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Communicating User Insights with Travel Mindsets and Experience Personas in Intra-City Bus Context

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Abstract. Design of attractive services for the bus travel context is important because of the aim to increase the usage of sustainable travel modes of public transportation. In bus travel, both user experience of the digital services and the broader service design context of the public transportation need to be addressed. Experience-Driven Design (EDD) can be used to take the passengers' needs and experiences in the core of the design process. This paper presents a qualitative diary and interview study on bus travel experience with 20 passengers in two major cities in Finland. The aim of this study was to identify and communicate frequent bus passengers' needs, experiences, values and activities as user insights to support experience-driven service design in the public transportation context. Based on the data analysis, we derived ten *Travel Mindsets*: *Abstracted, Efficient, Enjoyer, In-control, Isolation, Observer, Off-line, Relaxed, Sensitive,* and *Social*. To communicate the study findings on bus passengers' travel experience, *Travel Experience Personas* were created. The personas include primary and secondary travel mindsets, specific needs related to bus travel, insights on mobile device usage, and target user experience (UX) goals that could enhance the personas' travel experience. We also discuss how the personas can be used as a communicative design tool that supports EDD of novel services in the bus context.

Keywords: Experience-driven design, User Experience (UX), Travel Experience, Bus, Design tool, UX Goal, Persona, Mindset.

1 Introduction

Bus as a vehicle is an interesting context to study, since both user experience of the digital services and the broader service design context of the public transportation need to be addressed. As in many other fields, taking users in the center of the design process has become topical also in the context of public transportation; to make public transportation a more appealing option to a wide audience, its services need to be developed with the passengers' needs and experiences in mind [8, 9]. One way to make public transportation more appealing is to enhance the services related to the travel activities. For instance, bus passengers are opportune targets to be entertained during their journeys [8]. Research [e.g. 2, 8, 17] shows that there is a need for additional services beyond travel information in the bus context. Existing studies focus on travel behavior

[34], trip satisfaction [e.g. 9, 33], and travel experience [e.g. 2, 8]. These studies present mostly quantitative research efforts that cover the topic of improving the bus travel experience from the usability and efficiency perspectives. In order to create empathic understanding of passengers' needs, motivations and experiences, more qualitative research is needed.

In this study, we utilized Experience-Driven Design (EDD) approach to study and communicate bus passengers' needs. This paper presents findings from a qualitative field study on bus passengers' travel experience and proposes a way to communicate the findings as a design tool in form of Personas [4]. We utilized interviews and a diary method, inspired by the cultural probes [11] to collect insights of passengers' bus journeys. The study was conducted with altogether 20 participants, all frequent bus users, in two major Finnish cities: Tampere, and Helsinki region, during the spring and summer of 2017.

This study is part of a three-year research project *Living Lab Bus* that aims to develop a digital service ecosystem around modern electric buses in intra-city travel. One outcome of the research project is a developer portal for software developers to design and test digital services for bus travel. The aim of this study was to discover passengers' needs, and to gain understanding of bus travel experience, in order to derive useful insights which could be turned into visual format that the software developers and designers could utilize in the design process. Hence, our research question was: *What kind of travel mindsets do frequent bus passengers have?* We answer this question by analyzing the data and presenting ten *travel mindsets* derived from our study findings. These mindsets represent the central academic findings of the paper by contributing to the knowledge of intra-city bus passengers' travel experience.

To communicate our study findings – the found ten travel mindsets – in visual and tangible format, we created *Travel Experience Personas.* The personas as communicative design tool provide holistic understanding of the varying passenger needs to help the ideation and evaluation of new bus travel related services. Hence, the *Travel Experience Personas*, their travel mindsets and target UX goals enable the formulation of empathic understanding of bus passengers' varying needs.

This paper is organized as follows: next, we review related work on Bus Travel Experience, as well as EDD and Personas. Then we present our qualitative field study on bus travel experience. In the following section, we introduce the analysed findings structured as ten travel mindsets, after which, we present the visual and communicative Travel Experience Personas that can be utilized as a design tool in the development of travel related services. Finally, in the Discussion section, we address ways on how this communicative design tool can support the design of novel traveling services in the bus context.

2 Related Work

We present related work on Bus Travel Experience, Experience Driven Design (EDD), and Personas as tools for communicating user insights.

2.1 Bus Travel Experience

Trip satisfaction [e.g. 9, 33] and travel behavior [e.g. 34] are widely studied in the transportation literature, whereas travel experience has been left with relatively little focus [2, 3]. The aspects of travel have been studied across different travel modes. Passengers' traveling behaviour and experience is changing with the mix of transport modes and the services offered in them [34].

Bus is an interesting service context to study, since it contains services both in the physical realm, i.e. the actual transportation system, and in the digital sphere, i.e. the digital services in the bus, bus stops and on the passengers' mobile devices. According to Carreira et al. [2], travel experience in the context of public transportation is a result of the holistic view of the transportation service, including the different experience components: the customer's affective, cognitive, physical and social responses to the service. Their qualitative study investigated mid-distance bus journeys (intercity transportation), focusing on experience factors such as social environment, service interface, retail atmosphere, assortment, price, and retail brand (ibid.). In turn, Foth et al. [8] studied micro activities (social, entertainment, observational, travel, and routine) performed by passengers during commute, and how these activities impact the bus travel experience.

Other studies show that people spend their travel time listening to music and using social media applications in addition to reading newspapers and books or simply relaxing [23]. Several studies have been conducted to evaluate how certain services support the travel experience, these include traveller information systems [e.g. 7, 38]; games that for instance support social interaction [e.g. 25], communicate community information [e.g. 28], or simply entertain passengers with simple games [e.g. 21].

Research Gap

As seen above, several studies exist, ranging from trail experience [e.g. 27, 35] to air travel experience [e.g. 22]. Bus travel experience has also been studied, but for instance Carreira et al. [2, 3] focus on mid-distance intercity transportation, which has different characteristics to short-distance intra-city bus travel (for instance the vehicle itself, the length and purpose of the trip). Transportation literature is mostly presenting qualitative studies focusing on the efficiency and usability aspects of the travel. Studies that would investigate the travel experience from the aspects of service design and experience driven design are scarce in academic literature.

During the past three years, we have studied intra-city bus travel experience by conducting several qualitative studies that involve bus passengers in Finland. These studies include a preliminary interview study [16], collaborative ideation workshops by which we developed bus-specific design tool "Context Cards" [17], and this diary and interview study that was conducted in Helsinki and Tampere. Our aim has been to form holistic understanding of intra-city bus passengers' travel experience and communicate our study findings further to designers and developers working in the public transportation context. Hence, we have developed a *Travel Experience Toolkit* that consists of different tools that can be utilized in different phases of the design process to bring the user perspective to the centre of the design. A concept of this toolkit [19] consisted of

preliminary personas, Context Cards [18], and a Passenger Journey Map. In addition to these tools, we have also created a *Bus Travel Experience Model* [20] that presents the elements impacting the intra-city bus travel experience: *Passenger* and their own mood and values, *Context* including social, temporal, task and physical context; *System* of public transportation and the *System* of digital services on the mobile device. Travel mindsets and experience personas enhance the existing tools by providing deep insights on specific user groups and their needs, and thus help designers and developers to serve the whole range of bus passengers.

2.2 Experience-Driven Design

Experience is a complex fabric of actions, feelings, and thoughts [15], whereas user experience (UX) refers to an individual's range of perceptions, interpretations of the individual's perceptions, and the emotions that result during an encounter with a system [30]. User experience consists of both pragmatic and hedonic attributes [12]. Pragmatic attributes refer to the product's, service's or system's functional usability, whereas the hedonic attributes relate to the emotional and non-instrumental needs of the user (ibid.). The field of UX focuses on studying and evaluating the experiences that people have through the use of a system and designing better products or services that could enhance the user experience.

Experience-Driven Design is an approach that puts the user – their needs and experiences as a starting point of the design process [e.g. 6, 14]. The studied user needs are formulated into target experiences that are used to guide the design [6]. These target experiences can also be called *UX goals* [36]. Since experience is always subjective, it is not guaranteed that the targeted experience is evoked or the set UX goals fulfilled [14]. Thus, one can only design *for* certain experiences. Defined UX goals can be used as inspiration and target for the design [6, 14]. UX goals can have multiple purposes in design and development processes: according to Väätäjä et al. [37] a good UX goal provides focus and framing for design, it functions as a source for inspiration, ideation and innovation, and supports communication amongst different stakeholders. UX goals should be measurable in terms of experience, and therefore they can be utilized to support the evaluation of the product, service or system.

In this paper, EDD is utilized in the persona creation, to communicate the user needs and target UX goals.

2.3 Personas as a Tool to Communicate User Insights

In design field, 'personas' is a tool used to present and communicate user insights in order to support design team in gaining empathic understanding of the people they are designing for [e.g. 4, 5], and thus keeping the users' needs and characteristics at the forefront of the design process [10]. According to Cooper [5] personas provide a structural way of thinking and communicating users' behavior, goals, motivations, and the way they think. Personas are strongly based on research, and hence they differ a lot from archetypes or stereotypes, which often are only assumptions rather than factual data [5]. Personas communicate the ranges of users' behavior and thus, the tool does

not seek to establish "an average user" but the variety of behaviors within the identified ranges [5]. In order to be effective design tool, personas must be based on research of not only the users, but also the usage context [5].

If utilized correctly, personas can help design team to make better decisions [1] and determine what the product should be [5]. Personas also enable communication with different stakeholders [5, 29] by providing a common language to support discussion and decision making [1, 5]. Cooper et al. [5] state that personas can also be utilized in measuring the effectiveness of the design choices by testing them on a persona in a similar way of testing with real users (however, this does not replace the need to test with real users, but rather provides a powerful "reality-check tool" for problem solving).

3 Methodology

To gain deep insights about passengers' bus travel experience, a qualitative field study approach was selected. Twenty participants were chosen for a three-week study that included a self-documentation period of bus trips using a diaries and semi-structured interviews in the end of the field period.

3.1 Study Context

The study was run in two cities in Finland. In Helsinki region, the public transportation is multimodal, which means that the passengers have access to bus, commuter train, tram, metro, and a commuter ferry with one travel card. The Greater Helsinki has over 1,4 million inhabitants, whereas Tampere, including the neighbouring municipalities has close to half a million inhabitants. The city of Tampere was chosen for our study because of its public transportation infrastructure is limited to buses and thus, focusing on studying the travel experience of buses was straightforward. Figure 1 shows interior of the intra-city bus in this study. In both cities, the public transportation could be described as a functioning and well-planned system. Still there is a general need to develop the attractiveness of the public transportation services.

Fig. 1. Examples of typical bus interior in Tampere.

3.2 Participants

Ten regular bus passengers were recruited for the study in both cities, providing us with twenty participants in total. Since the study aimed at gaining insights also on electric buses, the participants had to be passengers of the specific bus lines with electric buses. In order to incorporate different viewpoints to bus travel experience, participants of different age, gender and background were recruited through advertisement in local electric buses and in social media in Tampere, and flyers distributed by local transportation provider's workers in Helsinki. The selected participants – 16 females and four males – ranged from young students to senior citizens, with average age of 41,8 (range 21-72). While the participants included both men and women, the overrepresentation of women in the sample reflects the widely observed gender difference in travel mode use [31]. The participants included a wide variety of occupations: students, unemployed, workers, freelancers, pensioners and people on parental leave. All participants of this study were frequent bus users: 19 use public transportation at least four times a week, where one uses city buses 2-3 times a week.

3.3 Self-documentation with Bus Travel Diaries

For this study, we chose two complementary qualitative methods: diaries and interviews. The diary we designed for the main method of data collection is inspired by cultural probes [11]. Diary as a long-term self-documentation tool is a practical way to enrich the conventional qualitative methods, such as in-depth interviews and field observation [26].

The data collection in our study consisted of a three-week self-documentation period with a paper-based *Bus Travel Diary* (see Figure 2 for visual representation). The participants were asked to fill in the diary of altogether nine journeys each. The questions focused on three main themes: Attributes of travel experience, Impact of the bus environment, and Activities during the trip – to gain holistic understanding of the bus travel, and the elements of travel experience. Among other things, the diary asked about the participants' feelings during the bus trip: *stressed, social, confident, awkward, relaxed, luxurious, annoyed*, *worried,* and *"other"* – based on the previous work by Hildén et al. [16]. The diary also included a reflection page of the documentation period that focused on the elements of bus travel that had biggest impact on the participant's travel experience. Data was received from 177 bus trips (one participant documented only six trips instead of nine).

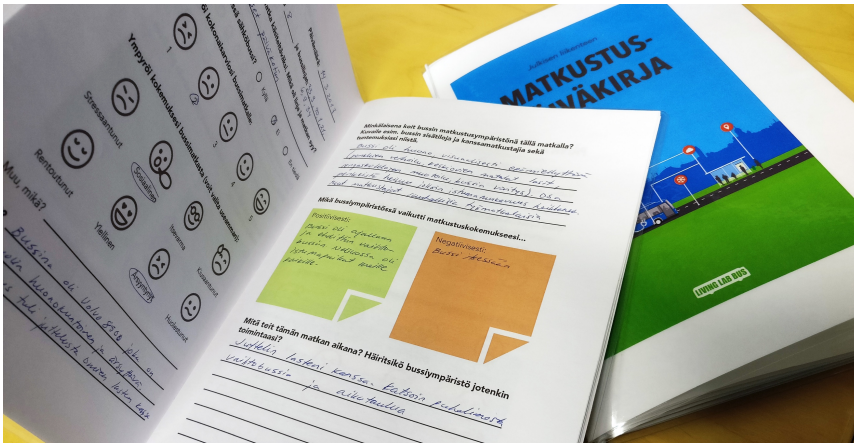


Fig. 2. Bus Travel Diary consisted of both open-end and multiple-choice questions. We included visual elements to make it more appealing for the participants to fill.

3.4 Reflective In-Depth, Semi-Structured Interviews

Semi-structured, in-depth interviews were used to collect additional deep, reflective insights of the bus travel experience. After the three-week self-documentation period, the participants were interviewed in groups of 2-4 people. Eight interview sessions were organized (four sessions in each city): one session with four participants, two sessions with three participants, and five pair interview sessions. The sessions lasted 1-2 hours. The interviews were video and voice recorded for transcription and analysis.

The interview themes were closely related to the topics in the *Bus Travel Diary*. The themes were: General questions of the diary study; Questions regarding electric buses; General questions regarding travel experience, with questions regarding traveling by bus and the elements impacting the experience most; Questions regarding activities during the bus ride and the use of digital services focusing on activities people conduct during bus travel, their mobile service usage and the preferred content on the bus screens.

3.5 Analysis

The interviews and Bus Travel Diaries were transcribed. Insights related to passengers' *activities, values, needs,* and *feelings and experiences* were thematically coded and analysed [13]. 440 direct citations from the interviews were highlighted, making an average 22 citations per participant (range 13-36). In addition to the insights derived from the interview data the Bus Travel Diary data was utilized: the diary consisted in total of 81 open-end questions and 54 multiple-choice questions. Similarly, to the interviews, relevant diary answers were highlighted. We analyzed the highlighted insights of each participant separately in Excel and formulated user profile type of descriptions of each participant.

The travel mindsets were derived from the interview and diary insights from different participants who had experienced a specific travel mindset. The personas, on the other hand, were created by combining the participants with similar insights. This led us finally having ten *Travel Experience Personas* – one being the "main representative" of each travel mindset. Each travel experience persona is based on 1-5 participants in the data set. Each persona has one *primary mindset* that reflects the usual travel experience of that persona. Additionally, each persona has 1-4 *secondary mindsets* that are caused by special situations in the travel context, such as someone exceptionally traveling with small children.

4 Findings –Travel Mindsets

This section addresses our research question: *What kind of travel mindsets do frequent bus passengers have?* The findings of our study, i.e. the ten travel mindsets are presented below. The insights behind the mindsets were derived from our qualitative study that combined a three-week self-documenting period with Bus Travel Diaries, and in-depth, semi-structured interviews. The ten travel mindsets were utilized as building blocks to create the *Travel Experience Personas* presented in the Section 5.

4.1 Ten Travel Mindsets

Based on the data analysis, we defined ten travel mindsets. These describe the high-level categories that emerged from the passengers' travel experiences we traced from the diary and interview data. Thus, the travel mindsets presented here, include the passengers' varying actions, feelings, needs and experiences that have an impact on the passenger when traveling by intra-city buses. The travel mindsets are (in alphabetical order): *Abstracted, Efficient, Enjoyer, In-control, Isolation, Observer, Off-line, Relaxed, Sensitive,* and *Social*. Section 4.2 summarizes the pragmatic and hedonic traveler needs related to these mindsets.

Abstracted
This travel mindset includes insights from people who often feel forgetful and absent-minded. These people have to put extra effort to stay in focus in both familiar and unfamiliar routes. This mindset can be stressful and it even causes passengers to miss their stop: "*Even on a route that is fairly familiar to me, it sometimes suddenly strikes me that I have no clue where we are. It's like 'did I miss the stop again'"* (female, 33). The attention might be focused on the mobile device or being social with fellow passengers: "*I have to stay highly alert the whole journey, because if I start interacting with my mobile phone I forget to follow the route and then I don't know where I am anymore"* (female, 55). Abstractedness does not seem to be related to the length of the journey, passengers are simply too distracted to pay attention whether it is about choosing the right bus line or getting off at the right stop. "*Sometimes I might take a completely wrong bus"* (female, 55). ***One participant was identified having this as a main mindset, and two as a secondary mindset.***

Efficient

People having *efficient* travel mindset often optimize their travels so that they can utilize the time in most efficient manner, including the time spent on the vehicle and at the bus stop: *"Even if the waiting time would only be 5 minutes, I usually check if there's faster options"* (male, 22). *Efficient*-minded people also utilise the travel time to "get things done", whether it is checking emails or planning the grocery shopping for the week. One participant makes use of the travel time by using dating apps: *"I use the time I spend in the bus swiping on Tinder*" (female, 32). Whereas one participant (female, 35) reported in her diary tasks such as book keeping, grocery planning, and studying languages. For some participants the commute was seen as a part of the workday, and hence, they were conducting work related activities during the journey. These included for instance reading work email and checking the day's agenda from the calendar. Some participants were even worried that they do not utilize the bus travel efficiently enough: "*Lately I've been thinking if the time I spend on traveling is actually used in the most efficient way"* (female, 21). ***Two participants were identified having this as a main mindset, and three as a secondary mindset.***

Enjoyer

The *enjoyers* are often elderly people who get to travel without being in a hurry. They tend to travel outside the rush hours making the bus journeys more pleasant and enjoyable experiences: *"I love the fact that I can just sit and look back on the old times"* (male, 61). People having this *enjoyer* mindset might spend their travel time on socializing with fellow passengers or simply enjoying the view: *"I enjoy looking at the scenery and making notions of the nature's different seasons"* (male, 68). Even though feeling *stressed* was often mentioned in the diaries, bus context can still result opposite feelings: *"Sometimes I sit in the bus knowing that I will be late from work. In those moments, I tell myself that there is nothing I can do about it, and I might as well just sit and enjoy the moment"* (female, 48). ***Two participants were identified having this as a main mindset, and three as a secondary mindset.***

In-control

People traveling with this mindset are often parents traveling with their kids. Based on the findings, we could see that parents' travel experience is often directly proportional to the behavior of the child. Key factors to successful bus travel are: avoiding the rush hours – *"Around 4 p.m. it is tricky to fit one person in, let alone the whole flock with a stroller"* (female, 33); and being well prepared – *"I always pack snacks, just in case… cookies, banana, chips etc. Snacks help if there's a scene"* (female, 33). It also helps if you can choose less crowded bus routes and avoid having to change. After fitting in to the bus (having space for the stroller), the second most important thing is to get seats for the kids: *"It makes things a lot easier if there is space for all of us in the quartet (two seat rows facing each other), or if at least I get space for the kids to sit next to each other. The worst is when you have to stand, or scatter the kids around the vehicle"* (female, 35). For the participants traveling with kids, bus was sometimes considered a more convenient choice compared to private vehicles: *"With a double stroller, it is*

easier to take the bus. Otherwise you have to first fold the stroller, then pack it into the car with all the other stuff and then – once you have reached your destination, unpack everything" (female, 33). People traveling with kids, hence, having an *in-control* mindset, report activities that are very different to what they would do if travelling solo. Instead of spending time on one's mobile device, you observe the surroundings: *"We look outside and try to spot something extraordinary, like yellow cars or pretty flowers"* (female, 48). Traveling with kids also includes some social aspects, like being social with your own kids or bonding with the other parents taking the same bus. ***Two participants were identified having this as a main mindset, and two as a secondary mindset.***

Isolation

In general, most participants preferred having their personal space in the bus. *"Usually I'm more like 'please don't notice me' so that the others wouldn't start a conversation"* (female, 42). Also, as one participant said:*" Most of the time I just want to be quiet and stay in my own bubble. The occasions are rare when I actually want to be social"* (female, 27). Participants stated that listening to music and immersing oneself with the mobile phone are good ways to isolate oneself from the others, and hence they do that to communicate the willingness to be alone: *"By putting headphones on, you usually get to be left alone. I often do that to prevent any kind of interaction with the fellow passengers"* (male, 22). ***Two participants were identified having this as a main mindset, and three as a secondary mindset.***

Observer

People whose travel mindset is *observer* tend to pay more attention to the physical and social context of the bus than others. Observers notice the running people trying to catch the bus and sympathize their struggle, but also the relief when they can actually make it. *Observer*-minded people usually choose a seat that lets them carry out the observing activity: according to our *observer*-minded participants, the best seats are the rear-facing seats in the quartet: *"I often choose a seat facing the back, because in my opinion it's fun to observe what happens in the bus"* (female, 55), or the front seats: *"I find the front seat the best for relaxing, because the other people are hidden behind me. I'm also very curious person and from the front I see all the people who enter the bus"* (female, 32). In order to be able to see out and enjoy the scenery, the *observer*-minded people appreciate *"not having the windows covered with advertisements (or other visualizations) that would block the view"* (female, 72). ***One participant was identified having this as a main mindset, and six as a secondary mindset.***

Off-line

People traveling with the *off-line* mindset do not use mobile devices at all or use them rarely when traveling. For some, the reasons were to have screen-free time, for example if work is heavily digital: *"I have to use my mobile phone at work all the time and that's why I choose not to do that anymore in the bus"* (female, 50). For others, the reasons were more social *"I like to see the people and the scenery. I rather interact with the fellow passengers than with my mobile device"* (female, 32). Some reported to suffer

from poor eyesight and hence using a mobile phone was seen both unpleasant and impractical during bus journeys. Thus, these passengers rely more on the selection of on-board digital services showcased on the public screens. ***Two participants were identified having this as a main mindset, and four as a secondary mindset.***

Relaxed

Many participants described the bus ride experience "automatic", allowing them to relax. For some, bus journeys were considered personal quality time. "*It takes half an hour for me to get to work and during that time I've learned to 'reset' myself completely"* (female, 50). Participants stated that they usually just sit quietly and zone out: *"On my way to work I might just close my eyes and relax"* (female, 27). Participants wishing to have *relaxed* travel experience, reported to use mobile devices for passive activities, such as audio content: *"I usually put on a radio-show, but for the rest of the journey the phone is in my pocket"* (female, 34). In order to get to the *relaxed* mindset, direct routes are preferred without having to change the vehicle: *"When I go home from work I choose the direct bus route. I use the time to recover by listening to meditation recordings. Having to change the vehicle would mean that my exercise would be interrupted."* (female, 32). Silent, noise-free bus rides were considered to improve the *relaxed* travel experience significantly. Hence, most were giving praises to the modern electric buses: *"The electric bus is so silent that it really increases my travel comfort, I somehow felt really calm in the bus"* (female, 25). ***Five participants were identified having this as a main mindset, and six as a secondary mindset.***

Sensitive

These people include not only people having a sensitive mindset but also people suffering from physical illnesses or condition such as asthma, migraine, menopause, and motion sickness. Sensitive people get easily disturbed by noise, strong smells and odors and too high temperature. As one participant described*:" I guess I'm sensitive to smells and noise. Also, if the sun is shining and the heating is on I might start feeling really sick. Then I rather get off in half way, wait for the next bus or even walk to my destination."* (female, 42). For some people, the crowded buses in general were unpleasant and stressful experiences: *"I become anxious in a crowded bus. I might start panicking if the crowd blocks my way out"* (female, 35). Key factors to successful bus journeys were mentioned to be having good air conditioning including heating, cooling and air flow. Also choosing a seat from the front of the bus was stated to be a good way to minimize or prevent the feeling of nausea. The smooth ride provided by the electric buses was also experienced to lessen the motion sickness: *"It felt much smoother that when riding the old-fashioned ones. I didn't get as easily sick as I usually do"* (female, 29). One way to feel better is occupy the thoughts with using mobile phone *"I use my phone as a way to get rest from the irritants. When the heat gets overwhelming it helps if I can immerse myself to some content, no matter what it is"* (female, 48). ***Two participants were identified having this as a main mindset, and three as a secondary mindset.***

Social

Even though feeling *unsocial* was often mentioned by the participants, some people reported to enjoy the social interaction with fellow passengers: *"It's so lovely if a neighbour or other acquaintance happens to be in the same bus! Unfortunately, the trips often run too short, since there should be enough time for us both to exchange the news."* (male, 68). Having *social* mindset is not limited to just familiar people – as one participant described: *"It's maybe even better if you have a good chat with a stranger!"* (male, 68). It seems that if you prefer to be social, the quartet (two seat rows facing each other) is the place to be: *"If you sit in the quartet, you often end up finding topics to discuss about"* (female, 50). ***One participant was identified having this as a main mindset, and seven as a secondary mindset.***

4.2 Summary of Specific Needs Related to the Travel Mindsets

Table 1 presents the specific needs – pragmatic and hedonic attributes – of the ten travel mindsets. The travel mindsets are put in a rough order starting (from top to bottom) from the pragmatic mindsets to more hedonic ones.

Mindset	Most relevant bus travel related needs
Sensitive	Air condition (P), smooth ride (P), avoiding strong smells (P), avoiding noise (P), avoiding crowded vehicles (P)
In-control	Room for stroller (P), getting seats (P), entertainment for kids (P/H),
Efficient	Being on time (P), reliable journey planners (P), getting a seat (P)
Abstracted	Limiting the distractions (P), clear journey information (P)
Off-line	On-board information (P), getting a seat (P)
Observer	Getting a seat (P), clean and clear windows (H)
Isolation	Being left alone (H), active mobile entertainment (H), getting a seat (P)
Relaxed	Silence (P), getting a seat (P), passive mobile entertainment (H)
Social	Getting a seat (P), having someone to talk to (H)
Enjoyer	Avoiding rush hours (P/H), getting a seat (P/H)

Table 1. Travel mindsets and their specific travel related needs. (H) stands for hedonic need, (P) for pragmatic need, and (P/H) for need that is both pragmatic and hedonic.

5 Travel Experience Personas

Based on the travel mindsets, ten *Travel Experience Personas* were created. During the past decade, personas have become a well-lauded method [10], which is widely utilized for instance in interaction design [29] and service design [32].

These personas are based on the bus passengers' primary needs and preferred travel experience. In addition to the primary travel mindset describing the persona, each have secondary travel mindsets that are caused by abnormal travel contexts. For instance, if

a passenger usually traveling with their kids travels alone, or if a passenger usually isolating oneself from the surroundings travels with a group of friends.

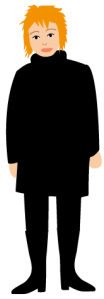
The personas in our study were created to describe different types of regular bus passengers, including their habits and needs related to bus travel and mobile device usage, as well as the specific elements that impact their travel experience the most. These personas help service developers to understand the varying needs and habits people have regarding bus travel and mobile device usage while traveling. The personas are: *Alba Abstracted, Edward Enjoyer, Emma Efficient, Ingrid In-control, Isac Isolation, Olga Observer, Olivia Off-line, Rachel Relaxed, Serena Sensitive,* and *Sophia Social*. Figure 3. presents the *Travel Experience Personas*, their additional travel mindsets and the UX goals we derived based on the study findings.

Alba Abstracted, 55-year old worker

Enjoys using public transportation, but still makes clumsy mistakes if she doesn't stay alert. Loves to socialize, play games and simply get deep in her thoughts. Gets stressed when having to focus on staying alert not to miss her stop.

TRAVELS BY BUS: Daily, prefers to walk short distance journeys **USES MOBILE DEVICE:** Sometimes. Would like to use more, but has to limit the usage to have more focus on the route **NEEDS RELATED TO BUS JOURNEYS:** Limiting the distractions, clear travel information **SECONDARY MINDSETS:** Social

UX GOALS: Competence, feeling of being in control, stimulation



Emma Efficient, 29-year-old student and entrepreneur

Effective utilization of bus trips makes the otherwise extremely busy days easier. Suitable tasks to conduct in the bus are for example, reading and answering to e-mails, making shopping lists and studying languages.

TRAVELS BY BUS: All trips, mostly to university or to work **USES MOBILE DEVICE:** All the time. Digital tasks vary depending on the length of the journey **NEEDS RELATED TO BUS JOURNEYS:** Avoiding noise, getting a seat, being on time, avoiding disruptions from fellow passengers **SECONDARY MINDSETS:** Relaxed, isolation, social

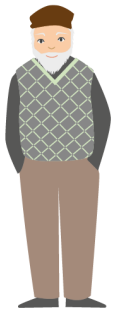
UX GOALS: Completion, efficiency

Edward Enjoyer, 68-year-old pensioner

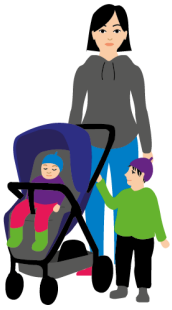
Bus journeys are one of the essential parts of the everyday social activities. It's nice to be surrounded with people and occasionally have conversations. The best trips are the ones shared with an old friend!

TRAVELS BY BUS: Daily – shopping and leisure trips **USES MOBILE DEVICE:** Occasionally, mostly text messages, calls and camera. **NEEDS RELATED TO BUS JOURNEYS:** Getting a seat, avoiding rush hours, on-board travel information, smooth ride, being social with the driver and fellow passengers **SECONDARY MINDSETS:** Social

UX GOALS: Discovery, connectedness, sociability



Ingrid In-charge, 34-year old mother on parental leave



Every bus ride is an adventure when traveling with a toddler and a four-year old. The ride is succesfull if the kids behave well. Secret mom powers include knowing the least crowded bus lines and having endless supply of snacks.

TRAVELS BY BUS: Almost daily, mostly outside rush hours **USES MOBILE DEVICE:** Very little. Checks the journey information or messages only if needed. Sometimes allows the kids to play games or watch videos **NEEDS RELATED TO BUS JOURNEYS:** Room for stroller, getting seats for everyone, being on time, entertainment for kids **SECONDARY MINDSETS:** Relaxed, isolation, social

UX GOALS: Feeling of being in control, safety, trust, nurture

Isac Isolation, 23-year-old student

Hopes to be left alone when traveling. Isolates himself from the fellow passengers by immersing into the mobile phone. Social only via smartphone or when traveling with friends.

TRAVELS BY BUS: Everywhere, mainly to school **USES MOBILE DEVICE:** Constantly – uses mobile phone to communicate with friends, listen to music and for various types of entertainment **NEEDS RELATED TO BUS JOURNEYS:** Being left alone, USB charging for mobile phones **SECONDARY MINDSETS:** Social

UX GOALS: Captivation, connectedness, feeling of being in control, relaxation

Olga Observer, 70-year old pensioner

Spends the bus journeys observing fellow passengers and the scenery. Enjoys being around people, but doesn't like to socialize with strangers. Prefers the front seat where she can hear the radio and see people entering the vehicle.

TRAVELS BY BUS: Almost daily, mostly shopping and leisure trips **USES MOBILE DEVICE:** Does not use mobile device during bus trips, actually often leaves it home **NEEDS RELATED TO BUS JOURNEYS:** Getting a seat next to doors, where she can observe people and also exit the vehicle easily **SECONDARY MINDSETS:** Enjoyer, social

UX GOALS: Discovery, exploration, sympathy

Olivia Off-line, 50-year-old office worker

Bus journeys are free of mobile device usage. Enough time is spent staring at a screen at work, and besides, she's not even wearing her reading glasses. Bus rides offer perfect 20 minute relaxation before and after the busy day at work.

TRAVELS BY BUS: Daily to work **USES MOBILE DEVICE:** Does not use mobile phone during bus trips **NEEDS RELATED TO BUS JOURNEYS:** On-board travel information, the service attitude of the driver, being on schedule, choosing an environmentally friendly travel mode **SECONDARY MINDSETS:** Social, observer

UX GOALS: Fellowship, serenity

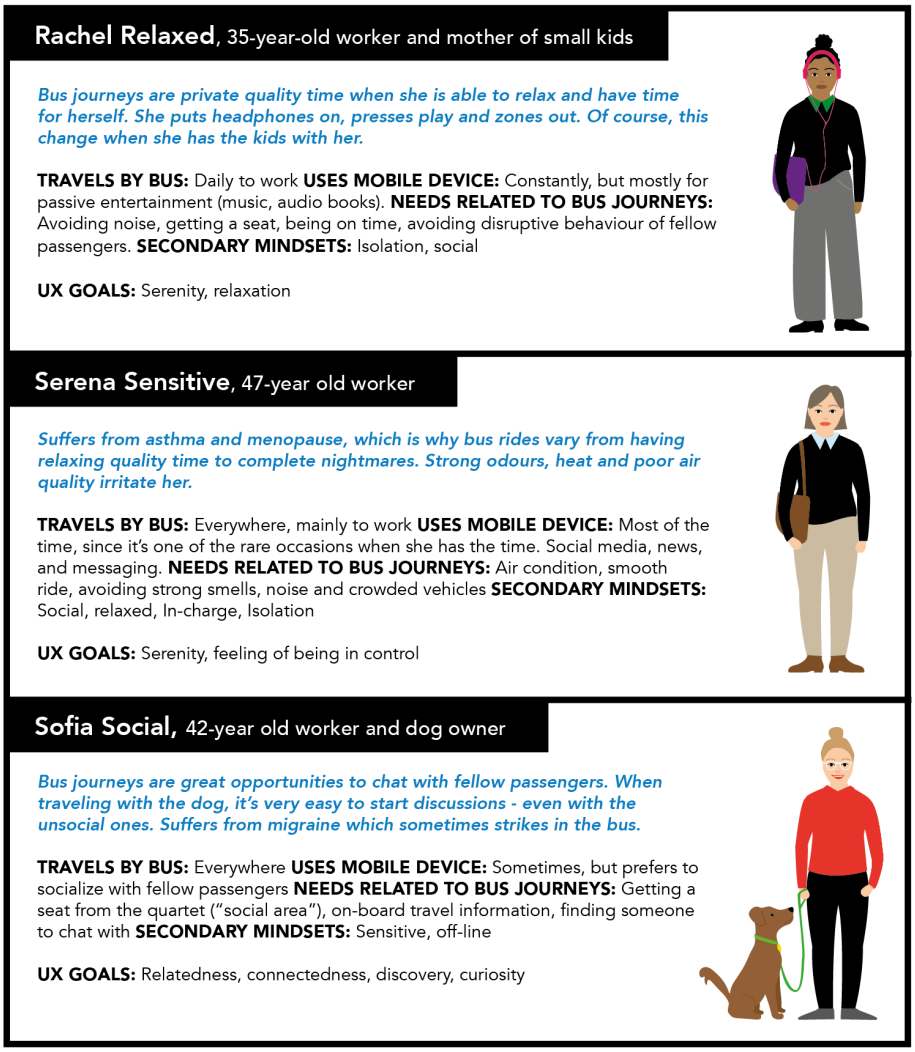


Fig. 3. Visual representation of the Travel Experience Personas, including their travel related needs, insights on mobile device usage, secondary travel mindsets and target UX goals.

6 Discussion

The aim of our study was to discover regular bus passengers' needs, and gain understanding of intra-city bus travel experience. Our motivation was two-fold: Firstly, to provide academic contributions by covering the research gap in short distance bus travel experience literature; existing studies focus on travel behavior [34], trip satisfaction [e.g. 9, 33], and travel experience [e.g. 2, 8] presenting mostly quantitative research efforts that cover the topic from the usability and efficiency perspectives. We wanted

to tackle this research gap with insights of the varying travel mindsets. The ten travel mindsets: *Abstracted, Efficient, Enjoyer, In-control, Isolation, Observer, Off-line, Relaxed, Sensitive,* and *Social*, provided an answer to our research question *What kind of travel mindsets do frequent bus passengers have?*

Secondly, our aim was to create a design tool would make a practical contribution. Hence, we derived *Travel Experience Personas* that communicated our study findings in visual and tangible format. The personas as communicative design tool provide holistic understanding of the varying passenger needs to help the ideation and evaluation of new bus travel related services. The novelty of our personas in comparison to earlier work on personas is that they include secondary travel mindsets and UX goals. Hence, the Travel Experience Personas enable creation of empathic understanding of the regular bus passengers' varying needs.

One of our aims has been to conduct research on passengers' needs and travel experience and to provide human-centered insights in the forms of design tools in the *Living Lab Bus* developer portal. We believe that both the travel mindsets and the Travel Experience Personas provide valuable insights to designers and software developers utilizing this platform when developing digital services for the bus travel context. However, in today's world, user insights are needed by several stakeholders. Hence, in the context of our study they are not only the developers and designers, but also for instance the public transportation providers. Thus, the personas serve as a communication tool for transferring the research insights forward in a compact, meaningful and tangible format.

Personas as a design tool have been criticized for instance by Friess [10], of being resource-expensive tool for design development. This is true also in our study. However, we believe that in our case this is efficient and optimal way of transferring our gained and collected user insights forward to other stakeholders, who do not have the time and recourses to conduct similar studies. Personas have also been criticized of being statistically insignificant [24], which means that we would need a quantitative study to reveal the distribution and popularity of the travel mindsets and experience personas.

In conclusion: While the mindsets are the synthesis of the findings, personas are the practical tool to communicate these findings. The personas could be utilized by a wide range of stakeholders: software developers, experience designers, public transportation service providers and even bus companies in their service design. The personas can be utilized to gain insights of the wide variety of bus passengers' needs and experiences. They could also be combined with quantitative surveys utilized often in the transportation field. The usage of these personas will provide in-depth understanding of varying travel needs and UX goals that can be utilized to guide the design of bus traveling services.

6.1 Limitations and Future Work

The study was limited in the number of participants that represent only the public transportation users of the cities of Helsinki and Tampere. While both men and women

were included, the overrepresentation of women in the sample reflects the widely observed gender difference in travel mode use [31]. The Travel Experience Personas include only two males and hence, they are in line with the gender distribution of our study participants.

Personas are based on the sample of 20 study participants, entailing rich qualitative insights. We started to see saturation of the data in the last third of the analysis. Additional personas and insights might emerge if the study would be conducted in a different city context. The travel mindsets and experience personas do not cover the full range of bus passenger, since our focus was on regular bus users, hence some travel mindsets might be missing. Also, one might claim that the travel mindsets are overlapping, for instance the enjoyer, observer, and social seem to have similar characteristics and travel related needs. So far, we have not been able to test these Travel Experience Personas. However, the preliminary personas were evaluated with software developers, and the findings show that the tool is seen valuable [19].

Even though the study was only limited to two Finnish cities, we believe that the found ten travel mindsets can be seen widely applicable to similar kinds of cities. Of course, there are cultural differences between different countries but because certain human characteristics are human (e.g. efficiency and sociability) we believe that similar mindsets can be valid also in other types of cultural contexts. Personas may differ more, because the traveller behaviour that they encapsulate is probably more contextual. Naturally, to make the mindsets and personas valid "universally", similar studies would need to be run in different types of countries and cities.

In the future work, we are planning to evaluate our study findings – the then travel mindsets with a quantitative survey study. We are eager to see how well the found mindsets map out to a large sample of bus passengers. We are also going to evaluate the Travel Experience Persona design tool with relevant stakeholders to see how well we succeeded to communicate the relevant insights and support the empathic understanding of bus passengers' needs and travel experience.

Conclusion

In this paper, we presented a qualitative diary and interview study on intra-city bus travel experience with 20 passengers. The aim of this study was to identify and communicate frequent bus passengers' needs, experiences, values and activities as *user insights* to support experience-driven service design in the public transportation context. Based on the data analysis, we derived ten travel mindsets: *Abstracted, Efficient, Enjoyer, In-control, Isolation, Observer, Off-line, Relaxed, Sensitive,* and *Social*. To communicate the study findings on bus passengers' travel experience, *Travel Experience Personas* were created. The personas include primary and secondary travel mindsets, specific needs related to bus travel, insights on mobile device usage and target user experience (UX) goals that could enhance the personas' travel experience. Thus, our findings – the ten travel mindsets, and the derived Travel Experience Personas can be utilized as communicative design tool to support EDD of novel services in the bus context.

Acknowledgments

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