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Seeking Emotions in Mobility Experience Elicitation: A Singapore-France Comparison

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Designing mobility experiences is complex. Technical issues can be out of a designer's scope or require the long-term development of solutions. Emotions and contexts shape user perceptions of experiences – the stronger the emotional reaction, the better people remember the experience. In this exploratory study, the focus is on the research stage of the design process and seeks to identify and characterise the interactions leading to emotional responses in users' mobility experiences. Three methods were applied to two studies in Singapore and Paris, France to collect people's lived experiences with mobility: diary cards, user journey maps and text stimuli. Results showed that people tend not to perceive mobility experiences emotionally. When they do, the emotions trend negatively due to deviations from expected service performance. An evaluation of the methods used led to a proposed set of parameters for the development of a tool to design emotional experiences.

Keywords: emotional design, empirical design, data collection methods, user experience, mobility

1   Introduction

Designing mobility experiences on public transport is an endeavour due to the complexity of product-service systems, which include infrastructural and operational requirements reliant on non-design departments. The drivers of public transport passenger satisfaction and affect have multiple directions of causality – variables play both positive and negative roles in impacting fatigue or un/pleasantness (Mokhtarian, Papon, Goulard, & Diana, 2015). Since people best remember experiences associated with strong emotion (Van Hagen & Bron, 2014), emotion can aid designers in the research stage with users to identify key concerns (Desmet, Fokkinga, Ozkaramanli, & Yoon, 2016). The overall goal of the study is to identify opportunities for 'quick wins', instead of solving the problem with technical solutions. The authors propose to modify users' perspectives of their experiences by inserting emotionally-driven design interventions at key moments to amplify positive and mitigate negative emotions for improved mobility experiences (Figure 1).
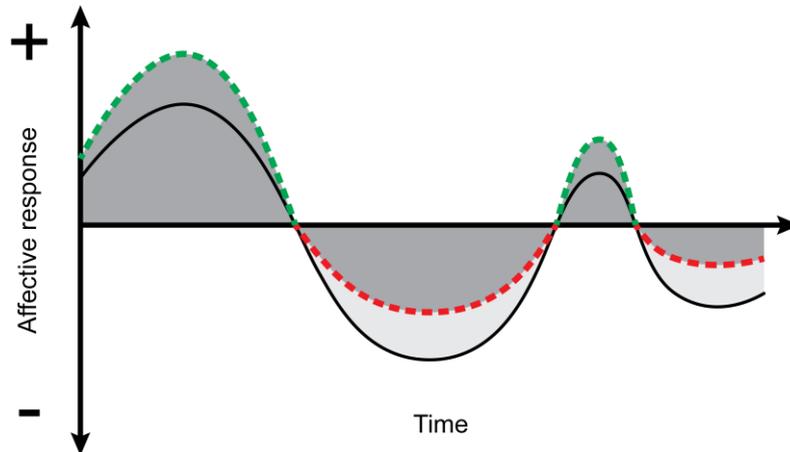
Figure 1 Amplifying peaks and mitigating dips, based on the peak-end rule (adapted from Van Hagen & Bron, 2014).

2   Deconstructing Mobility Experiences and Emotions

Woodcock et al. (2014) propose a description of door-to-door passenger experiences in 7 travel stages. Al Maghraoui et al. (2019) propose a traveller experience conceptual model (TXCM) connecting traveller interactions with artefacts, travel episodes, and travel problems experienced by people in their everyday life, whatever the transport mode.

Law et al. (2009) include in the experience framework what happens before and after the interaction between the user and mobility system. An important subjective dimension relates to emotions. Desmet (2012) elaborates the emotional state in user experiences by breaking down the sources of emotions: the system, meaning of the system to the user, interaction, activity facilitated by this interaction, effect of the system on the user, and other people involved.

3   Methodology

The main research question is: which data collection methods are most suitable for collecting affective data from mobility experiences? Two qualitative studies using three approaches were conducted in Singapore and Paris, France. Each approach aimed to deconstruct the travel experience to provoke participants' recollection of their lived mobility experiences. The diary cards and user journey maps focused on both positive and negative experiences, while the text stimulus stressed negative experiences or problems. The cards and text stimulus were expected to lead to isolated instances of experiences, while journey maps would produce storylines. Methods were chosen to elicit emotions related to an activity based on text and/or graphic prompts.

In Singapore, two methods were used: diary cards (Brown, Sellen, & O'Hara, 2003) and user journey maps (Oliveira et al., 2017). Participants (n=8; 4 females; age groups of 15-44 years) were recruited, through online ads, to represent diverse genders and ages. They received cash tokens for their time.

In France, an approach derived from text stimuli was used (Goldschmidt & Sever, 2011). The participants (n=6; 3 females; mean age: 29 years) were researchers from the institute. Participants in the 'expert' groups had experience in urban mobility. The 'non-expert' group had expertise in engineering. The setup was designed to detect the influence of mobility

expertise on the formulation of mobility problems. The assumption was that mobility experts would be able to generate a larger number and span of mobility problems.

3.1 Diary Cards

The diary cards (Figure 2) comprised 7 open-ended questions to provoke organic perceptions about mobility and public transportation. Each took about 5-10 minutes to complete at home. The cards started with 'What words or phrases come to your mind when you think about mobility?' Some broader questions included 'How or what do you feel about public transport?' while more specific ones were: 'What infrastructural elements did you interact with? How did you interact with it?'

Figure 2 Cards from the sensitising exercise to increase participants' consciousness of their mobility experiences.

3.2 User Journey Maps

After one week, participants returned for a 1.5-hour group workshop where they mapped their experiences in response to different prompts. Journey maps broke down experiences into their elements to identify key interactions and their specific details. In addition to details like 'people' and 'artefact', the template aimed to capture emotions on a bipolar positive-neutral-negative scale. When detailing their experiences and resulting emotional responses, participants were encouraged to describe the emotional valence and intensity, or add labels, e.g. angry, relieved. The journey maps were digitally transcribed and organised into the seven travel stages (Woodcock et al., 2014) and the categories 'pre-trip', 'intra-trip' and 'post-trip'.

3.3 Text Stimulus

Similarly, the Paris study provided 11 textual categories as stimuli to elicit responses. The case study was a rapid transit bus line connecting a public transport hub to a business district where the participants commuted daily. The control group was instructed to record travel problems without the stimulus. The experimental group was prompted by textual categories after 15 minutes of unprompted problem generation. Objective' categories described technical or contextual sources of problems (e.g. Weather, Operation – 'For me, the system is not well operated'), while the 'subjective' categories represented elements connected to personal perceptions or actions (e.g. Emotion – 'My emotions feel troubled when there is a problem with my trip'). The categories were obtained through a grounded theory approach (Al Maghraoui, 2019): individual interviews covering a large spectrum of

travel problems exclusive to specific transportation modes (e.g. cycling, driving) were conducted until saturation.

4 Results

4.1 Diary Cards

Participants' answers fell into six general themes (Table 1). Two participants used emoji in their responses (Figure 3); these were considered emotional responses.

Table 1 Sample answers for the diary cards fell into six distinct themes. Emphasis added in bold.

| Theme	n	Sample answers
Functional attributes	8	"Time of arrival; crowdedness" "Reliability; convenience; comfort"
Relation to daily life	4	"Necessity! I have license & can't drive." "Convenient way for daily commute"
Emotional responses	4	"**Disappointment** when it comes to the frequent train breakdown… it is **frustrating** to see the train breakdown as a normality…" "**Mad** if they are spoilt [because] you are LATE & not your fault."
Enhancing personal ability	3	"To be able to travel between places"
Abstract concepts	2	"Movement. Connectedness. Inclusive. Fast. Time and space."
Related elements	2	"Public transport; electric scooters, bicycles; cars, buses, trains; walking"
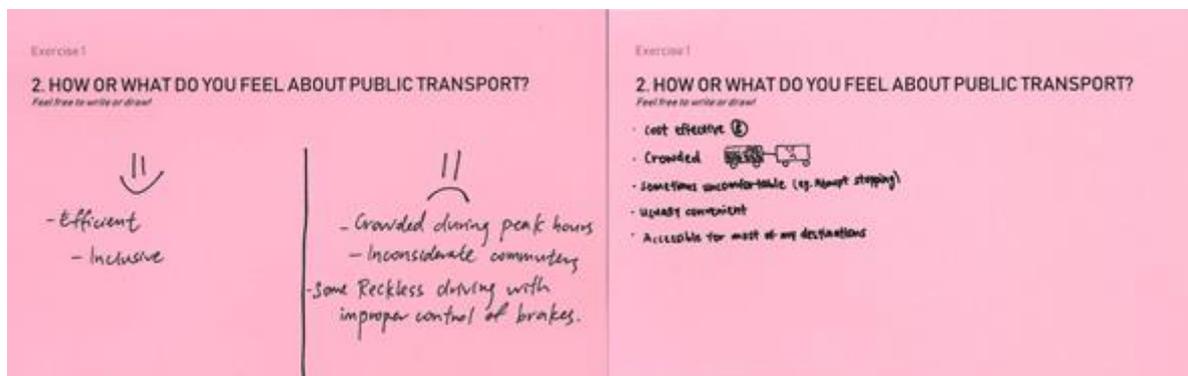
Figure 3 Using emoji was categorised as an emotional response.

4.2 User Journey Maps

One prompt asked participants to describe their most recent mobility experience, which was the journey to the study venue. Another prompt asked participants to describe a recent positive or negative experience (Figure 4). Participants' responses varied in style, content and detail. The mappings showed that experiences perceived as positive or negative could contain emotional responses of either valence. In an echo of the diary cards, functional attributes were a common cause of travel problems.
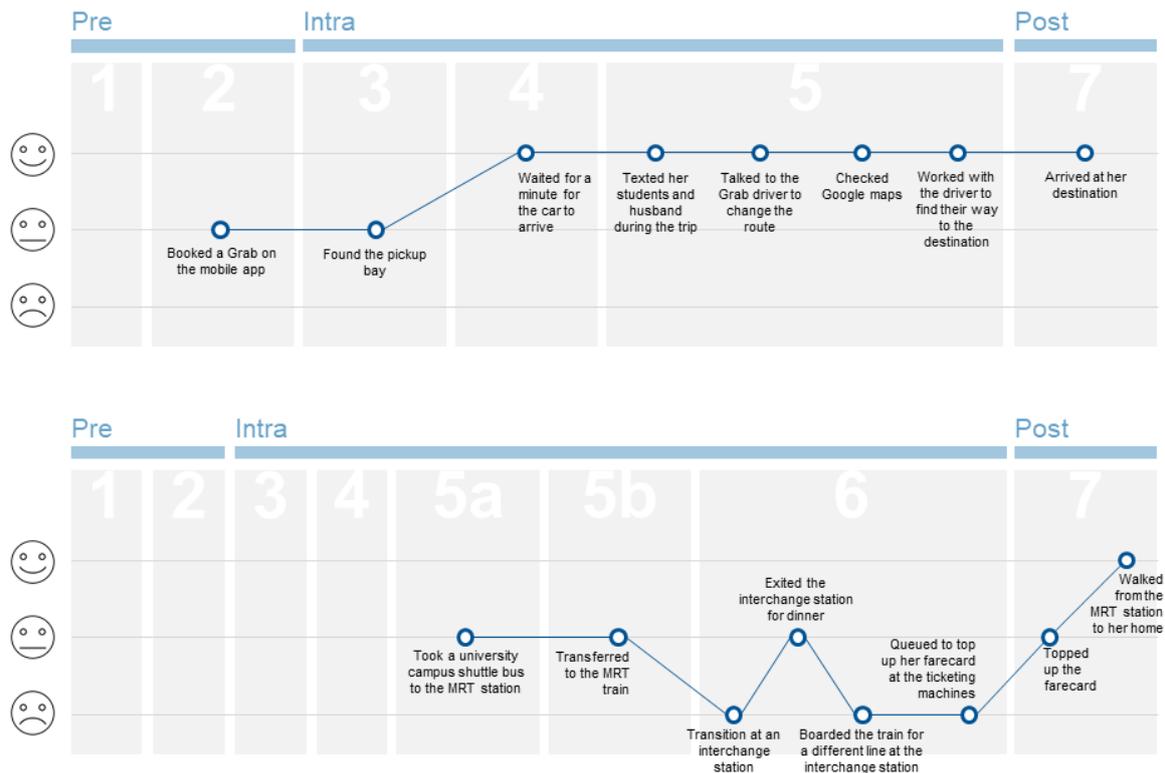
Figure 4 The affective state of one participant improved whenever she reached her destination in two positive experiences. (top) A ride-hailing trip; (bottom) A bus and MRT trip.

4.3 Text Stimulus

Statements containing affective responses are presented in Table 2 (non-expert group) and Table 3 (urban mobility expert group). For both groups, the travel problems either caused negative emotions during the pre-trip stage or left a lasting negative effect on participants' emotional states post-trip.

Table 2 Selected travel problems of the non-expert group illustrating affective responses. Emphasis added in bold.

Time	Travel problems with emotional responses
9"	**Shocking** driving
15"	Always crowded, so we arrive **without motivation** to work
32"	When the bus is full, attitudes of a few people can be **disturbing**
40"	It feels like we play sports when we take the bus, so it feels like a physical and **emotional effort**
46"	Why don't we have Wi-Fi by bus, or a little music to **relax** people!

Table 3 Travel problems of the expert group illustrating affective responses. Emphasis added in bold.

Time	Travel problems
26"	After a bad trip, we are **not in the right mood** for work
38"	Prices **don't motivate** people to take the bus, partially as tickets are expensive
50"	We feel **less safe/comfortable** when there are a lot of people around on the bus

Due to the structure of the diary cards, responses generated isolated instances of issues. Upon examination of the timestamps from the category stimuli in Table 2 and Table 3, no proximity was found, also confirming the expected output of isolated instances.

The next section compares the findings from each method to identify dominant themes and define parameters for an emotional design tool.

5   Discussion: Implications for the Design of Emotional Mobility Experiences

5.1   Practical Perspectives on Mobility
Participants began the diary cards and text stimulus without prior priming. The problems expressed resulted from mismatches between functional service expectations and the actual service rendered. The results support the finding that people tend to focus on practical concerns for mobility experiences (Guell, Panter, Jones, & Ogilvie, 2012) and generally do not perceive commuting as positive or negative experiences (Krome, Walz, & Greuter, 2016). The meaning (Desmet, 2012; Shove et al., 2012) of mobility appears to correlate strongly to functional attributes, suggesting that they are fundamental to positive mobility experiences.

5.2   Intra-trip Interventions and Pre-trip Preparations
The stages which most shaped Singaporean participants' experiences happened intra-trip, i.e. stages 3 to 6, when they are physically on the move. Peaks of either valence tended to occur during stages 4 (interaction with the transport service) to 6 (interchanges/transfers). This suggests that interventions should occur during the intra-trip stage for greater impact on experience evaluations, since most participants consider pre- or post-trip interactions to a lesser extent. However, in the Paris study, participants entered negative emotional states pre- and post-trip. The subjective categories 'mind', 'emotion and 'arrival' in the text stimulus might have prompted such reflection. Whether this is a cultural difference in experience evaluation, or a result of the method used, could be further investigated.

5.3   Feeling Emotional… or Not
The journey map results support the finding in Van Hagen and Bron (2014) that people tend to remember the extremes in their experiences. However, it is unclear why some experiences are remembered positively despite emotional dips, and vice versa. This could be because people disregard subtle emotions when evaluating an experience (Kahneman & Egan, 2011). Additionally, the duration of effect for each interaction resulting in an emotion could be explored. For instance, a trip's cost has longer-lasting effects as it permanently alters a user's financial state, whereas crowded vehicles are a temporary problem, resolving once the user or other passengers alight. For several participants, the cessation of the negative interaction led to a spike in positive affect. This could be because the user is removed from the event, e.g. leaving the bus where the poor riding experience occurred. In

other words, it is not a positive pull factor but the elimination of a negative push factor which resulted in the concluding positive perception of these experiences. Using push/pull factors in designing interventions can help to achieve target emotional responses.

5.4 Reflections on Methodology

The phrase 'how or what do you feel' in the diary cards sparked more affective responses than 'what words or phrases come to your mind…', suggesting that the language used can better provoke emotion elicitation. Narratives produced by the user journey maps showed clearer links between interactions and emotions than in the text stimulus. However, it is unclear how individual events influence a passenger's overall perception of the experience. Future work could delve into understanding the value of using journey maps over text stimuli.

In the journey maps, some participants could only remember emotions felt at specific points during the experience, while others were able to chart their emotional journey throughout. This could be because participants were asked to recall experiences which may have occurred some time ago. The challenge in collecting self-report emotional data on lived experiences lies in closing the distance between event occurrence and data collection, without interrupting the flow of the experience and resulting emotions. An ethnographic video captured on the move and replayed to participants could "articulate their experiences of fleeting sensations" (Spinney, 2011).

A simple bipolar scale was used in the journey maps in an inductive approach. Having a set of labelled emotions – e.g. angry, frustrated, joyful – for subjects to refer to when expressing the type and intensity of emotions felt could better guide dialogues.

As the three methods were conducted in two locations, the generalisability of findings is limited. All three methods should be repeated in each country with more rigorous sampling. However, the study identified challenges associated with each method to elaborate a methodology for the mobility context in future work, as discussed in the next section.

6 Proposed Parameters for an Emotional Design Tool for Experiences

Existing tools measure emotional responses for product design (Desmet, 2018), psychotherapy (Bradley & Lang, 1994), environments (Han, Back, & Barrett, 2010; Russell & Pratt, 1980), advertising (Morris, 1995; Sacharin, Schlegel, & Scherer, 2012) and marketing (Richins, 1997). Based on the findings from the three methods, parameters are proposed to guide the development of an emotional design tool (Table 4).

Table 4 Proposed parameters based on findings in the discussion in Section 5.

Findings	Proposed Parameters	Application Examples
5.1, 5.2	Captures data from functional attributes and each stage of the experience	Data on emotional reactions to the presence/absence of information at bus stations, or long travel times
5.2, 5.4	Phrased and structured to discretely provoke affective responses	Ask subjects about their emotions without emphasising one dimension (e.g. positive-negative, arousal levels) over another
5.3	Captures intensities and temporal dimensions to determine the effect of affect over time	Capture data, with valence and levels of intensity over time, to see how emotional responses interact throughout the experience

5.4	Feeds into a storyline framework	Record and link emotional reactions to specific instances (of interactions) within an experience
5.4	Self-report, ease of use to collect data during / shortly after the experience	Take-home questionnaires which can be distributed to subjects
5.1, 5.3, 5.4	Able to collect varying granularities and types of data,	For greater granularity, use a Likert scale with 7 anchor points compared to 3. To include labels, such as "happy, sad, upset"
Based on the case study	Application to experience design in product-service systems	Mobility experiences on public transport

Expected benefits of the tool include capturing data on affective responses to guide the design of experiences for emotional contrast, i.e. experiences containing both positive and negative affect. Furthermore, identifying specific affective responses can lead to the definitions of *emotional harmonies*, which are proposed as combinations of emotions leading to positive (or negative) evaluations of the experience.

Since the results indicated slight variances in responses between Paris and Singapore, the tool could be tested in both contexts to explore sociocultural effects.

7   Conclusion

Designing experiences with emotions changes how research and analysis is conducted. Through the identification of key positive or negative moments, designers can improve the creation of desirable mobility experiences. Findings from this paper will aid the development of a tool for the emotional design of experiences in complex product-service systems. While the case study focuses on mobility, the methods described could be applied to other domains to compare results.

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