Development of Context Cards: A Bus-Specific Ideation Tool for Co-design Workshops

Full Paper†

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ABSTRACT

The importance of context is widely studied in design practice. Still, design workshops often take place in meeting rooms, with the help of generic design materials. To support the participants' understanding of the context of products or services, context-specific design materials can be utilized. The aim of this study was to gain design-relevant insights on how to support ideation with context-specific card-based design tool. Thus, this paper presents Context Cards – a bus-specific ideation cards for co-design workshops. We present the four-phase process of the card tool development in our study of early stage co-design of digital services for the bus context. The findings reveal that the developed Context Cards aided the participants' ability to ideate new services for the specific context. As a concrete outcome of our design research study, we present the final version of the cards, and insights on how they can be used.

CCS CONCEPTS

• **Human-centered computing~User centered design** • **Human-centered computing~Contextual design** • *Human-centered computing~Participatory design*

KEYWORDS

Co-design; Workshop Method; Design Tool; Creativity Support Tools; Design Methods

1 INTRODUCTION

It is important to design solutions that bring value to users. The importance of user experience for customer satisfaction and loyalty have already been recognized widely across different fields [20]. When designing for good user experience one must familiarize oneself with the people who are going to use the product or service. In order to do so, designers have been moving closer to the users and this has led to an evolution in design research from a user-centred approach to co-designing [17].

In this paper, we present the development of context-specific ideation tool – Context Cards, for early stages of co-design process of digital services. This study is part of a larger research program *Living Lab Bus*, where the focus is on developing novel digital traveling services for city bus passengers and other relevant stakeholders. To understand bus travellers' needs and expectations for future traveling services we have conducted a four-phase study: preliminary interviews with ten international students, a set of three *Idea generating workshops* with 24 students, three *In-depth ideation workshops* with different user groups (3-6 participants in each), and finally an evaluation session with HCI experts. In order to gain deep understanding of bus travellers' needs, we wanted to find ways to build up on the previous study findings on each session. To address this need, we designed Context Cards—a context-specific design tool to support the ideation and discussion in each session. The focus of this paper is not on the ideas generated in the workshops, but rather on the card-based tool developed for, and used in the co-design sessions.

This study aims to gain design-relevant insights on how to support the ideation in co-design sessions with contextual information. The main motivation for the study was to explore what kind of design tools and methods can best support contextuality in the co-design sessions. Regarding the workshop methods, we followed human-centered design (HCD) and more specifically, co-design approach. Ideation of new services can be seen as the initial phase of co-design process, and thus, the workshops were organized with a strong focus on such ideation activities.

In human-centered design, contextual methods are incorporated in the specific design circumstances [14]. To this end, we wanted to advance contextual design methods.

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Therefore, our research question is: *How well can a card-based design tool support the ideation of novel digital services in the bus transportation context?* In this study, we applied a context-specific method to study situated activities in a specific environment, i.e. the bus. We address the research question by gathering feedback of the Context Cards from the participants as well as evaluating the card tool usage in two different types of ideation workshops, and finally, in an evaluation session with HCI experts.

2 RELATED WORK

We present related work on user involvement in collaborative workshops. We also give a brief overview of the suitable methods for ideation as part of co-design activities, including card-based design tools.

2.1 User Involvement in Collaborative Workshops

During the past decades, a shift from a user-centered design process to co-design [17] and participatory experiences [15] has lead the design research community to actively develop, communicate and practice new methods for user collaboration in the design process [12, 14]. Researchers from different fields – including design, have understood the benefits of involving user groups in the phase of novel product and service ideation, and thus facilitating the stakeholder participation has become very central in co-design [1]. With co-design the outcome of the project is likely to be better than without collaboration [19]. However, co-design is not anything new – similar collective activities has been done within the design field under the name participatory design since the 1960s [17].

Co-design can be described as a continuous cooperative process that bring normal people together with design professionals in order to ideate better solutions for daily life [e.g. 16, 18]. In co-design users are invited to participate to the design activities and they are treated like equal experts [16]. However, since they lack the design training and have very little experience on innovation, it is important to provide supportive materials – such as design tools, to help with the creative activities (ibid). A study conducted by Lucero et al. [14] presents dialogue-labs method with its three key structuring characteristics: the process how sessions are orchestrated, the space in which the session takes place set and the materials that are used. The study examined the roles of these three structuring elements in co-design events during 18 sessions. The study indicates that all of the three elements are important when carrying out co-design sessions [14].

2.2 Methods for Ideation

Methods that support participatory nature and creative engagement, as well as the creative outcome are referred as innovative methods [4]. The purpose of innovative design methods is to "allow for creativity in designing methods appropriate to the situation" (ibid). These, innovative design methods are best suited for the early phases of the design process, e.g. idea generation through brainstorming sessions or the rethinking of the existing solutions [14]. The methods help to direct design decisions and create better understanding of what and for whom to actually design [12]. One form of innovative methods are creative sessions, such as design workshops, where participants (users) are invited to generate ideas and communicate their thoughts [4]. Design projects can benefit from co-design sessions in various ways, e.g. it improves the creative process of ideation [19].

In co-design sessions, the tasks are often completed in groups. The artifacts can be e.g. some sort of collages detailing feelings, cognitive maps or other indications of activities or thoughts of desired product features [4]. The co-design workshop materials are tools that can provide different entry points to the design problem and help the participants to build their own design language [14]. In order to get the full benefits of the co-design sessions, researchers must explore not only what people say and do, but also what people make. Some of the design tools have been created with the focus on the making [16]. Both visual and verbal components are utilized to construct these tools, and thus they help participants to express their thoughts, feelings, wishes and new ideas (ibid).

2.2.1 Card-based design tools. Tools, such as card-based materials can thus be developed e.g. to enrich ideation at the workshop sessions [2] and to communicate framework categories to support ideation [13]. Card-based design tools are also developed to make design research insights and other domain knowledge accessible to designers [5]. Each card set serves its specific design space, and often supports transferring knowledge from academe to design practice (ibid). What varies is the content – the topic, size of the card and the total number of cards per deck. Card-based design tools are explored by several design researchers, organizations and research institutes [1]. It is a way to communicate ideas for design activities in a compact, tangible format.

There is a wide range of card-based design tools from which we have chosen to present few examples: *Inspiration Cards* [7], focus on enhancing the work of designers. The cards are divided into two broad categories: Technology Cards and Domain Cards. The idea of the cards is to store information, such as new interesting technologies to be utilised when innovating new concepts. Where Technology Cards are suitable for many type of projects, the Domain Cards are mostly project specific. *Tango Cards* [5], enable a variety of uses that make design knowledge about tangible learning games accessible to designers. *PLEX Cards* [13] were developed to communicate the Playful Experiences framework's 22 categories to people who wish to design for playfulness. *Envisioning Cards* [3] is a tool for attending to

human values during design: the cards were developed to raise awareness of long-term, systemic issues in design. The cards are divided into four different criteria: stakeholder, time, value, and pervasiveness. IDEO [11] has also developed their own *IDEO Method Cards* to inspire people with 51 cards, each describing one method including description of how and when to use the method. Bekker & Antle [1] on the other hand, have developed a card set that provides designers with age specific information about children's varying abilities.

The benefit of card-based design tools is that it is often possible to combine them with other design materials, such as prototypes and mock-ups [7]. Deng et al. [5] have listed some of the many good qualities of card-based design tools: they can help in structuring design discussions, and ensure a wide spread of perspectives when tackling different design issues. They can also help in speeding up the iteration of ideas. Cards can be used to shift focus when discussion slows down, and most importantly the tool provides its users with common language that help in communication. Even though several card tools exist, none of them focuses on digital services in the bus context.

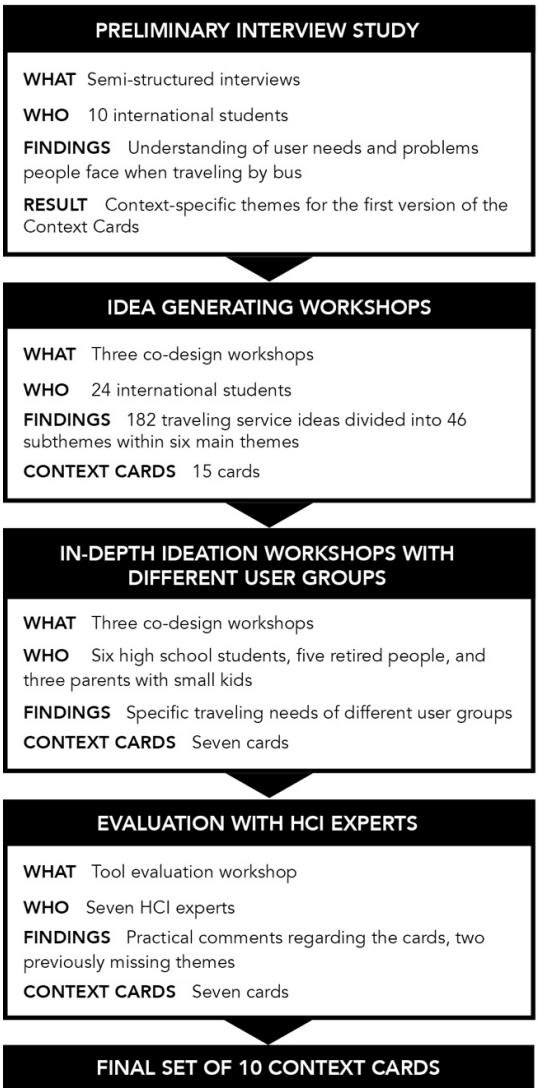

Figure 1: The four phases of our study and the development process of the Context Cards.

3 MULTI-PHASE STUDY FOR THE CONTEX-SPECIFIC TOOL DEVELOPMENT

To understand bus travellers needs and expectations for future traveling services, and to develop the context-based card tool, we conducted a study with four phases (see Figure 1). The first phase was a preliminary interview study with ten international students. The findings were used to form the basis for the Context Cards used in the following phases. The second phase focused on evaluating the first version of Context Cards. In this phase, we run three Idea generating workshops with 24 students in three different bus-related contexts. To continue the iteration of Context Cards, the third phase of the study was a set of three In-depth ideation workshops with different user groups, 3-6 participants in each. Finally, the fourth phase of the study was a session to evaluate Context Cards with HCI experts. In the following sub chapters, we will explain each phase and their findings in more detail.

3.1 Preliminary Interview Study

As a first phase of the study, a set of semi-structured interviews [9] was carried out in order to gain insights of the current user experience of buses in Finland, as well as of the expectations to the electric bus. The participants consisted of ten students with international background living in Finland. The aim was to gain feedback and collect users' experiences of different public transportation systems from metropolitan cities worldwide. The interviewees represented different nationalities (Brazil, Costa Rica, Finland, Germany, Italy, Iran, Sweden and Vietnam) and age groups (23-37 years, avg. 28 years). Both genders were equally presented (5 female and 5 male participants). Seven interview sessions (four individual and three pair interviews) were organized, 1-1,5h each. Interviews were audio recorded. The data from the interviews was transcribed and the transcriptions were further divided to 703 short notes with meaningful participant statements. To draw out common themes from the data we used affinity diagramming [10] in the analysis.

The results of this phase were used to create the context-specific themes of the card deck. The main themes found on traveler needs for future short distance bus traveling services are: *Emphasizing the ecological choice*, *Informative and entertaining bus stops*, *Atmosphere of relaxation, Subtle opportunities for social interaction,* and *Feeling of luxury*. In addition to using these findings as a guidance for the development of Context Cards, they also provided us with a good understanding of travelers' challenging situations. These situations were translated into scenarios that were utilized in

the next study phase, Idea generating workshops, to help the participants ideate service solutions for varying situations.

3.2 Idea Generating Workshops in Three Different Contexts

The second phase of our study aimed to gather design-relevant insights on how public transportation services should be developed in order to better serve the passengers' needs and expectations. The research focused on two aspects: firstly, to gain insights of the passengers' needs and expectations for the digital traveling services, in order to understand how the travel experience could be enhanced. This was studied by analyzing the ideas that the participants generated in the co-design workshops (see Hildén et al. [8]). Second, we wanted to study what kind of workshop environment could support the effective ideation of digital traveling services by the participants for this specific context of use. This was done by utilizing Context Cards to provide bus-specific themes to inspire the workshop participants in three different workshop environments. This allowed us to study the impact of the workshop environment to the participants' ability to ideate services.

3.2.1 The Three Workshop Contexts. A series of three collaborative ideation workshops were organized, all of them in a different environment with different levels of contextuality. This was done in order to understand the impact of the environment to the participants' creativity and ability to ideate using the Context Cards (See Figure 2). The settings of the workshops were: 1. A classroom at a university - *Imagined environment* (Workshop 1, WS1); 2. Laboratory environment augmented with interactive displays in a research institute – *Stimulated environment* (Workshop 2, WS2); 3. Moving electric bus, Espoo, Finland – *Real environment* (Workshop 3, WS3). The workshops took place in two cities in Finland: Tampere and Espoo, in the spring 2016.

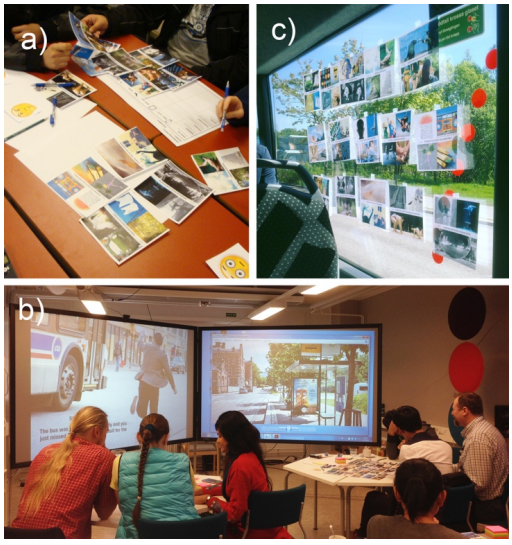

Figure 2: Pictures from the three workshop contexts: imagined environment (picture a), stimulated environment (picture b) and real environment (picture c).

In the *imagined environment* workshop, the setting provided very little additional inspiration, since it was a plain classroom with tables and chairs organized to support the work in small groups. The classroom had a projector, which was utilized to give the presentation and instructions for the workshop tasks. In the *stimulated environment* workshop, we tried to provide more contextual inspiration of the bus by utilizing the 90° cornered screens in the lab, in which two photos for each scenario (see Figure 2) were projected. The *real environment* workshop was organized in an electric bus that was driving in the city suburbs and thus provided the participants with real bus context information.

3.2.2 Workshop Process. We started the workshop with a short presentation of the day's agenda, goals for the day and briefs for the tasks. In the introduction presentation videos of the unique qualities of electric buses were shown to highlight the silent and smooth ride. This was done to inspire the participants to ideate and come up with service ideas specifically for electric buses. An icebreaker exercise served as a starting point – participants were asked to share a good or bad experience when using public transportation. The main part of the workshop focused around five scenarios – situations that could take place in the context of bus transportation. The task was to come up with service ideas that could enhance the traveling experience in that specific situation. For the scenario tasks, the participants were divided into teams of 2-3 persons (three teams in each workshop, nine in total). 15-20 minutes was spent for each scenario task after which the groups got to share their ideas briefly with the other teams. The scenarios were: 1. The bus was few minutes too early and you just missed it. Now you have to wait for the next one; 2. You are in the bus. The route is unfamiliar and you have to check your phone to follow the journey planner; 3. You are in the bus. The route is familiar to you so you can lay back and relax; 4. You get off at your destination stop after a busy day at work; 5. You have to change to another bus in a big transportation hub, like Kamppi in Helsinki.

3.2.3 Participants. The workshops had 7-9 participants each. The participants were mainly students and they were from diverse study programmes (e.g. HCI, Bioengineering, Business, Automation engineering, Art and Design), with average age of 30,6 (range 25-56). Participants represented different nationalities, such as Australia, Bangladesh, China, Finland, India, Indonesia, Iran, Russia, Spain, Taiwan, USA, and Vietnam. In all three workshops, both genders were presented.

Most participants of all workshops stated that their main reason for traveling was traveling to school (12 participants) or to work (4 participants). 12 said that they use public

transportation for free time traveling. Majority of the workshop participants stated that they use public transportation at least 4 days a week (12 participants) or 2-3 days a week (8 participants) and only four said that they use it once a week or more rarely.

3.2.4 Context Cards as Stimulus Materials. Findings of the study's first phase of qualitative interviews [9] were used as input to the workshops in form of the first iteration of Context Cards. This set of 15 inspiration cards was derived to help with the ideation of the intangible service ideas specifically for the bus travel context. Our assumption was that by utilizing these cards, the participants would be able to focus better on the bus as a service context when executing the scenario based tasks. The final set of cards are presented below in Section 4. Final Version of the Context Cards.

Seven (#1-7) of the cards were derived from the findings of the preliminary interview findings [9] and seven (#8-14) were chosen and altered from the 22 categories of Playful Experience (PLEX) framework [13]. The 15th card was added from the Living Lab Bus project agenda. The PLEX categories were chosen based on our judgement of what experiences and qualities could improve the experience of traveling. We wanted to combine some the themes from PLEX categories with the bus-specific themes in order to trigger participants to come up with diverse and surprising ideas, with the help of different experiences. Gamification – the use of game design elements, presented in PLEX categories – has gained wide popularity in non-game contexts, such as in research and software industry [6]. Tools, such as PLEX framework, are thus great sources of inspiration when designing for playfulness – despite the context [13].

In the workshops, the participants were asked to choose one to three cards at a time to guide their ideation during the scenario exercises. They were also encouraged to use different cards within and for each scenario to get diverse ideas. The cards consisted of 3-4 pictures and the card title. The size of the cards was 12x12cm. The first set of Context Cards consisted of three theme sources:

Context-specific themes
1. Making the ecological values of electric bus visible
2. Informative communication
3. Entertaining activities
4. Atmosphere of relaxation
5. Subtle opportunities for social interaction
6. Luxurious and premium experience
7. Getting to know the personality of the driver

Themes from PLEX categories
8. Confidence and feeling of being in control
9. Fellowship - friendship and communality
10. Opportunity to be creative and express oneself
11. Stimulating senses
12. Exploration and discovery to learn something new
13. Captivation - forgetting one's surroundings
14. Competition - contest with oneself or an opponent

Themes from Living Lab Bus project agenda
15. Utilizing the sensor data collected by the bus

The groups were provided with a documentation template for their ideas. In this sheet, the participants were asked to define a problem to solve and also to think about the user needs and expectations in the given scenario. The template was designed so that it suggested the participants to come up with service ideas for mobile devices, public screens, and physical service context. This was done in order to get varying ideas and to inspire the participants to think out of the box services that could be linked to the bus ride. Participants were also asked to mark the Context Cards they used in each scenario on the documentation template. This was done in order to understand which of the Context Card themes were most relevant for the workshop participants.

3.2.5 Data Collection and Analysis. The data from the Idea generating workshops was transcribed and the transcriptions were further divided to 182 traveling service ideas. To draw out common themes from the ideas we used affinity diagramming [10] in the analysis. The service ideas were categorized into 46 subthemes within six main themes. The ideas are discussed in more detail by Hildén et al. [8].

Feedback was collected of the workshop experience as well as the stimulus materials – the Context Cards, and their usefulness. The feedback was analyzed to see if there are any differences between the three workshops. Regarding the Context Card usage, we analyzed the documentation templates to see how the participants had used the cards. Data was collected on the frequency of single card usage as well as the total card usage in each workshop.

3.2.6 Findings Regarding the Context Card Usage. In the ideation activities, the Context Cards were used in all three Idea generating workshops in total 317 times. The most popular cards used in the workshops were with the themes of: #2 Informative communication (56 times), #8 Confidence and feeling of being in control (36 times), #4 Atmosphere of relaxation (32 times), #15 Utilizing the sensor data collected by the bus (32 times), and #6 Luxurious and premium experience (31 times). The least used cards were: #14 Competition - contest with oneself an opponent (4 times), #10 Opportunity to be creative and express oneself (7 times), #7 Getting to know the personality of the driver (8 times) and #13 Captivation - forgetting one's surroundings (9 times). In all three workshops, the most used Context Cards were the same, so there were no mentionable differences between the workshops what comes to the most popular cards.

The cards that were derived from earlier interview study conducted by Hildén et al. [9] were much more often used (210 times) than the ones that were based on the PLEX categories (107 times). Based on the feedback, the participants of *stimulated environment* and *real environment* workshops were more satisfied with the stimulation

materials, meaning the Context Cards and the documentation template.

Interesting notion is that even though the participants in the *real environment* workshop were more limited what comes to moving the Context Cards around, they, together with the *stimulated environment* workshop were utilizing the cards much more often (in both workshops 117 times) than the participants of the *imagined environment* workshop (83 times). In the *stimulated environment* and *real environment* workshops the participants were also using the cards more broadly, meaning that in each scenario task, the teams used more different cards out of the 15 Context Cards than the teams in the *imagined environment* workshop. In other words, the environments that provided more contextual information also encouraged the participants to utilize wider range of Context Cards.

When participants were asked which Context Card themes they found most relevant, there was no big differences between the workshops. In all workshops the cards #2 Informative communication (by 19/24 participants), #3 Entertaining activities (by 15/24 participants), #8 Confidence and feeling of being in control (by 17/24 participants), and #15 Utilizing the sensor data collected by the bus (by 18/24 participants), were seen most relevant. The least relevant cards for the participants were stated to be: #7 Getting to know the personality of the driver (by 14/24 participants), #13 Captivation - forgetting one's surroundings (by 8/24 participants), and #14 Competition - contest with oneself or an opponent (by 7/24 participants). Thus, there was correlation between the cards that were most used and the cards that were the most valued.

3.3 In-depth Ideation Workshops with Different User Groups

Unlike in the previous Idea generating workshops, the focus of the third phase of the study was in quality over quantity regarding the service ideation. This phase aimed to gather deep insights of three different user groups' needs and expectations for services of short distance bus travel. To address this, three separate sessions were organized, one for each user group. The user groups chosen for this study were: high school students, parents with small kids, and retired people. The workshops took place in Tampere, Finland in the winter 2016-2017.

The research focused on two aspects: firstly, to gain insights on the different user groups' needs and expectations for the digital traveling services. This was done in order to understand how the traveling experience could be enhanced by developing the existing services, and by adding new digital services to the public transportation. This was studied by analyzing the ideas that the participants generated in the ideation part together with the insights gathered from the group discussion. Second, we wanted to study how well the Context Cards support the effective ideation of digital traveling services with participants representing different user groups.

Figure 3: The simulation lab's 270° screens were utilized to augment the lab to resemble the bus

3.3.1 Workshop Context. Based on the participant feedback of the Idea generating workshops, the simulated environment was the most cost-efficient setting for the ideation. Thus, we decided to conduct the In-depth ideation workshops with Different User Groups in a simulated environment. However, this time we chose to use simulation laboratory with more immersion to the context than in the laboratory of the Idea generating workshop. The University of Tampere's lab with its 270° screens was utilized to provide the sessions with contextual inspiration of the bus setting (see Figure 3).

3.3.2 Workshop Process. The session consisted of short presentation of the day's agenda, goals for the day and briefs for the tasks. The actual workshop session was divided into two halves: first half was a group discussion focusing on relevant topics related to bus usage, and the second half focused on generating a suitable concept ideas for the bus context.

The topics of the group discussions were focusing on four areas: *Travel chains* – with questions such as "What kind of trips you usually make?", and "How do you plan your trips?"; *Changes* – with questions focusing on the bus stop environment and how people spend the waiting time; *Activities in the bus* – with questions focusing on social aspects of the traveling, participants' current activities in the bus and the limitations for those activities; and *Traveling experience* – with questions like "How would you describe your dream bus ride?" and "How would you describe the nightmare bus ride?". The discussion was voice recorded and filmed for later analysis.

After the discussion section the participants were divided into groups – pairs, or groups of three, depending on the number of workshop participants. The participants were given a task to ideate one service concept that would best serve their traveling needs and improve their travel experience. Time for the ideation was reserved 35 minutes. After the ideation section the teams got to present their ideas for others. This was done in informal manner so that the participants got to have discussion around the ideas.

3.3.3. Participants. The sessions had 3-6 participants representing the chosen user groups. The group of *high school students* consisted of six participants (three males and three females), with an average age of 16. The main reasons to travel by bus were: Traveling to school (5/6 participants) and Free time travel (1/6 participants). 5/6 participants used buses at least 4 days a week, and one less than once a week. The group of *parents with small kids* consisted of three participants (one male and two females), with an average age of 36. The main reasons to travel with bus were: Traveling to work (3/3 participants), Traveling to school (1/3 participants) and Errands or shopping (1/3 participants). One participant used bus transportation at least four days a week, and two 2-3 days a week. The group of *retired people* consisted of five participants (two males and three females), with an average age of 65. The main reasons to travel were: Errands and shopping (6/6 participants) and Free time travel (3/6 participants). One participant was traveling by bus at least four days a week, two participants 2-3 days a week, and two participants one day a week.

Two researchers were presented in the workshops. One researcher had the role of the main facilitator whereas the other one was supporting in the background. However, both researchers took part in the facilitation of the group discussion and supported the teams with the ideation task. Help was provided if the discussion got stuck or the participants had difficulties with the task.

3.3.4 Context Cards as Stimulus Materials. Findings of the earlier study phases (preliminary interviews and Idea generating workshops) were utilized to define the appropriate materials for the sessions. Based on the participants' feedback of the materials and the card usage analysis of the earlier Idea generating workshops, we chose to reduce the amount of the cards to seven – focusing on only the context-specific themes – the findings from the prior interviews [9]. We decided to reduce the number of cards also in order to gain more specific feedback of the context-specific cards. Also, the previous study phase revealed that the context-specific themes were much more used in the ideation tasks than the ones derived from PLEX categories.

To help with the ideation and documenting the ideas a documentation sheet was designed especially for these sessions. Unlike in the earlier Idea generating workshops, this time we wanted the participants to generate only one service idea and describe its functionalities in a detail level. Thus, the documentation sheet was divided into six sections. The sections were: *Description of the idea* – What kind of service or application it is? *How does it work* –How would you use the service and in which situations? *Added value* – What makes you want to use the service? How does using the service improve your travel experience? *Main features of the service or application; How does the idea work on different devices?* (two examples were provided: mobile phone and public screen); and *How does the idea support social communication?*

Participants were asked to give a name for their service or application and mark on the documentation sheet which Context Cards they utilized for the idea. The participants were also given change to draw how the service idea would look like. Templates of mobile phones and public screens were provided. However, this task was optional and not everyone had the time or willingness to do so.

3.3.5 Data Collection and Analysis. The sessions were voice recorded and filmed. We also transcribed and analyzed the documentation sheets in which the participants documented their ideas. To understand the impact of the Context Cards and the simulation lab's contextuality to participants' ability to ideate, we collected feedback from the participants.

3.3.6 Findings Regarding the Context Card Usage. The card usage on these workshops was much more minimal than in the earlier Idea generating workshops. This can be explained by the fact that in the Idea generating workshops the goal was to come up with many diverging ideas, whereas in the In-depth ideation workshops with different user groups the purpose was to focus only on one idea.

The cards utilized in the five service ideas were: #2 Informative communication (by 2/5 teams), #3 Entertaining activities (by 4/5 teams), #4 Atmosphere of relaxation (by 3/5 teams), and #5 Subtle opportunities for social interaction (by 3/5 teams). When asked in the feedback form which of the cards were most relevant in their opinion, the participants answers were in line with the card usage. The cards that were found least relevant were #7 Getting to know the personality of the driver (by 5/14 participants), #6 Luxurious and premium experience (by 4/14 participants) and #3 Entertaining activities (2/14 participants). Big differences were found between the three user groups – where five out of six high school students did not see the value of getting to know the driver, the retired people found the card most relevant. Also, while the high school students valued the entertaining activities and atmosphere of relaxation, the retired group did not consider these aspects that important. Furthermore, all participants of the parents with small kids group stated that the most important cards were #1 Making the ecological values of electric bus visible, and #2 Informative communication. In all workshops, the overall feedback of the Context Cards was very positive.

3.4 Evaluating Context Cards with HCI Experts

The fourth phase of the study was to evaluate the usefulness and expressive power of the Context Cards. Thus, we organized a session with seven HCI experts with extensive and diverse experience from the HCI field. Five male and two female researchers with an average age of 36,0 years, and 7,7 years of experience in the field participated to the session. For the workshop the participants were divided into three groups: two pairs and a team of three.

The session consisted of three parts: the first part focused on explaining the background of the Context Cards and how

they were utilized in the co-design sessions (Idea generating workshops and In-depth ideation workshops with different user groups). The second part consisted of two short (á 15min) ideation tasks where the participants were divided into teams to test the Context Cards. The task in the first round was – with the help of the cards – come up with as many new bus related service ideas as possible. The ideas were written on post-it notes. The second round was about focusing on one or more ideas in more detail. For this, the HCI experts were given the same documentation template as was utilized in the In-depth ideation workshops. The time for ideation was short, but considering the participants extensive experience of ideation together with a familiar topic of public transportation, 30 minutes was seen as long-enough time to get familiar with the Context Cards. The final part was about evaluating the cards. Also, the evaluation was done in two rounds: first, we spent 15 minutes discussing the experience of using the cards and what could be improved. The second part was done individually by filling in a feedback form similar to the ones utilized in the Idea generating workshops, and In-depth ideation with different user groups workshops. The evaluation part of the session was voice recorded. The documentation sheets were transcribed and analyzed, and feedback was collected from the participants.

3.4.1 Findings. The HCI experts stated that cards were really nice in general and that they were useful in the ideation. They all agreed that they fit to the context and that the themes reflect well the experience of bus traveling and public transportation. However, there were some questions and notions that were brought up regarding the use of the cards in different types of workshops and in different phases of the design process. These notions were:

How to use the cards – the experts noted that the card deck enables several different ways to use the cards and thus, some instructions could be provided. In the evaluation session, no instructions were given on how the cards should be used, since we wanted to observe the way the experts use them. During the ideation one team chose to go through the cards one-by-one, whereas the other two groups laid the cards on the table so that all the cards were visible. One team placed the cards in a row and the other group spread them randomly on the table. Several experts agreed that by using only one of the Context Cards, the ideas were quite general and dull. However, when combining cards, it was easy to come up with ideas that were diverse and novel.

How the cards fit into the process – The participants noted that the cards support only ideation activities. Questions were asked on what happens in the next steps of the co-design process after ideation? How one could support for instance the evaluation of service concepts with the Context Cards or could the cards be used to determine which ideas to take further.

Possibilities to combine the cards with other tools – The experts were wondering how the cards with general themes could provide surprising inspiration for the co-design participants. The experts agreed that the Context Cards could be combined with other existing card-based tools, such as card decks focusing on technology or different user groups.

In summary, the HCI experts evaluated the cards to deliver their purpose in a nice and visual way. The cards that the experts valued the most were #1 Making the ecological values of electric bus visible (by 3/7 participants), #2 Informative communication (by 4/7 participants), and #3 Entertaining activities (by 3/7 participants). The cards that were seen least important were #6 Luxurious and premium experience (by 3/7 participants) and #7 Getting to know the personality of the driver (by 2/7 participants). When asked if any themes were missing from the cards, economical thinking and commercial services were brought up.

4 FINAL VERSION OF THE CONTEXT CARDS

Based on the feedback collected during each of the four phases in this study, we iterated the Context Cards once more. The final version is a set of ten bus-specific ideation cards that can be used when ideating new service concepts for the context of public transportation. The cards can be used as a part of the initial ideation of the service design concepts, or for instance when evaluating existing service concepts. The tool works well in co-design sessions, providing the participants with bus context inspiration for the creative activities. There is no one correct way to use the cards and thus we encourage people to try them out and find the best ways to serve one's needs. The cards can be used – as explained in this paper – all at once, one by one, or combining 2-3 cards at a time. Different combinations produce interesting ideas that can become novel concepts when developed further. The final set of Context Cards (see Figure 4 for visual appearance of the cards) includes the following 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 (timetable, bus lines etc.), as well as, local surroundings and activities.

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

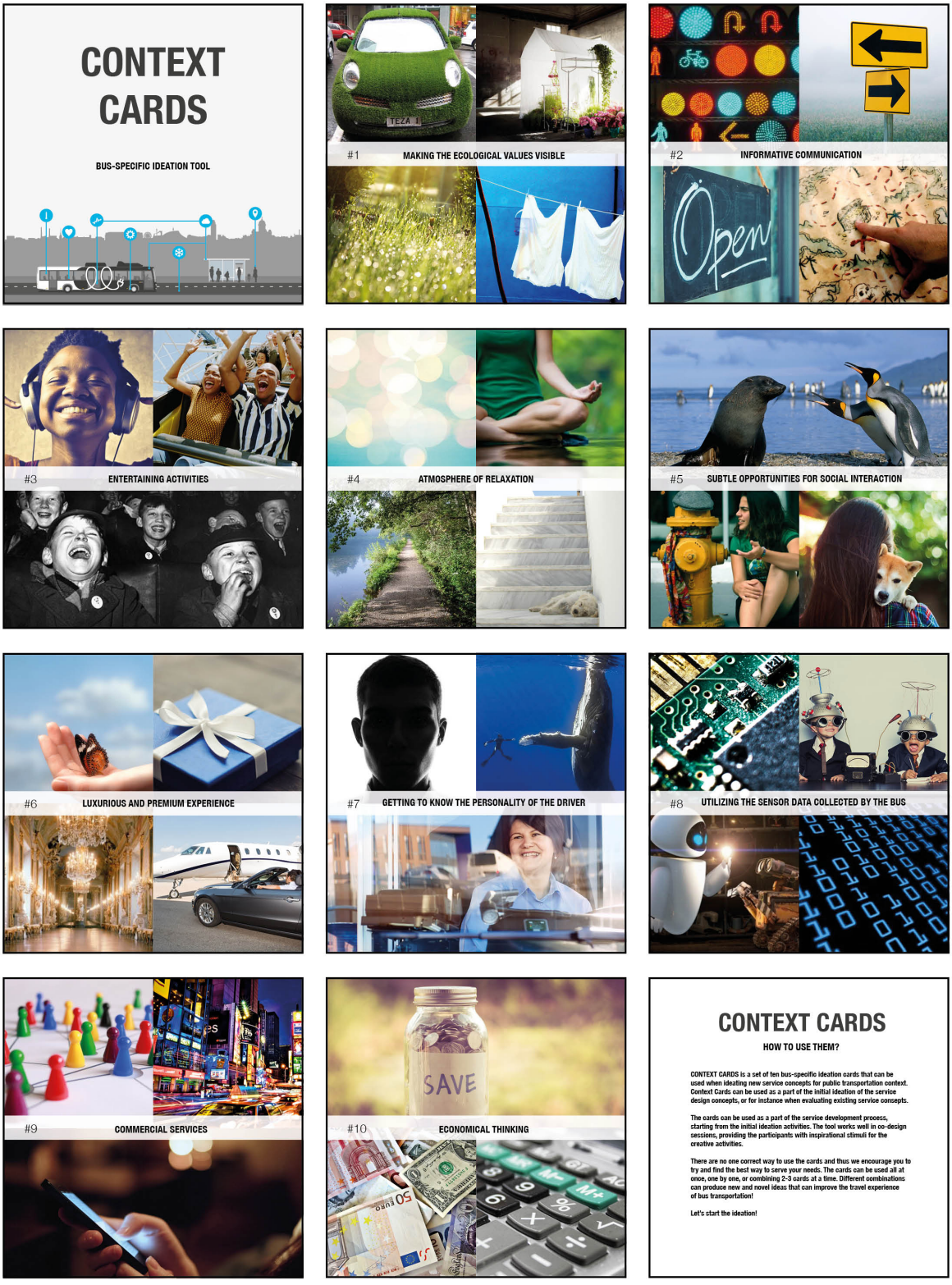

Figure 4:The final set of Context Cards including ten inspiration cards and a cover with instructions.

The bus and 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 passengers 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.

5 DISCUSSION

We now discuss themes that emerged from our analysis of the study results. In this study, our aim was to develop a tool that would support the ideation activities of new digital services for the bus transportation context. The development process (see Figure 1) of the tool – Context Cards, was iterative, meaning that after utilizing the preliminary interview study findings in the first version of the cards, we evaluated and improved the cards every time for the next study phases. - During the development, the content of the card deck changed: the initial deck consisted of 15 cards – including some themes from PLEX categories. To the next phase of the study, we reduced the deck to consist only the context-specific themes. The final version of the Context Cards consists of ten cards, focusing on the context-specific teams, but with two new cards that emerged from the evaluation session with HCI experts.

The four-phase study provided us with deep insights of bus transport and the needs different types of passengers have. The contribution of this work is also in the card tool development, and thus the process could also be utilized in other contexts. The length of the process might vary – the four phases might be too much or too little depending on the amount of knowledge and understanding of the context and its specific elements. Similar context specific cards could be developed for any context with specific characteristics, for instance healthcare centres or other transportation related environments.

Like Halskov and Dalsgård [7], our aim was also to develop a tool that would be simple, flexible and informal, in a sense that it could be utilized in varying ways to support the ideation. The Context Cards fulfilled our need to communicate the contextual findings of the primary interviews for the following co-design phases (Idea generating workshops and In-depth ideation workshops with different user groups) in order to support non-designers in the ideation. Since people often tend to come up with designers in the ideation. Since people often tend to come up with the most obvious ideas at the start of the ideation [7], it was essential for the sake of the four-phase study to provide material that could enable the participants to pass that phase of obvious ideas quickly and start exploring more creative ideas. The Context Cards also helped us to map out different user groups' needs regarding new services. Even though this study lacks strong quantitative validation of the results, we can still state that the three different user groups valued and prioritized different Context Cards based on their own values and needs.

Our overall evaluation of the Context Cards in the three phases of workshops (Idea generating workshops, In-depth ideation workshops with different user groups, and Evaluation workshop with HCI experts), together with the participants' feedback of the card tool is positive. The Context Cards stimulated creative ideation process and thus supported the participants' ability to ideate. When the participants of all workshops were asked if the materials supported the ideation, they gave a high score of 6,3 (1-not at all, 7-very much). Only eight out of 38 participants (seven in the Idea generating workshops and one in the In-depth ideation workshops with different user groups) had previous experience of similar kind of ideation sessions, and thus we can consider Context Cards as a successful tool in co-design ideation activities. The value of context-specific cards is thus evident, even though a new set of cards must be designed for each environment. What comes to the design of the cards and their content – we did not want to provide too much stimuli on new technologies because we wanted the service ideas be experience-focused, not technologically centred. However, as one of the HCI experts suggested, the cards can be combined with other design tools, for instance other card decks. Suitable cards could be the Technology card category from the *Inspiration Cards* [7], or for instance PLEX Cards [13].

The qualitative characteristic of the workshops provides direction for future studies. In our future work, we will continue the studies with other user groups. We will also study how the Context Cards can be utilized in the later phases of the new service development, such as when testing or evaluating ideas.

6 CONCLUSION

In this paper, we presented the development process of Context Cards – a bus-specific card-based design tool. The study provided understanding for context-specific ideation materials that can inspire the participants to generate ideas in co-design tasks. The findings of the Context Cards confirm that inspiration cards can enhance the collaborative workshop activities and help participants to come up with diverse ideas.

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