Travel Experience Toolkit: Bus-Specific Tools for Digital Service Design

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ABSTRACT
To design desirable digital services for public transportation, passengers' needs and expectations should be considered. This paper presents a novel bus-specific Travel Experience Toolkit to support the design of digital traveling services in the context of intra-city bus transportation. The toolkit is structured in three areas of user experience, or *travel experience*: user (passenger), context (bus) and system (public transportation). The initial toolkit includes three tools derived from the findings of our qualitative passenger studies conducted in Finland using interviews, co-design workshops, and the diary method. The tools are: *Bus Passenger Personas*, a card-based design tool *Context Cards*, and *Passenger Journey Map*. With the help of the Travel Experience Toolkit, digital services can be developed with a focus on passengers' needs, improving the bus travel experience and thus enhancing the desirability of public transportation. We evaluated the tools with software developers and present the key findings.

Author Keywords
Bus; public transportation; travel experience; toolkit; design tool.

CCS Concepts
• **Human-centered computing~User centered design** • **Human-centered computing~Systems and tools for interaction design** • Human-centered computing~Usability testing

INTRODUCTION
Positive travel experience is one of the key motivations for people to choose public transportation modes over private ones [1]. Existing studies focus on travel behaviour [13], trip satisfaction [e.g. 6, 11], and travel experience [e.g. 1, 2, 4]. These studies present mostly quantitative research efforts that cover the topic of improving the bus travel experience from the usability and efficiency perspectives. Additionally, different technical design standards and requirements regarding public transportation already exist (e.g. Streets Toolkit by Transport for London [12]).

Design toolkits are collections of carefully selected user-friendly design tools that enable development of new product or service innovations [14]. Most toolkits are not for general purpose, but rather for specific design challenges. Public transportation related toolkits are missing, and thus, *Travel Experience Toolkit* makes a novel contribution to the design area of digital traveling services.

We conducted four studies with bus passengers to understand their needs and expectations for novel digital services in the bus. Our aim with the Travel Experience Toolkit is to present these insights in communicative and concrete visual forms, in order to pass on the derived knowledge from us, the researchers, to the actual service designers and software developers, to support their ideation and design activities. Furthermore, the tools can be used to validate the design ideas. The tools of Travel Experience Toolkit were evaluated with ten software developers.

Travel Experience Toolkit was created as a part of a three-year research project *Living Lab Bus*, in which one of the aims is to develop a platform for interactive services for electric buses. However, the toolkit presented in this paper is not specific for electric buses, and thus can be utilized in the service development of short-distance bus transportation in general. Novel services can be for a wide range of purposes such as enhancing the activities of social, entertainment, observational, travel, and routine [4, 5].

Travel Experience Toolkit supports the three main elements of experience (see Figure 1): user (passenger), context (bus) and system (public transportation). These elements currently include one tool each but can be extended later. *Bus Passenger Personas* were created to communicate the bus travel relevant habits and needs of different passenger types. *Context Cards*, a card-based design tool, was developed to convey bus context specific knowledge to inexperienced workshop participants to support ideation activities in co-design workshops. *Passenger Journey Map* was generated to showcase the different steps and actions a passenger has to perform while traveling, in other words, when using the public transportation system.

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STUDIES BEHIND THE TOOLS

The toolkit is based on four empirical studies. *Bus Passenger Personas* are based on the findings of a three-week bus travel diary study conducted with altogether twenty participants in two major cities in Finland. *Context Cards* were iteratively developed and utilized in idea generating workshops [9] and in-depth ideation workshops [10]. Passenger Journey Map is based on an interview study with ten regular bus passengers [8]. These studies were conducted in 2016-2017 in Living Lab Bus project. The studies included altogether 68 participants with varying backgrounds, all being regular bus users from two major cities in Finland: Helsinki region and Tampere.

After forming the initial toolkit, the tools were evaluated with ten software developers.

TRAVEL EXPERIENCE TOOLKIT

This section presents the bus-specific design and ideation tools that can be used as inspirational and guiding materials when designing new digital services for bus travel. We formulated the tools under the categories of user, context and system to help designers gain design-relevant insights of the main factors of experience, according to well-known UX models, for instance by Hassenzahl and Tractinsky [7]. Accordingly, three tools are presented below (See Figure 1): *Bus Passenger Personas* to support the user or passenger understanding, *Context Cards* to offer inspiration of contextual factors in bus transportation and *Passenger Journey Map* to provide insights about the bus transportation system from the travel experience perspective.

Bus Passenger Personas

Five bus passenger personas were created to describe different types of regular bus passengers. Personas [3] in this study, describe the 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 mobile usage while traveling.

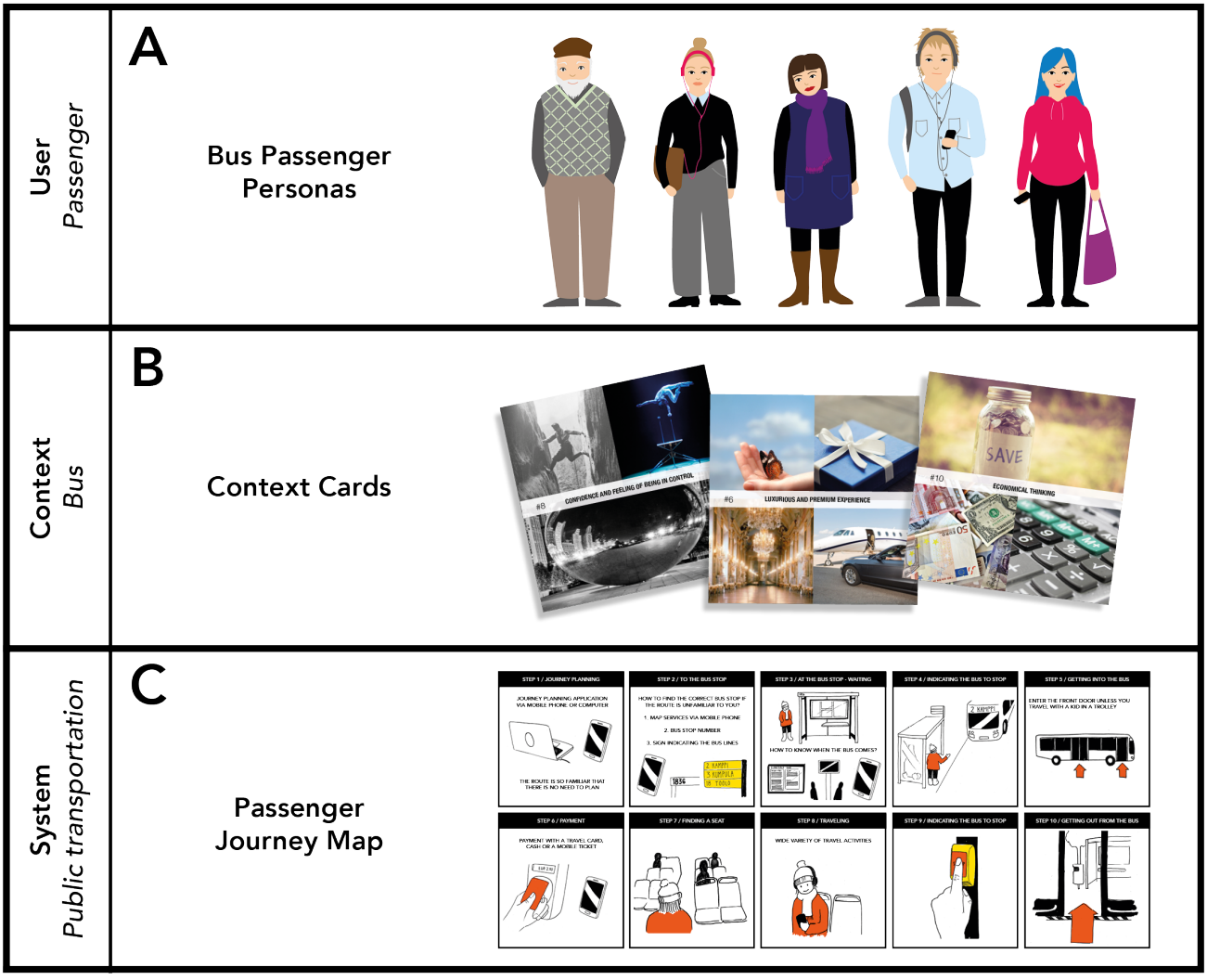

Figure 1. Tools of the Travel Experience Toolkit to support understanding of the main areas of user experience. A) Bus Passenger Personas, B) Context Cards, and C) Passenger Journey Map. ©Elina Hildén

The personas are: **Edward Enjoyer,** a 68-year-old pensioner to whom bus journeys are one of the essential parts of the everyday social activities. **Rachel Relaxed,** 35-year-old worker and mother of small kids, to whom bus journeys are private quality time when she is able to relax and have time for herself. **Olivia Off-line,** a 50-year-old office worker to whom bus journeys are free of mobile device usage. **Isac Isolation,** a 23-year-old student who hopes to be left alone when traveling by immersing himself into the mobile phone. **Emma Efficient,** 29-year-old student and entrepreneur, to whom effective utilization of bus trips makes the otherwise extremely busy days easier. Figure 1A represents the visual look of each persona and the format of the personas.

Context Cards

To communicate the insights of the bus context we iteratively developed Context Cards [10], a set of ten bus-specific cards that can be used when ideating new service concepts for public bus transportation context. The cards can be used as a part of the initial ideation of evaluating existing services. The tool can be used for instance in co-design sessions, providing the participants with bus context inspiration for the creative activities. The cards can be used in several ways: all at once, one by one, or combining 2-3 cards at a time. Different combinations can produce fresh ideas that can become novel concepts when developed further. Context Cards (see Figure 1B for their visual appearance) include the following ten bus-context specific inspiration cards:

1. Making the ecological values of electric bus visible. The bus and its information design could create awareness of the vehicle's sustainability and energy efficiency.

2. Informative communication. Bus stops could provide dynamic information about the things related to bus transportation (schedules, bus lines etc.), as well as, local surroundings

3. Entertaining activities. The bus environment could provide the passengers with passive or active entertaining activities or support the passengers' own entertainment channels.

4. Atmosphere of relaxation. The bus environment and its services could offer the atmosphere for relaxation and quietness.

5. Subtle opportunities for social interaction. Means could be provided for getting to know people without distracting them amongst fellow passengers.

6. Luxurious and premium experience. The bus and the its services could offer something "extra" or surprising, not available elsewhere.

7. Getting to know the personality of the driver. The driver is the only human touchpoint the passenger's face on daily basis. Currently unknown drivers could be brought closer to the passengers making them feel more human.

8. Utilizing the sensor data collected by the bus. The new buses collect enormous amount of sensor data and this could be utilized to develop digital services either for the passengers, drivers or the operating bus company.

9. Commercial services. Collaboration with third-parties could bring value to the passengers and thus enhance the attractiveness of public transportation.

10. Economical thinking. Public transportation is cost-saving option compared to private car usage. This benefit could be highlighted when developing new services for bus passengers.

Passenger Journey Map

We created a Passenger Journey Map (see Figure 1C) to visualize the different actions, tasks and steps that the passenger needs to take in order to conduct bus trips within the public transportation system. The journey map starts from the action of making a decision to choose public transportation and a bus. Later the journey includes searching for the right route and bus line, finding the correct bus stop, conducting the journey and finally stepping out from the vehicle in your destination. Our aim was to communicate the bus transportation system user's journey to the designers, by visualizing the several different touchpoints (journey planners, payment etc.). This information can help the design of digital services in several phases where the user (passenger) is in need for travel related services.

EVALUATION WITH SOFTWARE DEVELOPERS

Since the toolkit aims to aid in the ideation and validation phases of service design in the bus transportation context, it was seen important to evaluate the tools with software developers. Hence, evaluation interviews were organized with ten software developers. With the evaluation, our main purpose was two-fold: first, to understand whether software developers consider these tools beneficial on the general level; and second, to test if our chosen presentation format of the tools could be enough to inspire them in the early stages of development. We were also looking for feedback on what could be improved and changed.

Evaluation Procedure

For the evaluation interviews we created two user scenarios describing two different kind of developers using the toolkit for the first time. The first scenario described a start-up team member generating new ideas for bus travel services with the help of the Travel Experience Toolkit, and the second scenario focused on a UX-oriented developer validating his existing idea with the provided tools. After reading each scenario, the participants were interviewed to gain understanding of how convincing the scenarios were, and how beneficial the tools of the Travel Experience Toolkit seemed. Also, the participants were given a questionnaire with set of questions related to the structure, complexity and usefulness of tools and their visualizations. After reading both scenarios, the participants were provided with a paper prototype of the wireframe of the web-based Travel Experience Toolkit and visualizations of the tools (see Figure

1) to collect feedback on. Finally, questions were asked on the typical sources of inspiration for their personal and work-related projects and whether they use any kind of design guidelines. The sessions lasted on average for an hour. The evaluation sessions were transcribed and the findings were analyzed thematically by one researcher who also moderated the sessions.

Participants

The study involved ten software developers (eight males and two females) with varying backgrounds such as machine learning engineers and test engineers, with average age of 28,0 (range 25-34). Many of them had some experience in startups (five participants) and open source projects (four participants).

Findings

In general, participants demonstrated a positive reaction to the Travel Experience Toolkit, despite having no prior knowledge about the basic concepts of the tools. Most common wish among the participants was having easy access to research data and numbers behind these tools. This would make the tools more convincing and informative. Also, there was some confusion about the terminology, format and naming of the three tools.

Bus Passenger Personas were the most questioned tool amongst the participants. Even though the content was considered valuable by all participants, the format was seen confusing. The participants wished to get more information of data behind each persona. One participant thought that the personas were just assumptions. In addition, participants were keen to learn how much these personas overlap with the real passenger statistics: "*How personas map to actual people and how often do they overlap? Is Rachael Relaxed always like that or during working hours? Maybe outside working hours she is Emma Efficient?*" (software developer, 33). Some participants were confused by the terminology and actual concept of the *personas*, and perhaps that's why they questioned the amount of the personas: "*Five or six personas might not be enough. To be more realistic it needs to be 10-15 as you work with different age groups, genders and nationalities.*" (machine learning engineer, 29). However, when understood correctly, the value of the tool was clear: "*I use bus a lot and there I can see literally every person categorized in these*" (software developer, 25).

Context Cards were considered beneficial across all the participants. Participants understood their value in different use cases, and some showed definite excitement about potential use of them in their own work as a tool for both designing and communicating with other developers and designers. Question was raised regarding the amount of the cards: "*I am not sure how many cards are needed to start generating ideas*" (software developer, 26).

Passenger Journey Map was also positively received: "*Useful tool to communicate with designers."* (software developer, 33). Some participants hoped to had other situations described, such as "outside the bus" activities. The general response to this tool was that the map provided enough context to work with. "*Different situations do not really matter, it already gives a pretty good idea of the context.*" (software developer, 26). However, a participant having some prior experience with UX journey maps, preferred to have it in a more traditional and more detailed format.

DISCUSSION AND CONCLUSION

Travel Experience Toolkit presented in this paper can be utilized in the development of digital traveling services for the short-distance bus context. The tools were created to transfer the knowledge gained from passenger studies further to the designers and software developers who are designing digital traveling services. The toolkit consists of three tools, based on the main experience elements user, context and system [7]. *Bus Passenger Personas* communicate the user insights, whereas bus-specific *Context Cards* focus on the context information, and *Passenger Journey Map* describes the actions the user has to make within the system of public transportation.

The evaluation interviews with software developers show that the tools are perceived useful, but the personas should be linked to passenger statistics. However, the evaluation interviews do not guarantee that the tools actually work in real work activities and context. Hence, we will collect further design materials and develop tools iteratively with software developers in real travel service development projects. In the future, the toolkit will be integrated together with technical sensor data and implemented as a part of Living Lab Bus Developer Portal.

We also acknowledge that there are still limitations regarding the presented tools. For instance, Passenger Journey Map only presents one type of bus trip, and the Bus Passenger Personas currently represent regular bus passengers and thus, do not cover the wide variety of bus users (such as tourists). The studies were conducted in two Finnish cities – Helsinki region and Tampere. Hence, the cultural context of these studies is a socially homogeneous Nordic cities, which cannot be separated from the overall travel experience. However, conducting the studies in two different cities, we got winder understanding of the travel experience: in Helsinki region the public transportation is multimodal, whereas in Tampere, the public transportation infrastructure is limited to buses and thus, the travel experience of buses is being formulated in different settings. However, having covered only two cities, the toolkit has "local" attributes. Naturally, to make it valid "universally", similar studies would need to be run in different types of cities.

Regarding future work, we will iteratively develop the tools further, until then making sure that the developers are provided with the information of the data and studies behind the tools.

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