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# Understanding passengers' experiences of train journeys to inform the design of technological innovations

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## Abstract

In this paper, we present results from a collaborative research between academic institutions and industry partners in the UK, which aimed to understand the experience of rail passengers and to identify how the design of technology can improve this experience. Travelling by train can often provide passengers with negative experiences. New technologies give the opportunity to design new interactions that support the creation of positive experiences, but the design should be based on solid understanding of user and their needs. We conducted in-depth, face-to-face semi-structured interviews and used additional questionnaires given to passengers on board of trains to collect the data presented on this paper. A customer journey map was produced to illustrate the passengers' experiences at diverse touchpoints with the rail system. The positive and negative aspects of each touchpoint are plotted over the course of a 'typical' journey, followed by the explanations for these ratings. Results indicate how the design of technological innovations can enhance the passenger experience, especially at the problematic touchpoints, e.g. when collecting tickets, navigating to the platform, boarding the train and finding a seat. We finalise this paper pointing towards requirements for future technological innovations to improve the passenger experience.

Keywords: *customer journey map; user experience; user centred design; interaction design; rail transport;*

*innovation*

Sometimes passengers have negative experiences when travelling by train (Wockatz & Schartau, 2015). There are diverse aspects of the rail transport that could be improved (Transport Focus,

2015) and experiences tend to worsen with the increasing demand to the rail system (Office of Rail and Road, 2015a, 2015b). Customer journey experience maps are commonly used to understand and visualise user experience (Jüttner, Schaffner, Windler, & Maklan, 2013), with examples picturing passenger's interactions with transport systems (Aceves-González, 2014). The information provided by journey maps can be used to improve service operations (Tseng, Qin Hai, & Su, 1999). There is potential for technology to be designed in a way that support positive experiences (Desmet & Hassenzahl, 2012).

This research aggregates existing knowledge and complements it with bespoke data collection to understand the interaction between passengers and the rail system. The aim was to understand how rail passengers currently experience their journeys, providing real-life insights on interactions with the system, from planning and buying to alighting at the final station, in order to identify how innovative technologies can improve this experience. The study design focused specifically on the points of interaction where technology can affect the user experience. A passenger journey experience map was produced in order to illustrate how customers feel at each of these main touchpoints with the system, highlighting particularly where technology can play a role in improving the customer experience. The map is complemented by analysis of the interactions and suggestions for the development of technology to enhance customer experience for rail travellers.

This work is part of a consortium formed by two academic institutions and four industry partners named CLoSeR. The collaborative nature of this research requires synergy between academia and external organisations, combining research methods to better inform the production of

innovation that could improve user experiences. The main phases of the project are being conducted over a 27-month period, from December 2015 to March 2018.

## **Literature Review**

British rail transport is observing an increase in demand in recent years, with noticeable growth in the number of journeys, kilometres travelled and passengers entering, exiting and changing at stations (Office of Rail and Road, 2015a, 2015b). The extra demand places additional strain on a system, which inevitably will negatively affect how passengers perceive the quality of the service. User experience (UX) in public transport is subject to growing interest from the public sector, academia and industry. A recent government report indicated the need to increase the public transport UX as one of the solutions to promote efficient and sustainable transport systems that meet the needs of travellers in the UK (Wockatz & Schartau, 2015). Their results show that passengers complain about “lack of personal space, lack of connectivity, and a perception of poor value for money” (Wockatz & Schartau, 2015, p. 29). Academic research has been evaluating user experience and satisfaction with travel through diverse methods, from large-scale surveys (Ettema et al., 2011) to individual depictions of travel experiences (Jain & Lyons, 2008). A yearly survey with passengers in the UK provides a wide picture of customers’ satisfaction with rail travel (Transport Focus, 2015). Train operation companies and associations also evaluate passenger’s experiences via focus groups and customer journey mapping (FGW, 2016 – personal communication, ATOC 2016 – personal communication).

Experience can be defined as an episode or a length of time that one individual go through (Hassenzahl, 2010), involving tangible perceptions through our senses and also feelings and

thoughts. UX it is a very personal phenomenon: what engages and enchants one user may bore or irritate another (Blythe, Reid, Wright, & Geelhoed, 2006). Interactive products and services that we encounter in our lives have the power to shape what we feel, and will inevitably influence our experience (Hassenzahl & Tractinsky, 2006).

One common way to understand and visualise UX is through the design of Customer Journey Maps, which are graphical representations of one's encounters with the products, services or systems. Diverse types of service providers use customer journey maps to understand and improve their operations (Johnston & Kong, 2011; Tseng et al., 1999), including studies about transport services mapping the experience of passengers (Aceves-González, 2014; Aceves-González, May, & Cook, 2016). These diagrams usually contain different stages of the journey, user actions and emotions (Williamson, 2016). The map displays the 'touchpoints' for each main point of contact between the user and the system, where some sort of interaction took place. The development of the touchpoints usually derive from the definition of the sequential incidents of the interaction (Jüttner et al., 2013). The process for designing such maps involves collecting qualitative data, usually through interviews, where participants report the significant occurrences and issues during the interaction with the product, service or system (Stein & Ramaseshan, 2016). Interview transcripts are then subject to a thematic analysis (Braun & Clarke, 2006), and these themes inform the elements that define the touchpoints in question. It is also possible to obtain opinions from participants using questionnaires handed to the target population. This method is frequently used to understand who the users of a system are and what views they hold (Goodman, Kuniavsky, & Moed, 2012).

We will describe in the next sections the methods used and the results obtained during this study, which provide a detailed account of the experiences of rail passengers. We present the customer journey experience map and then discuss the implications of these results. The conclusions indicate the requirements for technological systems and suggest opportunities for improving experiences in each of the selected touchpoints with the rail system.

## **Methodology**

Two methods of data collection were used to generate the journey maps: face-to-face semi-structured interviews and paper questionnaires handed to passengers. Full ethical approval was granted by the Biomedical & Scientific Research Ethics Committee (BSREC), from the University of Warwick. The recruitment of passengers for interviews happened through emails sent to employees of the Warwick Manufacturing Group. Those who had taken trains recently were invited to take part in an interview having a variety of open-ended questions to describe their train journeys and express their opinions. Participation was completely voluntary: employees were under no obligation to take part in this research, and no penalties nor financial incentives were given to motivate participation. A further data collection method used printed questionnaires handed to passengers on board of trains. This instrument used similar questions to the face-to-face interview adapted to the printed format. Table 1 shows participants and data points from the instruments used during this research: interviews and questionnaires. Both data sources were merged to provide a concise analysis across all the 951 statements extracted from participants' expressions of opinions.

Table 1 – Participants and data points per study

Method	Participants	Average duration per participant (minutes)	Total data points
Semi-structured interviews	20	27	703 statements tagged
Questionnaires	50	-	248 statements tagged

## Interviews

Face-to-face semi-structured interviews with 20 passengers were performed to understand their expression of attitudes, feelings, preferences, needs, behaviours etc. in relation to rail travel.

Interviews are the most frequent method used for understanding user experience. “Observation is critical, but to really know the user’s experience, you have to ask him or her about it, and that’s an interview” (Goodman et al., 2012, p. 129). The initial part of the questionnaire used for this study had questions about the main touchpoints with real services, namely: planning and buying; ticket collection; wayfinding; boarding; seat location; ticket validation; and alighting. These touchpoints were selected after a review of existing customer journey maps and analysis of where technology can influence the experience. Participants were prompted to describe these activities, for example explaining how they usually do it, what works well and not, and how would they improve that touchpoint.

With CLoSeR

PLANNING AND BUYING	TICKET COLLECTION	WAYFINDING	BOARDING	SEAT LOCATION	TICKET VALIDATION	ALIGHTING
	✓	✓	✓	✓		✓ 😊
✓					✓	😊
						😐
						😞
						😡

Figure 1 – Touchpoint experience rating exercise

In order to motivate participants to recall their train journeys and to foster discussions, they were asked to rate their experience on a 5-point ‘smiley scale’ from very happy to very sad, for the seven touchpoints. The interviewer then disclosed the nature of the technological innovation proposed by the CLoSeR project. Participants were asked to rate their experiences again, but now as if the CLoSeR system was implemented. Finally, a set of questions, similar to the first part of the interview, were placed in order to obtain participants’ impressions related to these innovative systems.

A total of 8 hours and 47 minutes were spent interviewing the 20 participants, meaning an average of 27 minutes per interviewee. The interviews were all recorded with the interviewee’s permission, transcribed verbatim and imported into QSR International NVivo software. This data was subject to customary thematic analysis (Braun & Clarke, 2006) to facilitate the process of creating meaning from the qualitative data.

## Questionnaires

Questionnaires were used during this research in order to increase the reliability of the results and to validate the information obtained from the interviews. Passengers on board of week-day, off-peak Great Western Railway (GWR) services were randomly approached and invited to fill in printed questionnaires and to agree to contribute via a consent form. The researcher would come back a few minutes later to collect the questionnaires. Passengers' responses were transcribed into the same NVivo file used for the interviews to complement the existing thematic analysis.

## Results

The information obtained from the interviews and questionnaires were aggregated in order to understand passenger's opinions and feelings in relation to their journeys. This knowledge indicated the touchpoints with the system to be plotted on a map and the corresponding mood on a 'smiley scale'. The Passenger Journey Experience Map, which resulted from this research, can be seen on Figure 2. The design follows recommendations from practitioners on how to plot this information on a map (Williamson, 2016). On the top of the map we define who is represented on the map and who contributed to the information there displayed. The second box of text indicates the scenario to which the experience is plotted (Oliveira, Maguire, Mitchell, & May, 2015). The user goals are indicated on the right hand side of the map, and this information is linked to the classification of touchpoints at the bottom of the map. The colour bars correspond to the main user goals in each stage of the journey. The bottommost row (in blue) indicates the business goal that the map supports, describing that there are opportunities for the CLoSeR project to improve experiences on those specific touchpoints.

## Passenger journey experience map

The process of **planning journeys and buying tickets** is usually positive for passengers. That is because there are diverse alternatives to suit individual preferences. Participants reported that they purchase tickets on the web on their preferred vendor, using their favourite apps on smartphones. However, five participants indicated that they still prefer to buy tickets at the station from a real person. Passengers gave diverse explanations for using their preferred purchase methods, such as that ticket machines do not give you the best prices or all the options, that online is cheaper, or that they prefer the assistance of a staff member. It indicates that there may be resistance to using a different method than usual. Also, some participants mentioned having different methods for different journeys according to price and convenience:

*P5: I usually I do it online. Or at the station. If I go to London or whatever I'll do it online, but I go to Oxford regularly so I buy it at the station.*

The **arrival at the station** is usually positive for passengers, if they have enough time, can relax and have a drink. However, if they are late, it will affect the next steps on the journey and make the experience particularly negative. Most passengers choose to **collect their tickets** at the station before departure. This stage is often negative for passengers since there are sometimes queues and it is a time-consuming process per se. In addition, there is the effort of inserting the card and inputting the code, which is seen as unnecessary.

*P20: you have to use that debit card to print the ticket off which is quite annoying.*

*P13: Some of the older machines do take an eternity to print the tickets, and if you're standing there with 5 minutes and you've got tickets gradually printing... it's frustrating.*

Once with the tickets at hand and with time, the **wait for boarding** can be fine. However, in large stations and at busy times the concourse can become crowded with people staring at the boards waiting for the authorisation of boarding and announcement of the platform. Passengers report that sometimes there are too many people or this information comes too close to the departure and there is competition, making the experience very negative.

*P2: Euston is a bit of a pain, because typically the boards don't update for trains up to Manchester up until about 5 or 10 minutes before the train is about to depart which normally means there is a mad dash for the gate. And you end up with a scrum of people all trying to board the same train in a very short period of time.*

*P13: One annoying thing is the train is at the platform, but you aren't told until 5 minutes beforehand that you should go, and there's a swarming.*

The need to **go through the barriers** can worsen the experience, they not always know which ticket to insert, and there may be a bottleneck. However, passengers acknowledge that

## PASSENGER JOURNEY MAP

Based on 20 interviews and evaluations by passengers, as part of the CloSeR project.

## SCENARIO

This map represents the average train journeys taken by our participants. These routes are mainly long distance services in which passengers can reserve a seat, and interact with train managers during the ticket validation process.

## GOALS AND EXPECTATIONS

- Passengers have the following goals when travelling by train:
- Find the cheapest ticket for their journeys
  - Have a stress free wayfinding and boarding
  - Find a seat
  - Have a stress free journey up to the final destination

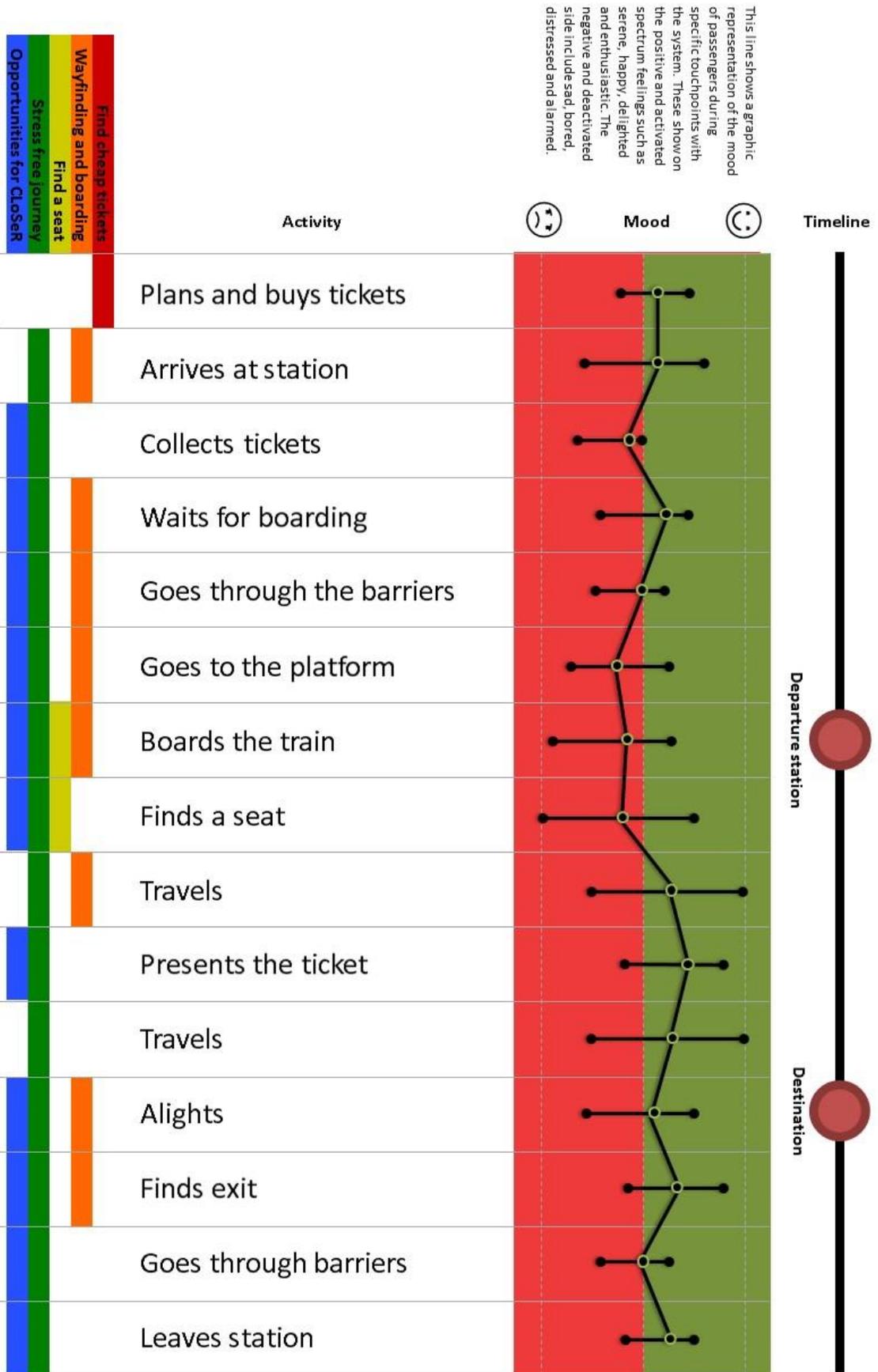


Figure 2 – Passenger journey experience map

it is unavoidable. Thanks to the barriers, the stations are safer, and it is fair with those who paid since it prevents fare evasion.

*P3: Ticket barriers are always annoying.*

*P5: It just seems to create a lot of unnecessary queueing. I mean I understand why they do it, because people don't buy tickets.*

The wayfinding process, when passengers have to **go to the platform**, is ranked rather negative by participants at large stations, due to big crowds, poor signage or lack of time. However, in small or familiar stations that does not seem to represent a problem.

*P3: If you're transferring trains, because I never know what platform, so I have to get off and look for a board and so.*

*P4: I'm probably a little bit late when I arrive and it can sometimes be a bit difficult to find a platform.*

**Boarding the train** is often problematic due to the insecurity of knowing if that is the right train. Some trains do not have any indication of the destination outside or inside, and if they do, it may not be very visible. The step and the gap are frequent concerns. It is also difficult to know where the coach for your specific seat reservation will be at the platform. Big crowds and other passengers' aggressive behaviours compound the problems, making the experience during this stage of a journey rather negative.

*P15: Wayfinding is a nightmare, I took the wrong train just days ago.*

*P17: I used to get the ten past 8, it was absolutely horrendous. Like fully elbowing people to get in. It's horrendous, and dangerous.*

*P18: Where I really struggle at a different station is where you should stand at the platform. So if you've booked a seat, where should you be standing so you don't have to run up the platform when the train arrives.*

Once on board, and being able to **find a seat**, the passengers' experience improves considerably. They are now heading to their destination, can occupy their personal spaces and engage in their preferred activities. However, if on a crowded train and unable to find a seat, frustration builds up, especially for those paying large sums for their tickets. Participants mentioned a number of issues with the current system for seat reservations. For example, that sometimes the allocated seat is not exactly what was selected during booking.

*P13: When you're booking online and you specify your seat, they deliberately set out to troll you, you say forward facing window seat, and that's interpreted as sitting backwards or next to a wall.*

Often the reserved seat is difficult to find because there is no clear indication of where the coaches will be when the train arrives at the platform. In addition, some passengers do not use their reservations and decide to sit elsewhere resulting in one passenger occupying virtually two seats.

*P3: I never bothered trying to find my seat because I'd just get on the nearest coach to me, that's fine, as long as there's space. But I won't go and hunt down where that seat is. I just seat in whatever seat I can find, even if I do have a seat reserved.*

One issue that can affect the journey rating is if someone is sat in someone else's reserved seat. The resulting conflict (or the need to ignore it to avoid conflict) compromises enormously the travel experience.

Probably the larger chunk of time of the journey is the **travel** itself. That can be a positive experience if passengers find themselves in a stress-free environment where they can read, work, interact or simply pass the time. A crowded train or the behaviour of other passengers can compromise this experience though.

At certain points of the journey, passengers are generally asked to **present their tickets for validation**. This process is often positive, since it is probably the only chance of interaction with the train manager. Passengers then have the chance to ask questions and get the valuable reassurance they need. This occasion is also positive because it is when passengers see the figure of authority on board, which can bring feelings of safety and security. Knowing that someone will come to check tickets makes them feel better that other people are not travelling for free, or in the event of conflicts such as seat disputes. The negative aspects of the ticket validation process are the fact that sometimes passenger have several tickets with them and it's difficult to find them or know which one should them hand for inspection.

*P9: Sometimes you get about 4 different tickets, and then it can take you ages to find the one they want to see.*

*P1: By checking tickets it's giving them a reason to be going up the train and interacting with people. If somebody's got a problem, they stop and talk to them.*

*P8: Checking the ticket doesn't really inconvenience me to be honest. It almost in a way gives some reassurance that if you're travelling without a ticket you will be caught.*

*P13: I do remember when I had a small book's worth of tickets, and a particularly jolly inspector, he just took one look at all those tickets and said 'oh someone has been using a lot of trains' (laughs). The guy, somehow, despite working on a dismal morning, my goodness, he was just so friendly.*

The process of **alighting** at the destination presents some anxiety, especially in busy services.

Passengers report having to wait behind other people, and the fact that there are only two doors at each end of a coach, which creates the risk of missing the stop.

Passengers then find the exit and **leave the station**, which are usually trouble-free activities, probably because people may not be in a hurry as they are when arriving at the station. The fact that they have to go through the barriers again is seen as troublesome if they have to locate the right ticket to leave the station, and as redundancy if they have been checked already at the entrance and on the train.

*P5: What I don't understand though is why do you have to go through the barriers anyway, if you've already had it stamped. It's like a double check.*

## **Discussion**

The results presented here illustrate how passengers currently experience their train travels. Even though there have been other studies on passenger experience and other passenger journey maps produced, this research contributes to the existing knowledge by focusing on specific touchpoints, which were not explored in detail previously. These touchpoints are the ones where technology is believed to have higher potential to enhance the rail experience, specifically when passengers have to collect their tickets, go through the barriers, find the platform, board the train, find a seat and present the ticket for inspection. This paper also adds to the previous literature by proposing a number of strategies of how technology can create better experiences for rail travellers.

As illustrated by the passenger journey experience mapping (Figure 2), passengers have a range of positive and negative experiences during rail travel. Depending on the scenario, a passenger can be pleased by how their activities panned out during the interaction with the systems, but in other situations, the interactions may seem negative hindering the experience. Systems and products should always be designed with the aim to provide a good UX, and interactions should be worthwhile and valuable (Hassenzahl, 2010). It is possible to design for pleasurable interactions (Desmet & Hassenzahl, 2012) and mapping of passenger experiences provides interesting insights into how technology could provide better experiences.

### **Touchpoints**

Planning and buying tickets is usually a positive experience, given that currently there are several channels where tickets can be bought according to passengers' preferences. Every

channel presents advantages and disadvantages depending on the type of passenger and scenario. Even though the proportion of sales at the staffed ticket offices is decreasing year by year, it still remains as the most popular method of purchasing tickets, representing about 40% of the sales in 2014 (Transport Focus, 2016). With the addition of new technologies, the variety of purchase alternatives should ideally be maintained. An attempt to force users to use one specific channel to buy tickets may hinder the user experience.

The ticket collection is frequently seen as a negative experience as it takes time and effort. Our results resonate findings from a usability study which indicated that the ticket vending machines are complicated, unclear and passengers were not confident they would find the best price (Transport Focus, 2010). Passengers were pleased with the idea of removing the need to interact with these machines altogether. The experience can be improved if passengers have an easy way to prove that they have the right to travel. Technology can provide means to identify passengers and allow access to stations without the need for a paper ticket printed prior to boarding.

However, some passengers are still reluctant to use smartphones. A new system should provide means of identification of passengers who do not own a smartphone, or in the case of batteries running flat, or simply not carrying their devices at that time.

The process of waiting for the train can be pleasurable if passengers have time to spare, if they know the station in question and if it is not very crowded. However, passengers reported that at larger stations at busy times the experience can be really miserable. If a system can provide platform numbers directly to smartphones as soon as they are available, it can reduce the anxiety

and the need for passengers to congregate at the main concourse at busy stations, reduce the need to stare at the boards and minimise the chances of a ‘mad rush’ to the train.

Another problematic touchpoint is the interaction with the ticket barriers. Passengers usually do not know which ticket to use, it can delay the process of going to the platform, and is worsened by queues at peak time. A system should provide a way of going through the barriers quickly and with less effort. The idea of removing the barriers altogether is not welcomed by passengers, which rely on them to have a safer station and reduce fare evasion.

A frequent complaint from passengers was regarding the boarding process. There is insecurity about if ‘this is the right train’, difficulty getting to their reserved seat or to locate an empty seat. If an application gives more information for passengers, it can minimise the insecurities during the boarding process. Previous research shows that passengers generally stand in the central portion of platforms and it eventually causes the ‘concentrated boarding’ (Fox, Oliveira, Kirkwood, & Cain, 2017). Our study shows that they would like to know where is the best place to stand at a platform to reach their reserved seats. Often there is no indication as to where the train will stop, how long it is or where first class coaches will be. In general, the provision of detailed information was highly valued by participants, in accordance to previous reports (Transport Focus, 2014). A system can communicate directly to mobile devices to enhance the information accessibility for passengers and create customized travel experiences (Miñano et al., 2017). It can for example present a map of the train with number of coaches and sequence, real time occupancy of seats and location of a reservation, so passengers can anticipate how to get to their seats.

On board of the train, the most negative aspect was in relation to seat location. A large number of passengers are not guaranteed a seat since they do not have a reservation. Those are season ticket holders, passengers on open return tickets and those buying tickets close to the departure of the train. Passengers would strongly appreciate a technological innovation that allows them to find seats. For those with reservations, sometimes the current system allocates a seat which passengers do not like. Passengers place different values to different seats (Wardman & Murphy, 2015). A reservation system that allows passengers to select a specific seat according to their preferences, or change an existing reservation, can improve the travel experience.

A dynamic seat reservation system will not prevent overcrowded trains and the fact that someone may sit on a reserved seat regardless. Often passengers do not have a choice given rush hour, disruptions or cancelations. However, some passengers have flexibility and are willing to wait for a later and less crowded train or to board a less crowded carriage (RSSB, 2016). A system should be able to show occupancy levels of next trains in real time, giving passengers the possibility of making informed choices.

The main issue with the ticket validation process is with the ticket itself. If a system allows people to validate their right to travel without the need of a physical evidence, it can save the trouble of having to locate tickets, find the right one, and produce it to crew. However, passengers value highly the fact that an inspector can come and interact with them. Similarly to a previous research, our results show that the presence and assistance provided by a customer-facing staff is still seen to be essential, such as for ticket retailing, accessibility, information provision, assistance and personal security (Transport Focus, 2016). However, if a system

automates some of the activities performed by crew, especially the mechanical work of checking tickets, there will be more time available for them to give personalised service and customer care for those in need.

Alighting is not often a reason for concern, although on busy services or unknown routes there is anxiety in relation to the right stop. If an application gives the information about when to proceed to the doors, that can reduce the anxiety of alighting at the right station. When leaving the station, passengers mentioned the need to go through the barriers again, as it affects the experience negatively. Passengers will appreciate if a technological innovation makes it easier and more convenient than paper tickets to enter or exit a station.

## **Conclusions**

This research used customer journey maps as a method of understanding passengers' experiences in relation to rail travel. With this research, it was possible to produce knowledge about passenger journey experiences and complement existing literature in user experience for the travelling public. This research focused in matching this new knowledge with the possibility of introducing new technologies to improve passengers' journey experiences at specific touchpoints with the rail system. A number of conclusions are drawn from this research and listed below.

From the interviews and questionnaires, it was observed that passengers have specific high-level goals when using train services. This section highlights these goals indicating the potential for improving experiences with the introduction of innovative systems for the rail industry.

- Passengers want a better way of proving the right to travel – Collecting tickets is ranked as negative due to the time and effort involved. Technology can grant access to only the right person without the need for a physical ticket.
- Passengers want to have a stress-free navigation through stations up to their seats on a train – A system can give personalised information to passengers according to their preferences, destinations and familiarity with the route. Push notifications can ensure passengers receive the information as soon as it is available.
- Passengers want to find a seat – Seat sensors can provide information to show occupancy levels, free seat availability and location in real time. Reservations can be issued in real time.
- Passengers want an easier way to locate their reserved seats – Visual representations of trains and coaches and their respective positions when the train arrives at the platform can help passengers anticipate and plan how to get to their seats.
- Passengers have their own preferences regarding seat choices – A dynamic system should allow changes to reservations in real time.
- Passengers do not appreciate having to travel on crowded trains – Technology can inform occupancy levels of next trains in real time, helping passengers’ decision-making process in search for less busy train.
- Passengers appreciate the physical presence of a crew member – There is still the need for on-board authority for safety reasons, or in order to give information about the journey. A system can automate some of the repetitive activities performed by crew such

as the process of validating tickets. With more time available, train crew can give personalised service and customer care for passengers in need.

This knowledge is being shared and discussed with all consortium members. The academic institutions and industry partners are working in cooperation to develop these innovative technologies which have the potential to ultimately benefit the travelling public.

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## Author biographies

Luis Oliveira

Luis is a Research Fellow at the University of Warwick. He is involved with the CLoSeR project, funded by Innovate UK through their Enhancing Customer Experience in Rail competition. Luis focuses on the user-centred design and user experience, and is responsible for

conducting all stages of the user research, from designing the studies to analysing data and reporting the results. Luis obtained his PhD from Loughborough University as part of the User-Centred Design and Sustainable Design research groups. He developed new ways for motivating behaviour change to promote sustainable energy consumption, applying user-centred design methods to investigate how technology can work as the platform for change.

### Callum Bradley

Callum Bradley has a BA (Hons) degree in Philosophy and Literature obtained from University of Warwick in 2017. As a research intern on this project, he has underlined the recognition of and borrowing from a wide array of theoretical concerns that originate from training across the social sciences and humanities. Presently commencing an MA in Psychoanalytic Studies, Callum's interest as to the diverse ways in which people can be understood and considered in the world has had influence on both initial strategies of gathering data, as well as creative techniques for re-imagining the presentation of customer journey maps.

### Stewart Birrell

Stewart A. Birrell has a BSc (Hons) degree in Sport Science from the University of Hertfordshire and a PhD in Ergonomics from Loughborough University. His primary research interests concern how humans interact with their surroundings and subsequent effect on task outcome and performance, which has been developed through working within a variety of different domains such as sport, military and transport. Stewart has recent experience in the design and evaluation of in-vehicle systems, where currently he works as an Assistant Professor at University of Warwick investigating human factors aspects of low carbon transport. Stewart has numerous scientific papers published in the field of Human Factors.

### Andy Davies

Andy is the Research Manager from Unipart Rail involved with this project. He is a purchasing professional with an Engineering background and over twenty years procurement experience of a wide range of quality component and bespoke manufactured products for both high volume automotive and SME manufacturing/distribution companies. He has considerable experience of Global sourcing particularly from China and the Far East and with a proven record of accomplishment of purchasing quality electronic and mechanical products in order to achieve significant cost savings.

### Neil Tinworth

Neil is the Research and Innovation Director at Unipart Rail. He has over twenty years of international business experience, undertaking strategic planning and analyses, organisational restructuring, business and process analysis, compliance and risk management, and

organisational change and development in international business environments within management consultancies, industrial companies and operating leasing organisations.

### Rebecca Cain

Rebecca Cain has a background in design, with a First Class degree in Industrial Design & Technology and PhD in user involvement in the design process, both from Loughborough University. In 2009, she was awarded a prestigious EPSRC Challenging Engineering fellowship to build new research capability in improving the design of healthcare environments through user involvement in the design process. Rebecca's innovative multi-disciplinary research programme 'Participation in Healthcare Environment Engineering' brought together design and engineering, with architecture, psychology, healthcare and ICT, and involved working in close partnership with the NHS, patients, architects, designers and engineers. Her research has created improvements to the healthcare environment in areas such as the Emergency Department, the hospital soundscape, wellbeing centres and waiting rooms.