

## Passengers' Requirements for developing a Passenger-Centred Infrastructure to Enhance Travel Experiences at Airports

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**Abstract.** PASSME (Personalised Airport Systems for Seamless Mobility and Experience) is an EU-Horizon 2020-funded project focusing on enhancing passengers experience at airports while reducing air travel time, through optimising interiors, luggage flow and offering real-time personalised information. We identified current processes, interactions and needs passengers and airport services experience while travelling. We employed mobile diary surveys on-the-go followed by semi-structured interviews to unpack journey trails and contextual information that influence passengers' experiences while at airport(s) and on board. Passenger experiences are multi-factorial while at airport(s) and during their journey demonstrating a strong need for trust, situation awareness and prompt information provision.

**Keywords.** State-of-Art requirements; PASSME-checkpoints; passenger experiences; airports

### 1. Introduction

There is limited research-based literature on passengers' travel experiences. Recent airports survey data (Sita, 2014) suggest that three key priorities for improving airports services are: 1) passengers flow; 2) airports' capacity analyses and 3) Airport service quality reporting. These key points constitute PASSME priorities and innovations such as passengers' experience, fast and seamless journey flow, enhanced interiors (for e.g. capacity analyses, personalised experiences and volume decongestion) and forecasting for handling decongestions and potential disruptions occurrence.

According to recent airport surveys (Sita, 2014), passengers experience is being prioritised within the airport travel industry by investing in new innovative IT & Telecommunications technologies. There is a great shift towards *enhancing mobile services, self-servicing and self-management* in passengers' trips. Passengers are anticipated to gain more control in managing their trips while airport and airline services become support agents. This year's airline surveys (Sita, 2015), demonstrated the increasing need for a more connected airport with enhanced airport-passengers interactions that promote personalised and tailored trips to passenger's needs.

### 1.1 Emotions and Passengers Experience

Passengers' emotions appear to change throughout their journey depending on what stage (i.e. check-point) of their airport experience they are. For example, while passengers may experience negative emotions when they go through security (36%), the majority of positive emotions are experienced during dwell time (95%) at the airport and while on board (91%) (Sita, 2015).

Ruffin (1993) suggested that daily stress -including airport stress- can be comparable to stress experienced during big life changes such as divorce, death and change of job impacting heavily on the overall perception of quality of life. Impairment in human performance has also been linked to negative emotions (e.g. stress) affecting attentional focus (Liao & Masters, 2002), spatial working memory (Hölscher, 1999) and cognitive mapping (Fewings, 2001), all of which can be critical for airport operations such as wayfinding, (Fewings, 2001) and decision-making (Kazda & Caves, 2007). By reducing stress when engaging in complex and time-dependent processes (e.g. navigating through airports) may 1) increase passengers' performance in wayfinding, 2) enhance their experience of *being* at the airport and 3) provide more opportunities for new interactions among passengers and among passengers and airports/airlines infrastructure. PASSME's aim is to provide personalised passenger services for enhancing travel experiences while optimising airport and aircraft interiors, forecasting passengers' flow at the airports and improving luggage handling to reduce air passenger journey time. Here, we aimed to capture core passenger requirements to inform the design of new personalised technological infrastructure to enhance passengers' experience.

## 2. Methodology

While PAX Surveys can quantify aspects of passengers' travel experience at airport, they do not provide qualitative insights as to how negative (e.g. stress) or positive (e.g. excitement and contentment) experiences occur and what other factors may interplay in determining these. We adopted a mixed-methods approach for capturing state-of-art requirements for PASSME based on current literature and empirical studies. We employed mobile diary surveys on-the-go followed by semi-structured interviews aiming to unpack journey trails, retrospective reflections and contextual information that determine and influence passengers' experiences while at the airport(s) and while on board. Our study had been approved by the Ethics Committee of Faculty of Engineering, The University of Nottingham prior to collecting data.

We employed the use of Contextmapp application (<http://contextmapp.com/>) (Figure 1), which enabled a multimodal data collection approach for capturing passengers' experiences at the major key check points of their travel and airport navigation i.e. 1) Basic demographic information for each passenger including gender, age range, flight and airport details, mode of travel and the existence of travelling companions or not; 2) Time of arrival and first impressions at the departure airport; 3) Check-in and Bag drop; 4) Security and Customs; 5) Waiting at gate to board on plane; 6) When on board; 7) After landing to the connection/destination airport; 8) At connection/destination exit gate.

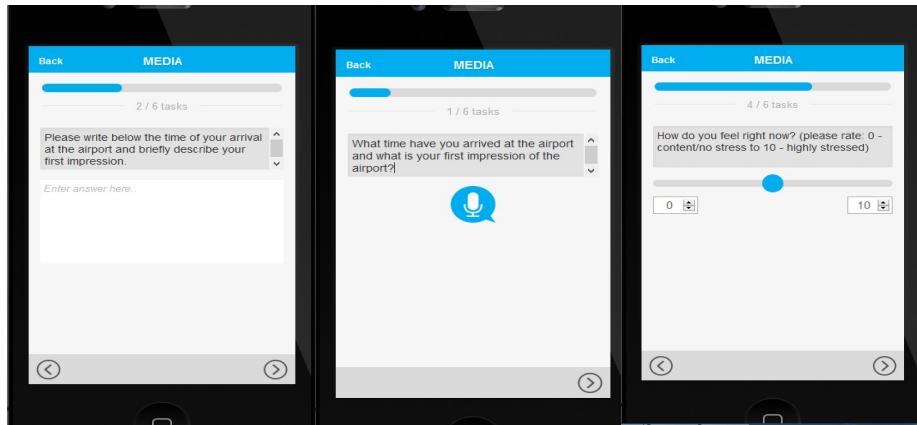


Figure 1: Snapshots of the Contextmapp mobile diary survey tool with questions included

### 2.1. Participants

Eight passengers (3 female and 5 males;  $M_{age} = 34$ ;  $SD_{age} = 8.43$ ) were recruited and asked to record their travel experiences using the Contextmapp mobile diary survey tool. Seven passengers travelled with Economy-Class tickets via either medium-size and/or large-size airports or both (e.g. East Midlands, Birmingham International, Dubai, Schiphol, Hamburg and Dublin) and none of them had any major mobility issues. Participants were selected on the basis that they travelled by plane, for business and/or leisure purposes and they had planned a journey in the forthcoming period.

### 2.2 Procedure

All passengers were introduced to the purpose of the study as well as the study procedures prior to their participation. The mobile diary survey study consisted of 3 phases. After agreeing to take part in the study and signing a consent form, all participants were provided with introductory information about the study, including information regarding the Contextmapp app (phase 1). They were then asked to install the Contextmapp app (<http://contextmapp.com/>) on their mobile phones (either iPhone or Android-based mobiles), register themselves and use the Contextmapp app for the duration of their air travel (i.e. from departure airport entrance point to destination airport's exit point). They were particularly instructed to record their *thoughts and experiences while they were at the airport(s)* (phase 2). Once back from their trip, they were interviewed (e.g. skype or phone session for those not co-located in Nottingham) where they were asked to comment on their experiences during the travel and on using the Contextmapp a posteriori (phase 3). This session lasted for approximately 1 hour. All participants' comments were audio recorded.

## 3. Results

Diary entries and interviews were analysed following a thematic analysis approach (Braun & Clarke, 2006) while travel logs were created to demonstrate the passengers' flow, interactions, behaviours and needs throughout their air journey.

### 3.1 Themes identified

The identified themes span across different types of needs for the passengers. For example, passengers expressed particular contextual, navigation and awareness needs at different points within the airport. Examples of such include the following as shown in Table 1 below.

Table 1. Themes from Passengers' needs with descriptions and examples

Theme	Description	Example
<b>Knowing where they are at any point (self-awareness)</b>	This is particularly useful for individuals not familiar with the airport premises. Furthermore, it was noted -even from passengers that are familiar with specific airport premises- that they may find difficulties in identifying where they are while navigating through the airport due to renovations within the airports at any given moment.	<i>“Airport layout confusion, no direction on depart area for flight, check in machines hidden, old fashioned interiors from the 80s, couldn't find bathrooms, felt stressed. also flight info was not clear on board” (P1)</i>
<b>Knowing where certain facilities are (e.g. restaurants, toilets, types of shops and different options available) (facilities-awareness)</b>	Experienced and non-experienced passengers found this particularly important especially when travelling with other company and when they have a tight boarding time available.	<i>“I need to find out where the loo is...hopefully not too far as we are getting closer to the boarding time....(...) back from the loo – I would appreciate some indication of where the loo is rather than guessing where it may be...some poor signage here!” (P2)</i>
<b>Clear signage within the airport</b>	This point facilitates the success of the two above-mentioned points. Quite surprisingly, our passenger participants experienced confusion and mixed-messages in the signage at the airports that they travelled from/to, which had been detrimental in increasing their stress and frustration levels.	<i>“Just to make things more confusing...there are 6 different signs indicating departures 3 showing different directions!!! This signage drives you mad!!” (P1)</i>
<b>Knowing what is expected from the passengers to ensure fast and smooth passing through the check points (expectations-awareness and rules-awareness)</b>	Our participants expressed confusion in terms of knowing in advance what is needed in order to pass through quickly critical check-points at the airports (e.g. security and customs). The feeling of confusion spanned across different aspects of these check-points. For example, it was reported that different requirements were expected from passengers prior to passing through security – some airports required watches and shoes to be off while others not; some airports required bags with liquids to be out and placed on separate trays for inspection while others required only the baggage of liquids in plastic bags; some airports required mobile phones	<i>“Staff held my ben and jerrys while I went through security...also passport check after security. This is a first!”; “Requirements for security are different at all three airports. A bit confusing” (P3)</i>



	<p>to be out for inspection while others not. These different requirements – that passengers expressed not to be aware of – resulted in building up queues and delaying the security process, something that inevitably affected their experience (e.g. generated more stress to go through these check points).</p>	
<p><b>Validity in screen announcements</b></p>	<p>It was reported that certain announcements within airports (e.g. boarding announcements) did not necessarily align with passengers’ expectations. For example, ‘now boarding’ announcements led some passengers to believe that they were embarking on the plane, however, in reality they found themselves passing through the boarding gate but not yet embarking. This agitated passengers as the waiting time period was unexpected and seemed to be additional beyond what was announced. Furthermore, in some airports, the waiting time for boarding is spent on stairwells where passengers do not have a view of any progress or movement, which inevitably leads to frustration and stress.</p>	<p><i>“Arriving at gate, we saw there is speedy boarding. We use that and pass through at exactly the same speed as everyone else. Attendant tells us to use the steps at the bottom (top?). There is only one set of steps - can see so I stand there. Once again, speedy boarding adds no value. (...) It is apparent 'now boarding' [announcement] was a lie. Still waiting in plane stairwell. It is intolerably hot. I am sweating and uncomfortable, and confused as to what speedy boarding is supposed to do for me.” (P4)</i></p>
<p><b>Clarity of the announcements</b></p>	<p>Our passenger participants reported disparities between the clarity of announcements for the airport and the clarity of announcements for the airline (e.g. calling passenger names or requesting certain actions). This can potentially increase stress levels and negatively impact passengers travel experience as they feel that there is no clear communication between stakeholders and passengers. At the same time, stakeholders do not have any means of knowing whether their announcements were indeed received and understood by the passengers.</p>	<p><i>“Finding desk was confusing. Announcement made at baggage drop. Had to ask travelling companion to be quiet so I could listen. Still didn't hear announcement until third time-our flight go to baggage drop immediately! Jump the queue!” (P4)</i></p>
<p><b>To receive an unexpected happy surprise</b></p>	<p>Passengers appeared to particularly value happy surprises while at airport. Surprises as such may include unexpected upgrades on tickets (e.g. fast track boarding), gift vouchers for promotional reasons and free wi-fi</p>	<p><i>“Flexifares got me more privileges than expected!(...) Seeing the long line and being able to avoid it made me very relaxed and happy” (P5)</i></p>

	(e.g. for planning the rest of the journey and working).	
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### 3.2 'As-is' Personas and Scenarios

'As is' personas and scenarios were constructed based on our empirical data from the mobile diary surveys (an example is presented in Table 2) to enhance understanding passengers' requirements and provide a basis for the future PASSME usability testing. Our design solutions will be evaluated against the personas and their tasks while at airports. Any quotes in italics correspond to representative quotes from our empirical data. The scenarios cover the key PASSME travel check-points as mentioned earlier in this paper. The non-italicised words emphasise the changing emotional states of the passengers as a result of events which occur as they travel through the airport. These states – positive, as well as negative – will be considered as part of how PASSME can enhance passenger experiences and will be used to identify where key stress points occur. These points will inform how PASSME will provide better delivery of information, services and interiors as a next step for our project.

Table 2. Some 'As-is' personas and scenarios with emotions expressed check-points

<i>Personas</i>	<i>Scenarios</i>	<i>Emotions expressed at PASSME key check-points</i>
 <p><b>Catarina &amp; Cecile (Researchers)</b> Image courtesy of the National Cancer Institute</p>	<p><b>Catarina and Cecile fly to a business meeting</b> They travel in economy class with a low-cost airline on a direct flight. Their taxi picked them up promptly so they arrived at the airport on time.</p>	<p><i>Arriving at the airport: happy, tired</i> <i>At Check-in: in pain, concerned</i> <i>At Security: uncertain, confused, frustrating</i> <i>At Lounge/Boarding gate: relax, agitated, frustrated, little anxious, complaining, tiresome</i> <i>On Board: relief</i> <i>After landing: hectic, confusing</i></p>
 <p><b>Marion (English Teacher)</b> <b>Sheila (Daughter – Party Planner)</b> <b>Cameron (University Professor)</b> <b>Billy (Grandson – Student)</b> Image courtesy of Photostock / FreeDigitalPhotos.net</p>	<p><b>Sheila, Billy, Marion and Cameron fly for leisure to their summer holiday destination</b> They travel in economy class with a low cost airline on a long haul.</p> <p>Sheila and her son Billy were on their way to her parent's place to pick them up to go to the airport altogether. It was a rainy day but the roads seemed to be clear. Initially they had planned to take the train altogether to the airport but her father's bike accident made them re-plan their trip to the airport due to his reduced mobility.</p>	<p><i>Prior to Airport: struggling, determined</i> <i>Arriving at the airport: worried, hurry, being calmed, shouted, difficulty, overwhelmed</i> <i>At Check-in and Bag drop: anxiously, swiftly, sceptical, stressed, too hectic, worrying, horridly, tense, panic, struggling, relieved, frustrated, half-heartedly, stressed and frustrated, struggle</i> <i>At Security: relief, thankful</i> <i>At Lounge/Boarding gate: anxious, calm them down, panic, rushed</i> <i>On Board: annoyed, frustrated yet embarrassed, relax</i> <i>After landing: rested, thankful</i> <i>Custom: OK, happily</i> <i>Baggage Retrieval and Exit: frustrated, overly anxious, excitement, unwind</i></p>

#### **4. Conclusion**

This paper has highlighted fundamental issues faced by air travel passengers while at airports. These issues span across different themes, needs and locations within airports. We found that while passengers' experiences at the airports may often involve clear-cut needs (e.g. knowing where different amenities and services are located) they are also of complex nature as emotional experiences and reactions that are carried over urge for a multi-channel provision of services and access methods over the whole period of the air journey. As such, passengers' requirements necessitate careful consideration for designing novel technological approaches that optimise both passengers' travel experiences and airports' and airlines' services in a synergised manner. Amongst the design challenges for novel technologies in this field include 1) identifying the balance between automated service provision and configurable-by-passengers services, 2) reducing travel stress without inducing stress from the use of technologies, 3) supporting privacy and security of personal data while nurturing opportunities for novel passenger-passenger, passenger-data and passenger-infrastructure interactions.

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