UNIVERSITY OF BIRMINGHAM

Human-Computer Interaction

A Clean Interface for Train Ticket Vending Machines

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Group 4

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To be completed later.

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To be completed later.

3 Introduction

The primary aim of the project is to design an interface for a train ticket vending machine through which a customer can buy a ticket or collect pre-booked tickets quickly and easily regardless of level of technological expertise. The project will investigate the usability of current ticket vending machines at train stations, conduct a review of studies conducted in the area of interface usability and finally propose a new interface based on user-centered design. Principles of effective human-computer interaction will be used to design an interface that improves upon existing designs, both physical and theoretical.

4 The Problem

Whilst discussing possible project topics, the team considered various examples of poor interface design that had impacted their daily lives. Having considered several possible topics, it was decided to focus on self-service ticketing machines, in particular those vending train tickets.

Ticket vending machines (TVMs) are becoming increasingly prevalent as an alternative to manned kiosks in an effort to reduce staffing costs and queueing times at railway stations. However, studies have determined that the majority of customers opted to use a manned kiosk instead of a ticketing machine if possible. (PassengerFocus 2008).

An initial study was performed in 2008 with a follow up in 2010, clearly identify several aspects of the user interfaces which deterred customers from using TVMs, primarily concerning the usability of such systems, especially for those with less technical expertise. It was noted in discussion that several team members had on multiple occasions been required to assist other customers in purchasing their tickets and examination of current ticketing machines from several different rail operators suggested that there were still many issues with the usability of these systems.

We feel that there is much that could be done to improve the user experience when buying a train ticket and that there are many improvements that could be applied to current TVM interfaces in order to increase their popularity and reduce the time taken to buy a ticket, thus reducing queuing time. This project will analyze existing designs from a user-centered view, review existing studies in the area and discuss how current human computer interaction theory can be applied in designing a prototype for a TVM interface with an improved user experience.

4.1 References (To be moved)

PassengerFocus (2008) - Buying a ticket at the station: Research on ticket machine TransportFocus. (2016) Retailing. [ONLINE] Available at: http://www.transportfocus.org.uk/key-issues/retailing/. [Accessed 20 October 2016].

5 Literature Review

5.1 Existing Systems

Ticket vending machines (TVMs) have become increasingly popular over the past several years, being used to replace manned ticketing kiosks in a variety of sectors. Whilst buying a train ticket from a machine has been a possibility for decades, it is only relatively recently that a single touchscreen interface has become the norm for these machines. However,as discussed previously, research into train ticket vending efficiency has suggested a customer preference of a manned kiosk over a TVM. Studies attempting to determine the reasoning behind this preference identified several key issues with the current user interfaces (UI) obtained via passenger feedback (ref). Several of the issues identified (TransportFocus 2016) have been summarised below:

- Difficulty of interacting with touchpad - customers found that the touchpad was generally unresponsive and often poorly calibrated, making selecting options on screen difficult
- Too much jargon - customers experienced confusion over off-peak and peak times and when a travel card could be used. Ages applicable to child fares were also often not shown.
- Sheer volume of information- customers felt the amount of information displayed on the screen was overwhelming and made it difficult to decide where to press.
- Visibility of key options - Information boxes to the side and bottom of screens were often not seen by passengers.
- Poor choice of colour scheme- for example, customers found that information in yellow writing was not readily visible and that a colour scheme of blue and green did not provide enough contracts to easily read on the screen.
- Intervention by staff still required - In some cases information about routes and restrictions was not provided, instead instructions were given to ask a member of staff for information.

In the following section, two existing UIs designed for TVMs will be examined in order to determine the current prevalence the above issues in the UK and to identify further barriers to the usability of TVMs. There has been much research in the area of improving usability of ticketing machines across a range of sectors and both good and bad elements of interface design will be identified in existing models in order to help determine the requirements for an improved approach to train ticket vending. In the UK, there are two particular designs of ticket machine that are utilised by the majority of train operators. These are the Scheidt & Bachmann Ticket Xpress and the Shere FASTticket. The UI of each machine has a different livery for each individual train operator however the underlying UI is essentially the same. An example of each of these widely used machines will be analysed to determine both positive and negative aspects of their UIs from a user centred design perspective.

5.1.1 Shere FASTticket

The example of the Shere FASTticket machine discussed here is a Virgin Trains ticket machine found at Birmingham New Street Station. In terms of the physical machine, the UI consists of a 15 inch touchscreen, chip-and-pin keypad and a tray into which the printed tickets are delivered. There are two variations of the machine, one which takes credit/debit card only and one which also takes cash. Nearly 60% of purchases in the UK still being undertaken in cash (Consult Hyperion, 2013) and it was anecdotally noted at both times at which the machine was examined (once at peak time and once at an off-peak time), there were queues for both the manned ticketing office and the machines that take cash whilst several card-only machines were still free. This would suggest that consumers prefer to have the option to pay with cash; this is a design feature that adds choice to the process without impacting on

the usability of the system as the customer will likely have decided in advance on their preferred method of payment.

The main UI of the Shere FASTticket is the touch screen via which the majority of actions are performed. The initial screen on approaching the machine is shown in Figure 1.

Figure 1: To Do

The screen in Figure 1 provides several options:

1. Buy tickets for travel
2. Collect pre-bought tickets
3. Choose language – languages represented by country flags

This simple starting point requires the user to choose between two options, this is an easy decision as a user will be aware of whether they have pre-booked a ticket or not. The use of flags to represent the languages is easy to understand however it does mean that the language selection is limited to the six languages specified. The large red circle in the centre of the screen has no function, this has the potential to be confusing for those who are using the machine for the first time. The screen does however follow good design principles in that it provides only the key information required to make this first decision and has a clear method of changing language which does not require any knowledge of the default language, the issue of presenting language options is discussed in more detail later in the report. On the other hand, the largest feature of the screen, a "big red button" has no function and detracts from the usability of the system by providing unnecessary distraction.

In order to demonstrate the usability of the UI, a typical scenario of buying a ticket was enacted. The users in this scenario are a pair of students wishing to buy one way tickets to Southampton at 7pm on a week day using their 16-25 rail-cards to get a discount. They select the option to buy tickets from the welcome screen and are taken to the screen shown in Figure 2.

This screen contains 21 different "popular destinations". If, as in this scenario, the user wishes to travel to a different destination, they can use the Station Finder A-Z button in the bottom right corner. The functionality to buy tickets for a different starting station also exists and is accessed by pressing the button "Tickets from another station" however this is not required in this case. There is also a "start again" button to return to the welcome screen. For a first time user of this system, or someone with a learning disability or low level of technical knowledge, the sheer amount of information and optionality on this page impacts the usability of the UI. The theory of choice overload becomes relevant here; it has been shown that too large a set of possible choices can lead to choice overload which results in reduced user satisfaction (Bollen et al, 2010).

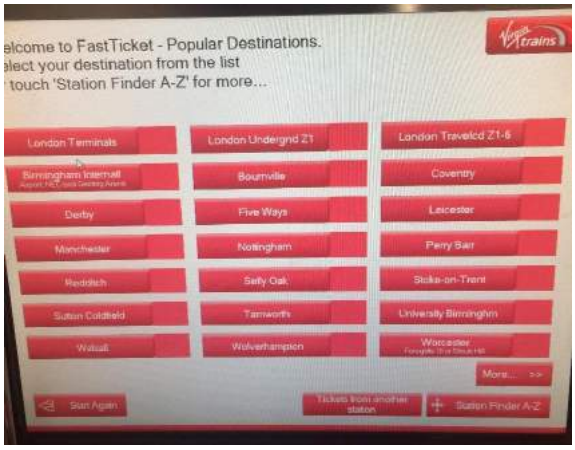

Figure 2: To Do

The option of choosing a different station comes only in the form of a small button that is difficult to distinguish from the other options on the screen, the instructions on using the UI also do not stand out on the screen and were not noticed initially. As discussed previously, customers have stated that buttons at the bottom or side of the screen are often missed and reduce the usability of the UI. In general, searching through a list of possible destinations is impractical and unlikely to encourage an impatient customer to make use of the ticketing machine again. For the scenario described previously, the students take the time to read through the popular destinations, discover that Southampton is not present and select the Station Finder A-Z option to reach the screen shown in Figure 3.

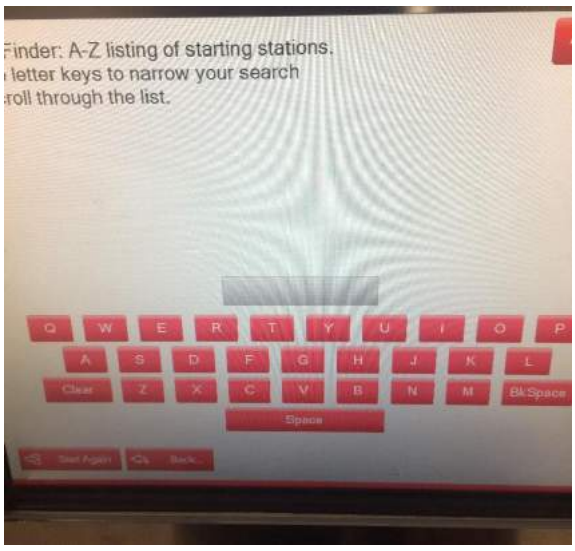

Figure 3: To Do

The user must type in the required destination on a QWERTY keyboard; although it has been shown that the elderly find an alphabetic keyboard more intuitive (ref), as time progresses it is likely that the majority of users will be familiar with the layout of a QWERTY keyboard and so this seems like a sensible design decision.

Once the destination has been selected, a selection of possible ticket types are displayed as shown in Figure 4. Again choice overload becomes an issue along with a large amount of train ticket jargon such as off-peak, anytime, day return etc which may well not be intuitive to a first time user.. The addition of railcards and additional passengers is fairly straightforward, the railcards option is selected and the

required railcard to add is chosen from a screen of the different types of card shown in Figure 5. The number of passengers is selected from a choice of 1 to 8 passengers as shown in Figure 6. In terms of the issues raised in previous studies, the relevant age limit for a child ticket is stated on the number of passengers screen (Figure 6), however the text is small and difficult to read given the glare produced by the screen.

Figure 4: To Do

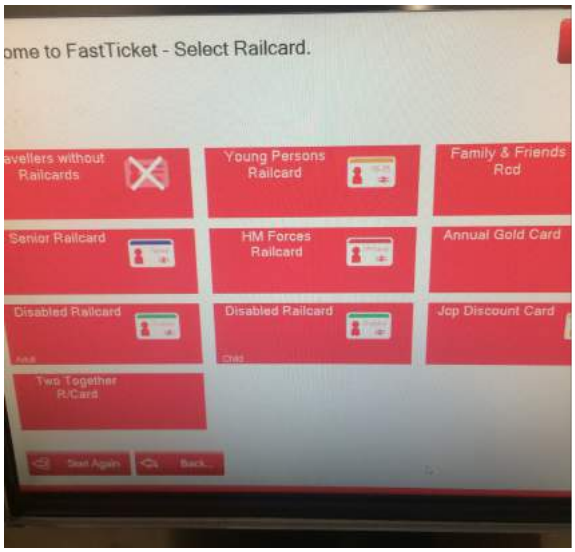

Figure 5: To Do

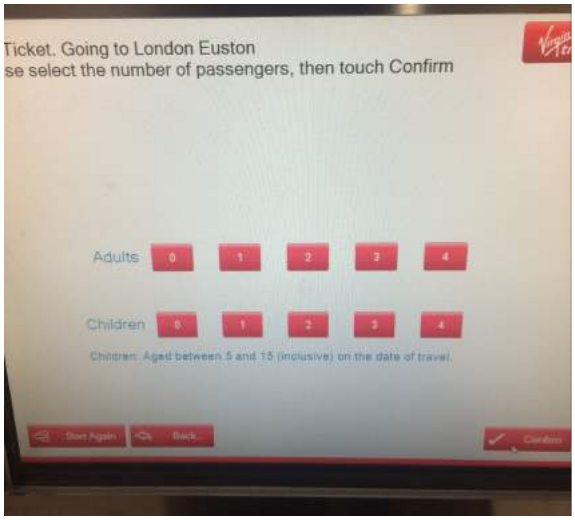

Figure 6: To Do

Overall, several of the issues identified by passengers are shown to be prevalent in this particular UI:

- Jargon is used without being easily explained
- Information overload
- Buttons to the side and bottom of the screen are not easily found
- Off peak timings and child age restrictions not immediately obvious

Additional issues were also identified:

- Choice overload
- Excessive number of steps to achieve goal
- Redundant objects on screen are misleading

5.1.2 Scheidt & Bachmann

Similar issues were found in the UI for the Scheidt & Bachmann Ticket Xpress, here a machine with the London Midland livery was examined. The main issue here was again choice and information overload. In contrast to the FASTticket design, there is no welcome screen, interaction commences with a screen of popular journeys demonstrated in Figure 7.

Whilst there are few redundant graphics on the screen, in comparison to the previous design, there are options to perform several different actions from this screen. The option to collect pre-booked ticket exists, however the button to do so is located in the corner of the screen, with small white text on a pale green background. The issues of poorly readable text and buttons at the side of the screen being missed were raised in previous studies and are clear design flaws of this UI. When selecting a station other than those on the initial screen, the name of the station must be typed in, this time on an alphabetic keyboard. As discussed previously, this is less intuitive for the majority of users and increases the time taken to purchase a ticket. Ambiguity in ticket types is also an issue, no indication could be found of the eligible times for an off peak ticket. On the other hand the addition of rail-cards and passengers once a ticket has been selected is again fairly intuitive, the relevant age limit for a child ticket is clearer on this UI than in the previous case.

Figure 7: To Do

Figure 8: To Do

It is apparent from the above case studies that there are still many design issues with train ticketing UIs and that little has been done practically to address the concerns of customers determined in previous studies.

5.2 Other Existing Approaches to Self Service Machines

Upon further research, it became apparent that several of the issues identified with self service machines in the transport sector are in fact common to many other sectors. One sector in which large amounts of time and money have been spent on interface improvement is in self-service checkout machines in supermarkets. Similar to TVMs at railway stations, these machines have been introduced to reduce both staffing costs and queueing times, however unlike the rail industry, where rail operators each

claim ownership of specific lines, the supermarket sector is fiercely competitive with significant financial investment into improving the shopping experience in an attempt to win customers from their rivals; a study by (ref) identified a positive correlation between a good user experience of self service machines and customer loyalty. Several aspects of the Tesco self service checkout system are examined below in order to determine positive design ideas that could be applied to a train ticketing interface. The first aspect of the user interface that is of particular interest is the search method for items that do not have a bar-code, i.e. loose fruit and vegetables and bakery goods. As shown in Figure **??**, the look up options for these items are presented in groups which make the items easy to classify. The options are presented as large folder shaped buttons, an indication that these are interactive buttons to press. The use of images in addition to text improves usability as users can determine the required category more quickly. This categorisation of items into an easily searchable format is a design element that could be explored in the context of purchasing train tickets, specifically in the selection of rail-cards, additional passengers and route specifics. The use of images, and the resulting ability to expedite searching for a required item is also an idea to be considered for TVMs , for example for tourists wishing to visit popular areas by train, an image of an easily recognisable local attraction could decrease search time on a "popular destinations" screen like those seen in the existing systems.

Modern self checkout machines also frequently make use of tutorial videos in order to aid in the use of the machine, For example, as shown in figure x, part of the screen consists of an animation indicating how to scan items and where to place them once they have been scanned. In this way. This is far more efficient that listing textual instructions which can be easily missed or misunderstood by the user.

Self-checkout machines still have several design flaws however the majority are not relatable to vending train tickets, for example malfunctions with the scales tracking item weights and the need for a staff member to check IDs for the purchase of alcohol. They do however often present a large number of possible operations on one screen, giving the potential for choice overload, a design issue that should be avoided where possible.

5.3 Ticket Machine Interface Design in Literature

5.3.1 Approaches to Ticket Machine Redesigns

The issue of HCI design within self-service rail ticketing machines has been tackled by different groups around the world, resulting in a variety of approaches that attempt to solve the problem. The employed strategies highlight existing UI shortfalls and establish a new focus on how the user interacts with the interface for the re-design. Subsequently a new set of methods are put forward to tackle the UI problem. These alternative approaches investigate two particular areas, the first is the use of colour and graphical representation, and the second is interface simplification; reducing the number of options and requesting user input sequentially.

5.3.2 Colour and Graphical Representation

The use of graphics and colour are fundamental in creating a successful UI REF but it should be used sparingly so as not to overwhelm the user. Taiwan rail's REF first heuristic highlights the importance of using graphical elements but only when they assist the user. Trivial graphics may lead to distraction by crowding the screen and impacting the user's performance at completing the task. Over use of colour and high contrast may introduce confusion rather than highlight important aspects since no one colour stands out REF. Conversely, low contrast screens inhibit a user's understanding of the interface and gives a lack of weight to certain elements, Norman REF describes how sufficient visibility of UI controls is required in order for a user to assess the situation and make an informed decision to progress forward.

It is therefore a fine balance in which sufficient contrast should be given through a limited set of colours (Taiwan rail REF).

In addition to limiting the range of colours, the chosen colours must be readable by those who are visually visually impaired or suffer from colour blindness since ticketing machines should be designed for the widest array of users. REF Globally the prevalence of colorblindness is quite high and is therefore an important aspect when designing the colour scheme of a UI system. REF states that "One in twelve Caucasian (8%), one in 20 Asian (5%), and one in 25 African (4%) males are so-called "red-green" colorblind.". To overcome this, the UI colour scheme can be designed in one of two ways to give more differentiation to elements; firstly by using patterns REF, and secondly by using a colourblind barrier-free colour pallet REF. The use of patterns such as hatching can help to separate two elements even if they are perceived to be the same colour by the user, this can be taken further through the use of edge stokes and shadows within button selections, in turn adding more distinction between elements (REF). This approach should not be a replacement for colour however, but instead be used in addition to a colourblind pallet FIG1. A key component of the pallet is to use 'warm' and 'cool' colours alternately; two of the same type should be avoided. REF also highlights that the the use of the colour red should be used with caution, especially for displaying important information. The vividness can make it appear black to those who are colourblind, as such red and black should not be used in conjunction with one another.

FIG1 colour blind pallet.

The choice of font in the UI is also an important aspect. Scripts that use thin lines such as 'Times' or 'New York' can pose difficulties for readers, whereas bold fonts 'Arial' or 'Helvetica' can be perceived more easily (REF). The amount of text on screen should also be taken into account, similar to a large range of colour, the vast amount of text can introduce confusion to the UI. An approach to overcome this is to use graphics as they can be an alternative to words, Taiwan rail REF explores how choosing a single or return ticket can be portrayed using graphical arrows, not only to reduce text in this example but to also reduce ambiguity. Since languages can express the same thing with different words, a level of uncertainty can be introduced. The UK terms for "single" and "return" would be written as "one-way" and "roundtrip" in the US (REF). The use of a picture can however reduce ambiguity since an image can help to explain the ticket type at a glance, this method is used by both swiss rail company REF FIG2 and by SBB REF FIG3. It has also been noted that the direction of a single trip should read in the same direction as the language of the user (REF Taiwan Rail) such that someone from the UK would expect to see an arrow from left to right for a "single" ticket.

FIG 2 graphics Swiss Rail Company FIG 3 graphics SBB

Rethink REF introduces the idea of using graphics to help identify certain location within London FIG4. Landmarks are used alongside the location name to help make journey decisions easier for the user. It is also helpful for tourists as identifying buttons with visual landmarks is quicker and more accurate than choosing place names REF. This ties into one of Taiwan rail's REF heuristic of relying on recall, not memory, users to recognise what they want more easily and faster through graphics as opposed to remembering location names. Taiwan Rail REF takes an alternative approach to using landmark graphics by instead combining destinations within a map interface FIG5. Whilst this method may work well on a rail network consisting of one route with a small number of stations, this would however be more difficult to implement within the UK rail system due to its complexity.

FIG 4 Rethink graphics for locations FIG 5 Taiwan map system

Many of the redesigns introduce a form or progression bar which indicates how far along the buying process the user is. It was a key heuristic identified in Taiwan rail REF, and is additionally used for similar reasons in both south eastern rail FIG6 and SBB REF. It works in two fold by showing all the steps at once, whilst showing the progression for the user. This is especially important for a user who

wishes to use the machine quickly as it allows the user a full understanding of where he is within the UI at a glance and is made clear from the first step.

FIG 6 progression bar South Eastern FIG 7 progression bar Amazon

This technique could be taken further by introducing the option to actually select one of these elements to skip back to that specific step and forward at any time. Graphical images could be implemented within the nodes of the progression line to visually indicate the type of stage that the user is on such as that used by FIG7 Amazon REF. Expanding these concepts further to create multiple uses for this one progression line ties into a fundamental theme of good design which is expressed by Shigeru Miyamoto REF "A good idea is something that does not solve just one single problem, but rather can solve multiple problems at once".

5.3.3 Process Simplification

One of the main issues with rail ticket machines, as highlighted previously, is the overwhelming array of options presented to the user. Redesigns have tackled this by attempting to reduce the number of options and the introduce a more sequential approach to UI design REF. This ties into the graphical representation of the progression line which allows for an understanding of structure and hence presents the process in a more readable way, in turn reducing its apparent complexity. By breaking the the request for information down this helps to reduce information overload and hence can allow the user to progress faster Taiwan Rail REF. This is especially true when the user is put under a time constraint to make a quick decision, ticket machine use increases during peak times REF adding pressure to collect tickets quickly. When presented with a vast array of options the user is more likely to make a wrong choice as opposed to when simple questions are asked sequentially REF.

One of the main challenges encountered by ticket machine users on South Eastern rail was the lack of responsive touch screens REF , therefore to make a feasible ticket machine interface within existing infrastructure they must take into account the unresponsiveness of the interface. South Eastern rail REF suggests the way to overcome this, whilst at the same time speeding up and simplifying the process is to remove next buttons entirely and use confirm buttons sparingly. Instead of selecting to progress at every stage, after the last option is selected the interface will automatically advance to the next screen. Taiwan rail REF reinforces this idea by describing how reducing the number of options and button clicks helps to speed up the selection process and save screen space whilst at the same time simplifying the UI. The reduction of button clicks may even extend to reducing some steps entirely by using alternative progression methods. However this requires careful planning as combining steps could lead back to information overload for the user. The ideas put forward by Rethink REF go against those of South Eastern rail and Taiwan Rail as they instead combine destination, date, number of tickets into one section after the initial ticket type selection FIG8. Whilst the system is perhaps more readable than those presented by London Midland, it does not match with the conclusions drawn from other redesigns which both favour sequential breakdown. An alternative approach to the reduction of steps instead uses the existing idea of using pre-booked tickets.

FIG8 Rethink ticket selection screen.

An area of confusion highlighted by South Eastern rail REF was the peak and off-peak ticketing times. Both South Eastern rail REF and Rethink REF use different methods instead of the peak and off-peak system, the former uses time selection to imply peak and off-peak FIG 9 , and the latter asks the user what kind of traveller they are, whether it be a commuter or tourist FIG10. Whether any one of these approaches is better than the other is hard to determine. The terms peak and off-peak are so widely used within the current UK system (REF) that failing to mention them at all may lead to a user questioning where to find an off-peak ticket, or if they are in the off-peak time. It is therefore of greater benefit to

the user to visually emphasise the clear difference between the two ticket types and what times the two categories fall under.

FIG 9 Rethink ticket type

FIG 10 South Eastern rail time selection

Other topics to include in the literature review:

- Use of the written language as opposed to a flag although could be argued either way. Europe does have countries whose flag does not directly represent the name of their language.

5.4 Summary of Findings

After reviewing current self service systems, both physical and theoretical, it is apparent that there is much that can be done to improve the user experience when buying a train ticket. There are many issues with the two systems currently in use however each one also possesses some elements of good design. (summary of existing systems)

Recent theoretical approaches have already improved vastly upon the systems currently in use for example, methods for process simplification, more intuitive user interaction and improved visibility have been extensively researched by teams globally, often with a prototype interface being produced. Much inspiration can be taken from the literature in terms of designing an interface that is easily accessible to all, especially those with lower levels of technical proficiency. The analysis of the supermarket self checkout system provided possible concepts for improved station selection methods and a more practical approach to conveying instructions. The benefits of using graphics instead of words where possible have also been made clear in research. The use of instructional videos as opposed to written instructions has been shown to be beneficial due to reduced chance of misunderstanding and the human tendency to recognise images more quickly than reading text.

In summary, several poor aspects of interface design have been identified and will be avoided in the design of an improved TVM interface:

Conversely, this review has also identified many effective design methods which will be used to inspire a more user-friendly approach to train ticket vending:

In the following section, these findings are used, in conjunction with a set of realistic personas and scenarios to describe in detail the user requirements of the UI.

5.5 References (To be Moved)

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colour blindness https://designshack.net/articles/accessibility/tips-for-designing-for-colorblind-users/

http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0000HT"

http://jfly.iam.u-tokyo.ac.jp/color/

6 User Requirements

To be completed later.

7 First Prototype

To be completed later.

8 Second Prototype

To be completed later.

9 Summary and Recommendations

To be completed later.

10 Persona's

<table>
<tr><td>Photo
  </td><td colspan="2">Barbara Smith</td></tr>
<tr><td></td><td colspan="2">Elderly lady - Technologically illterate</td></tr>
<tr><td></td><td>Background
Age - 67
Occupation - Retired Teacher
Field of Study - Education
Level of expertise - No experience or formal training</td><td>Main Points
-Barbra likes to spend time with her family.
-Barbra lives in a small town and needs to use the train to visit her family in the city.
-She is technocially illiterate and doesn't know how to use a smart phone.
-Poor vision due to glaucoma.</td></tr>
<tr><td></td><td colspan="2" rowspan="6">Barbara is living in a rural town with her husband Jerald. Jerald is five years older than Barbra. He does not like to travel on the train. Barbra's daughter in law has just had a baby which is the third baby to join the young family. The family live in London and childcare is expensive.

Barbra would like to help take care of the children when both her daughter in law and son return to work. Barbra does not travel regularly as her husband does not like to travel far due to illness.

Her son bought her a new personal computer for Christmas so that could use Skype on weekends however she has been unable to figure out how to set up an email address to register for the service. She has attended an event at the local library training OAP's to use digital devices. She enjoyed the experience however struggled with most of the technology. However, she was able to use the devices that had been specifically designed for the elderly and commented how she wished more devices were user friendly for the partially sighted and elderly population in the UK.

Barbra has decided she would like to use more technology
in here everyday life.</td></tr>
<tr><td>Goals
-Barbara would like to visit her grandchildren in London.
-She wants to travel often on similar routes to her son's home in London back to her home town.
-She wants to find the quickest possible route to London so she can spend more time with her grandchildren</td></tr>
<tr><td></td></tr>
<tr><td>Frustration and Pain Points
-Barbara needs to purchase tickets at the station but thinks the machines are too complicated.
-Barbara cannot use the internet as she is technologically illiterate therefore cannot purchase tickets online.
-She wants to use ticket machines as staff shortages at her local station have caused increased waiting times for the helpdesk.</td></tr>
<tr><td></td></tr>
<tr><td>Scenarios (Titles)
1.Barbara has arrived at the station and no helpdesk
members are available to serve her.
2.She is late for her train and needs to buy a new ticket
3.She is travelling to see her son's family but he will
be travelling to Paris on business at 7pm so she needs to arrive 3hrs before so she can see him.</td></tr>
</table>

Figure 9: To Do

Photo	Hubert Dijon	
	French Backpacker	
	Background • Age - 21 • Occupation - Student • Field of Study - International Business • Level of expertise - Some experience with touch screen phones and computers in general.	Main Points • Hubert is from the small village, Gordes, in France • Hubert has just landed in London and wants to get to the Welsh country side • He had a long flight from Australia and is very tired • He only speaks broken english • He is independent and likes to works things out for himself • He enjoys rock climbing and camping
Goals • Hubert has to check into his hostel in Swansea by 8pm • Hubert wants to travel independently, without help, as that is part of the backpacking experience! • Hubert wants to spend as much time in the countryside, catching up with friends, or enjoying the local sights	Hubert Dijon has lived in the small French village, Gordes, all his life. His mother and father own the local Bakery and have also lived in Gordes all their lives. During the week he studies International Business at the local university and on weekends he teaches rock climbing to a small class of 5. Being an adventurous sort, Hubert started feeling isolated from the rest of the world, so at the age of 21, he is backpacking around the world. Hubert plans to leave in January for Australia and spend 3 months exploring the sunny East coast. He is excited to see beaches, Kangaroos, and to try some Australian red wine. Hubert's next stop is the United Kingdom. After landing in Heathrow he heads straight to Swansea to stay for 1 night. The next day he plans to reach the Welsh country side and spend the next week looking for serene rock climbing and camping spots. But Hubert's student life won't let him afford a rental car so he must ask around at the local pubs and shops for a cheap lift out. After spending a week in the country side, Hubert plans to catch the train from Hereford up to Edinburgh. Some of his friends are on Erasmus at the University of Edinburgh and wants to catch up with them for a few days. Hubert last stop is Brussels in Belgium. He has a long train ride to get there as he has to travel from Edinburgh, switch to the Eurostar at King's Cross (in London), which can then take him to Brussels. He only has a few days in Brussels before catching the train back to Marseille, the closest city to his hometown Gordes. His parent's will not have seen him for 4 months and be thrilled to see him. They plan to pick him up from the train station and hear all about his travels during the ride home.	
Frustration and Pain Points • Hubert has to catch a train straight after a 24 hour flight from Australia • He cannot read or speak English too well • He doesn't like asking for assitance • He wants to board the train as quickly as possible		
Scenarios (Titles) • After a 24 hours flight from Australia, he has to catch a train from Heathrow to Swansea. He has to reach there within 4 hours to check in. • It is morning and Hubert is in Hereford. He has dinner planned with his friends in Edinburgh but has the whole day to get there. • Hubert needs to travel all the way from Edinburgh to Brussell, via London. He want's spend the least amount of time possible at the stopover in London.		

Figure 10: To Do

11 References

[1] Simon Rogers and Mark Girolami. *A First Course in Machine Learning*. 1st. Chapman & Hall/CRC, 2011. isbn: 1439824142, 9781439824146.

[2] Jim Frost. *When Is It Crucial to Standardize the Variables in a Regression Model? | Minitab*. http://blog.minitab.com/blog/adventures-in-statistics/when-is-it-crucial-to-standardize-the-variables-in-a-regression-model. (Accessed on 10/21/2016). Feb. 2016.