and travelling on public transport. Aged 18+ for ethical reasons
<b>Metrics:</b> Successful completion: The user is able to complete each task in a suitable time – no longer than 25 seconds. After completing the task list, the user will comment on the process and the prototype, regarding the difficulty of tasks and the prototype areas for improvement. <b>Error:</b> <ul style="list-style-type: none"> <li>• User opens the incorrect ticket (not the one stated on the task list)</li> <li>• User provides incorrect information shown on the ticket / user fails to locate relevant information on the ticket asked for by the tester.</li> </ul> <b>Critical error:</b> <ul style="list-style-type: none"> <li>• User continuously opens the incorrect ticket.</li> <li>• User continuously fails to provide the information requested by the tester.</li> </ul>
<b>Roles of Researchers:</b> <ul style="list-style-type: none"> <li>• Observer and note taker – Notes down results of user testing</li> <li>• Ask no leading questions</li> <li>• Use research results to develop ideas for improvement on the prototype.</li> </ul>