Experience Maps for Mobility

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Abstract. Intermodal mobility services are enabled by the complex orchestrations of different service providers and resources. Looking at users, service providers aim to offer users a great holistic experience across the entire journey. For designing the holistic mobility experience, methods and tools must be provided that address the emerging challenges. This article examines the method *experience map* to apply it to the field of mobility. The goal is to create assistance for the design activities: Understanding existing experience, exploring service ideas and communicating service concepts. Based on a best practice analysis, the article investigates the structure of currently used *experience maps*. Building on these results, a two-stage expert study is conducted in order to provide a framework for the creation and analysis of a *mobility experience map*. Finally, the article discusses the implications for the analysis of the holistic experience using the *mobility experience map*.

Keywords: Experience map · Mobility experience · Service design

1 Introduction

Thinking and offering services in the terms of systems generate a new competitive advantage, this is how Kalbach defines the yardstick for future services [1]. The mobility sector is also facing up to this challenge. Mobility providers cooperate with each other to provide customers a seamless intermodal travel chain. In contrast to traditional services, users can individually determine their journey across multiple means of transport and thus the user experience arises over the entire travel, from travel planning to arrival at the destination. In order to systematically design this holistic experience, the concept of the mobility experience was introduced. The mobility experience covers all the passenger's perceptions and responses resulting from any direct or indirect contact and anticipated contact with the service providers along the journey [2].

For designing new mobility services, methods and tools are required that can describe and visualise the holistic nature of the mobility experience in order to understand the design space, make design decisions and assess their impact in advance. For example, it is crucial to design each touchpoint, without losing sight of the user's overall experience [3]. Yet despite the recognition of the importance, there are hardly any scientific discussions on this subject [3], especially in mobility sector. By contrast, in design practice the method *experience mapping* is partly used to face these challenges. Building on findings from practical work, the present research is investigating

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whether the mobility experience of users can be conceptually expressed in the form of an *experience map*. In doing so, the investigation is guided by the research question: How can the mobility experience be described and visualized in a generic way in order to build a framework for a *mobility experience map*?

Answering the issue, this article discusses at the beginning different approaches for *experience mapping* in the theoretical basics. Afterwards, the study identifies the essential elements and interrelations that constitute the mobility experience and thus builds the framework for the experience visualisation in the form of an *experience map*. Finally, the implications for the analysis of the holistic mobility experience and the specific limitations of the presented framework will be discussed.

2 Background on Experience Mapping

The literature in service science and user-centered design historically has not considered *experience maps* as a separate research topic. However, efforts have already been made with other methods to illustrate the experience of users. All methods visualise the experience to support the designers in their design activities: Understanding experience, exploring the experience of new design ideas and communicating users' experience. The methods provide different insights, depending on the described factors influencing the user's experience and the described responses of a user. The influencing factors show which elements affect the experience during a user journey. The latter shows physical and psychological responses of users to the provided services. In order to distinguish the *experience map* from the other methods, different approaches are discussed with each other.

The *service blueprint* is an applied process diagram that subdivides the service delivery process from the customer's perspective [e.g. 4]. The process covers the physical activities of a customer that lead to interactions with the service provider. The *mental model diagram*, on the other hand, provides deeper insights into a user's cognitive perspective. Young transferred the concept of mental models into simplified affinity diagrams of behaviours [cf. 5]. The goal is to contrast the behaviour of the users with the potential solutions of an organization. In contrast, the *empathy map* uses a more comprehensive approach to understand the user's behaviour. Therefore the *empathy map* integrates the elements what users think and feel, hear, see, say and do, as well as the pain and gain of the users [e.g. 6]. The method tries to uncover why users are functioning the way they are and investigates cognitive, affective, sensorial, and physical responses of a user. Thereby the focus is on the description of the responses, the influencing factors as well as the interactions with a service providers are not considered. This combination of the user responses and the influencing factors depicts the *customer journey map*. The customer journey involves all activities and events related to the delivery of a service from the customer's perspective [7]. But the displayed spectrum of the experience varies in the different *customer journey maps*. In summary, the goal of the *customer journey map* is to illustrate how customers behave across a journey, what they are feeling, and what their motivation and attitude is across that journey [7].

Building on these insights, recent definitions point out that "*experience maps* focus on a general human activity within a given domain" [1]. In contrast to the *customer journey map*, the *experience map* separates a user's experience from the concrete solutions of a provider [1]. In doing so, it illustrates the user's journey, in which a user interacts with a variety of different touchpoints and providers. Adding to the above, the *experience map* represents an archetypal user journey through a certain domain and considers all activities and events that are relevant to the user's experience. In order to give a comprehensive picture of the holistic experience, the *experience map* should contain the cognitive, affective, and physical responses of a user.

3 Research Design

In this research, the method *experience map* is investigated and adapted to the field of mobility. The aim is to develop a framework for the *mobility experience map* that enables the analysis and communication of holistic mobility experience. To achieve this goal, the research procedure is divided into four phases and is oriented on the design science research framework [8] (Table 1). In the phase I, a basic construct for the *mobility experience map* is determined. The subject of this investigation is the disclosure of a uniform structure for *experience maps*. In detail, it is examined which elements are used to describe the experience, by the authors of *experience maps*. For this purpose, 40 practical *experience maps* from the sector of entertainment, finance, healthcare, mobility, and retail are investigated. All used elements from the 40 practical examples are documented and then evaluated according to their frequency of use. Building on these results, the basic elements of a *mobility experience map* can be determined.

The phase II covers the evaluation of the developed construct. Ten experts are provided with the construct and use it to develop an *experience map* for mobility. In the following interviews, the experts assess the construct in terms of completeness, simplicity, elegance, understandability, and ease of use [cf. 8]. The results are then evaluated and combined in the model for a *mobility experience map* (Phase III).

Finally, the application and evaluation of the *mobility experience map* follow in two case studies (Phase IV). The case studies are carried out as part of two research projects by the *Federal Ministry of Education and Research* and *Federal Ministry of Transport and Digital Infrastructure* in Germany. Depending on the focus of the projects, a map for electric mobility and a map for public transport are developed. To validate the developed framework, the two experience maps are examined using the member checking method. Experts interviewed in Phase II assess the two *mobility experience maps* and the underlying model, giving their approval or rejection of the results. The *mobility experience maps* are evaluated in terms of their fidelity with real world phenomena, completeness, and level of detail [cf. 8].

Table 1. Research procedure

Phase I	Phase II
Objective: Identification of used elements in experience maps from different sectors and modelling of the construct **Method:** Best practice analysis and conceptual modelling **Criterion for analysis:** Frequency of the elements occurring **Study size:** 40 Experience maps **Sector considered:** Entertainment, finance, healthcare, mobility, and retail	**Objective:** Evaluation whether construct is suitable for the mobility sector **Method:** Expert interview **Evaluation criteria:** Completeness, simplicity, elegance, understandability, and ease of use **Study size:** Ten experts in mobility and user experience domain
Phase III	**Phase IV**
Objective: Definition of the framework for mobility experience maps **Method:** Conceptual modelling	**Objective:** Evaluation of the framework for mobility experience maps **Method:** Case study and member checking **Evaluation criteria:** Fidelity with real world phenomena, completeness, level of detail **Study size:** Two projects are reviewed by the experts

Research output - Construct

Research output - Model

Research activity - Build

Research activity - Evaluate

4 Results

As explained in the beginning, the main goal of this research is to provide a framework for an *experience map* that allows the designers to accurately describe and visualize the mobility experience of a user. The underlying structure of the framework consists of basic elements that describe the content of a *mobility experience map*. Furthermore, the interrelations within the *mobility experience map* are investigated in order to reveal general perspectives that can support the designers to understand the holistic experience and to carry out a systematic analysis and design.

4.1 Basic Elements of Mobility Experience Maps

Looking for an appropriate basic structure for the *mobility experience map*, the initial question arises: Which elements are necessary in an *experience map* in order to adequately represent the mobility experience? The search for the basic structure of the *mobility experience map* is accompanied by two contradictory objectives. The experience map intends to both provide the designers with a comprehensive understanding of the mobility experience, and at the same time to ensure that the experience map is

Table 2. Comparison of experience maps from practice

	Elements of experience maps	Context of use	Guiding principles for providers	Influencing factors on user experience	Key moments for user experience	Provider activities	Provider aims	Provider description	Provider opportunities	Provider strengths	Scenarios	Statistical data on usage behaviour	Timeline	Touchpoints	Usage process	User activities	User aims	User barriers	User description	User needs	User emotions	User decision point in usage process	User expectations	User experience	User thinking
Number of elements used in all experience maps		1	4	5	6	4	3	1	20	2	13	6	4	31	40	33	8	4	23	6	32	4	4	5	23
Experience maps of the entertainment sector																									
1	Playing online games	○	●	○	○	●	○	○	○	○	○	○	○	○	●	●	○	○	○	○	●	○	○	●	●
2	Playing online games	○	○	○	○	●	○	○	●	○	●	○	○	●	●	●	○	○	●	○	○	○	○	○	●
3	Playing social online games	○	○	○	●	○	○	○	○	○	○	○	○	●	●	●	○	○	●	○	●	○	○	○	●
4	Visiting festivals	○	○	○	○	○	○	○	●	○	○	○	●	●	●	●	●	○	●	○	●	○	○	○	○
5	Visiting museums	○	○	○	○	○	○	○	●	○	○	○	○	●	●	○	○	○	○	○	●	○	○	○	○
6	Visiting museums	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○	○	○	●
7	Visiting museums	○	○	○	○	○	○	○	●	○	○	○	○	●	●	●	○	○	○	●	●	○	○	○	●
8	Visiting restaurants	○	○	●	○	○	○	○	○	○	○	○	○	●	●	●	●	○	●	○	●	○	○	○	○
	Total	0	1	1	1	2	0	0	4	0	1	0	1	7	8	7	2	0	4	1	6	0	0	1	5
Experience maps of the finance sector																									
9	Applying for loans	○	○	○	●	○	○	○	●	○	○	○	○	●	●	●	○	●	●	○	○	●	○	○	○
10	Applying for loans	○	○	○	○	○	○	○	○	○	○	●	○	●	●	●	●	○	●	●	●	●	○	●	●
11	Applying for mortgages	○	○	○	○	●	○	○	●	○	○	○	○	●	●	●	○	○	●	○	●	○	○	○	●
12	Dealing with financial affairs	○	○	○	○	○	○	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○	○	○
13	Dealing with financial affairs	○	○	○	●	○	●	○	○	○	●	●	○	○	●	●	○	○	●	○	●	○	○	○	●
14	Dealing with loans	○	○	○	○	○	○	●	●	○	○	○	○	○	●	●	○	○	●	○	●	○	○	○	●
15	Registering and identifying for online banking	○	○	●	○	○	○	○	●	○	●	○	○	●	●	●	○	●	●	○	●	○	●	○	○
16	Using internet banking	○	○	○	○	○	●	○	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	●
	Total	0	0	1	2	1	2	1	4	0	2	2	0	6	8	7	1	2	6	1	7	2	1	1	5
Experience maps of the healthcare sector																									
17	Consuming healthy and organic food	○	○	●	○	○	○	○	○	○	○	○	○	●	●	●	○	○	●	○	●	○	○	○	●
18	Consuming healthy and sustainable food	○	●	○	○	○	○	○	●	●	●	○	○	●	●	●	○	●	○	○	○	○	○	○	●
19	Dealing with cancerous diseases	○	○	○	○	○	○	○	●	○	●	●	○	○	●	●	○	○	●	●	●	●	○	○	●
20	Dealing with cancerous diseases	○	○	●	○	○	○	○	●	○	●	○	○	●	●	○	○	○	●	○	●	○	○	●	●
21	Dealing with cholesterol diseases	●	○	○	●	○	○	○	○	○	●	○	●	●	●	●	●	○	●	○	○	○	○	○	○
22	Managing therapy	○	●	○	○	○	○	○	●	○	●	○	○	●	●	●	○	○	○	○	●	○	○	○	●
23	Seeking medical support	○	○	○	○	○	○	○	○	○	○	○	●	●	●	●	●	○	○	○	○	○	○	○	○
24	Selecting health insurance	○	○	○	○	○	○	○	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●	○
	Total	1	2	2	1	0	0	0	4	1	6	2	3	7	8	7	3	1	5	2	5	1	1	2	5
Experience maps of the mobility sector																									
25	Planning a journey	○	●	○	○	○	○	○	●	○	○	○	○	●	●	●	○	○	○	○	●	○	○	●	●
26	Planning and doing holiday trips	○	○	○	○	○	○	○	●	○	●	○	○	○	●	●	●	○	●	●	●	○	●	○	○
27	Planning and doing a trip by airplane	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	○	○	●	○	●	○	●	○	●
28	Planning and doing a trip by airplane	○	○	○	○	○	○	○	●	○	○	○	○	○	●	●	○	○	●	○	●	○	○	○	○
29	Planning and doing a trip by train	○	○	○	●	○	○	○	○	○	○	○	○	○	●	○	○	○	●	○	●	○	○	○	○
30	Using autonomous vehicles	○	○	○	○	○	○	○	●	○	●	○	○	●	●	●	○	○	●	○	○	○	○	○	●
31	Using breakdown services	○	○	●	○	○	○	○	●	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	●
32	Using breakdown services	○	○	○	○	○	○	○	●	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	●
	Total	0	1	1	1	0	0	0	7	0	2	0	0	4	8	7	1	0	5	1	7	0	2	1	5
Experience maps of the retail sector																									
33	Ordering grocery online	○	○	○	○	●	●	○	○	○	○	●	○	●	●	●	●	○	○	○	●	○	○	○	○
34	Ordering grocery online	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	●
35	Purchase decision-making process	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	○
36	Purchase decision for mobile telecommunications	○	○	○	○	○	○	○	○	○	●	○	○	●	●	○	○	●	●	●	●	○	○	○	○
37	Purchase decision for telecommunications	○	○	○	○	○	○	○	●	○	○	○	○	○	●	○	○	○	●	○	●	○	○	○	●
38	Purchase decision for telecommunications	○	○	○	●	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	●	●	○	○	●
39	Using vouchers	○	○	○	○	○	○	○	○	●	●	●	○	●	●	○	○	○	●	○	●	○	○	○	○
40	Visiting shopping centres	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○	○	○	○
	Total	0	0	0	1	1	1	0	1	1	2	2	0	7	8	5	1	1	3	1	7	1	0	0	3

easy to use. Therefore, a trade-off must be sought between the completeness and simplicity of a *mobility experience map*.

Due to the lack of scientific discussions and the limited practical use of *experience maps* in the field of mobility, a step-by-step approach is conducted to answer this question. The best practice analysis conducted in Phase I examines 40 *experience map* examples covering the sectors of entertainment, finance, healthcare, mobility, and retail. As the result, the synthesis reveals that seven elements are used most often in an *experience map*: Descriptive user model, provider opportunities, touchpoints, usage process, user activities, user emotions, and user thinking (Table 2).

However, the comparison of the results of the best practice analysis (Phase I) with the results of the expert study (Phase II) shows that the elements of an *experience map* used in practice must be adapted to meet the characteristics of the mobility sector. The experts express the need to extend the *mobility experience map* by the element context. According to experts, context influences the effectiveness and efficiency of an executed user activity. In addition, the perception of a mobility service is also influenced by the environment (so-called service scape) in which the usage process takes place. The element context is particularly relevant for the area of public mobility services. For example, a long queue at the ticket machine or insufficiently air-conditioned vehicles can have a negative impact on the experience of a passenger. But also in the case of individual transport, the context, such as traffic density or road conditions, influences a user's mobility experience.

According to the experts, there is a need for further changes with regard to the element provider opportunities. The opportunities illustrate how providers can influence and improve the user experience. The experts are of the opinion that provider opportunities should not be part of a *mobility experience map*. This element does not

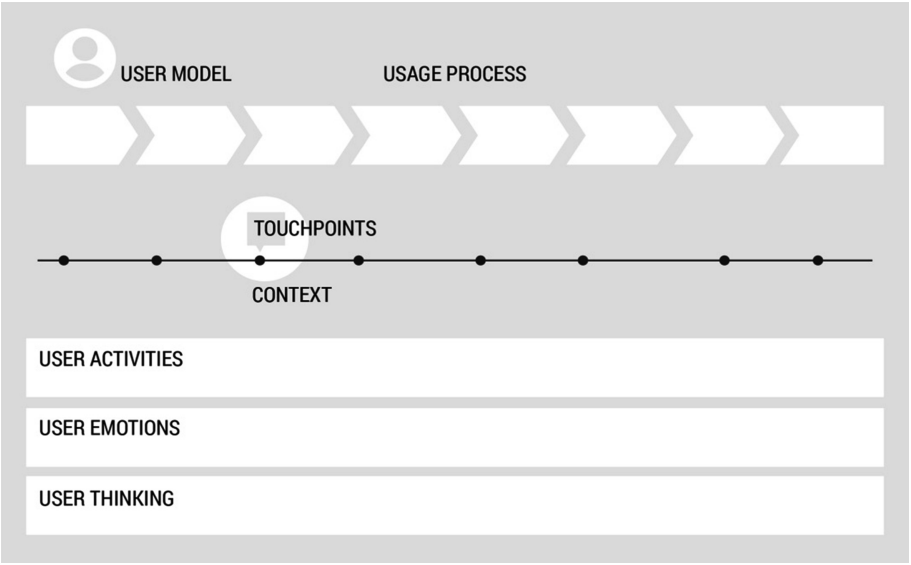

Fig. 1. Basic elements of a mobility experience map

provide any further information about the users and their behaviour. The experts see the provider opportunities as a further analysis that can be carried out on the basis of the *mobility experience map*. The results of the analysis have a special relevance in deciding and prioritizing future measures.

In summary, the studies carried out (Phase I + II) reveal that the mobility experience can best be described using seven basic elements (Fig. 1) (Table 3).

Table 3. Description of the basic elements of a mobility experience map

Element	Description
Usage process and its phases	A usage process is any purposeful activity or group of activities that result in an outcome [cf. 9]. In general the usage process of services follows a tripartite division, the pre-service phase (getting in touch), the actual usage phase, and the post-service phase [cf. 10]. By dividing the usage process further into domain related phases, each phase is implicitly assigned a goal which the users are supposed to achieve For the mobility sector, this division can be further concretized by archetypal process independent of the means of transport: Planning a journey – Starting a journey – Entering a stopping point – Boarding a means of transport – Travelling on means of transport – Alighting a means of transport – Leaving a stopping point – Arriving at destination. (Stopping point corresponds e.g. to car park or bus stop.)
Descriptive user model	User descriptions contain stereotypical users and embody their motivations, expectations, attitudes, and skills that are relevant to the use of the services [cf. 11] For the mobility sector, the experts emphasise the enrichment of the mobility experience map with a user model. The described user type acts as a sort of filter and concretizes the findings of a mobility experience map. In order to divide the users into different user types, the criteria like the choice of means of transport and the availability of the means of transport are used, for example [cf. 12]
User activities	The user activities contain all the actions that users actually perform to achieve a goal during the mobility service [cf. 13]
User emotions	User emotions generally involve the physiological response of the brain and body to threats and opportunities [15]. Emotions have a prominent cause, occur and decrease rapidly and thus are relatively intense and clear cognitive contents [15] (e.g. Anger over train failure)
User thinking	User thinking indicates which actions a user thinks through before deciding to execute them For the mobility sector, user thinking provide insights into a user's mental model what is defined as a rich and elaborate structure, reflecting the user's understanding of what a mobility service contains, how it works, and why it works that way [cf. 14]

(*continued*)

Table 3. (*continued*)

Element	Description
Touchpoints	A touchpoint is defined as any possible contact point between users and providers. These interactions take place human-human, and human-machine, but also occur indirectly via third parties, such as reviews from other users [cf. 10] For the mobility sector, the touchpoints are characterised by the means of transport used. For public transport, the mobile passenger information application or the timetable at the bus stop can be mentioned as examples
Context	The term of context can be used to characterize the situation of an interaction between users and service providers In the sector of mobility, touchpoints are closely interwoven with the context, which shows to what extent a prevailing situation influences the perception and interaction of the users. In order to precisely identify and analyse these situational influences, the context for mobility can be defined in five categories: Spatial, temporal, environmental, social, and informational context [16]

4.2 Three Perspectives for Understanding Mobility Experience Maps

The perspectives serve as an instrument for the analysis of a *mobility experience map*. The goal is to illustrate the interrelations within the *experience map* for designers in order to increase their understanding of the mobility experience. These perspectives are the result of the investigations in the phases II + IV. In the discussions with the experts, the interrelations within a *mobility experience map* could be extracted and subsequently generalized in the terms of the three perspectives (Fig. 2). The perspectives *sequence* and *interaction-response* reveal findings on the internal structure of the *experience map*. Whereas the perspective *experience cycle* describes how the users perceive a service and shows how the mobility experience occurs and alters.

Sequence Perspective (Chronological Order – Workload – Rhythm). Mobility services are dynamic processes that take place over a certain period of time [cf. 10] and therefore the chronological order is crucial for the understanding of mobility experience. This chronological order arranges the elements of the mobility experience in terms of content (horizontal axis) and indicates which sequence of the usage process appears plausible to the user. In addition to that, the chronological order also makes it possible to divide the usage process into individual phases. In this way, the single phases, such as planning a journey, can be considered separately, which allows a detailed analysis of the mobility experience.

This sequence of the individual phases is usually depicted in the *experience map* as a linear process. Contrary to this linear and at the same time seemingly ideal-typical process, experts estimate that in reality the use of a mobility service is often not linear. The planning of a journey is usually cited as an example. Passengers of public transport services perform identical activities several times in order to compare different mobility providers and their travel connections. Due to the non-linear usage process, the

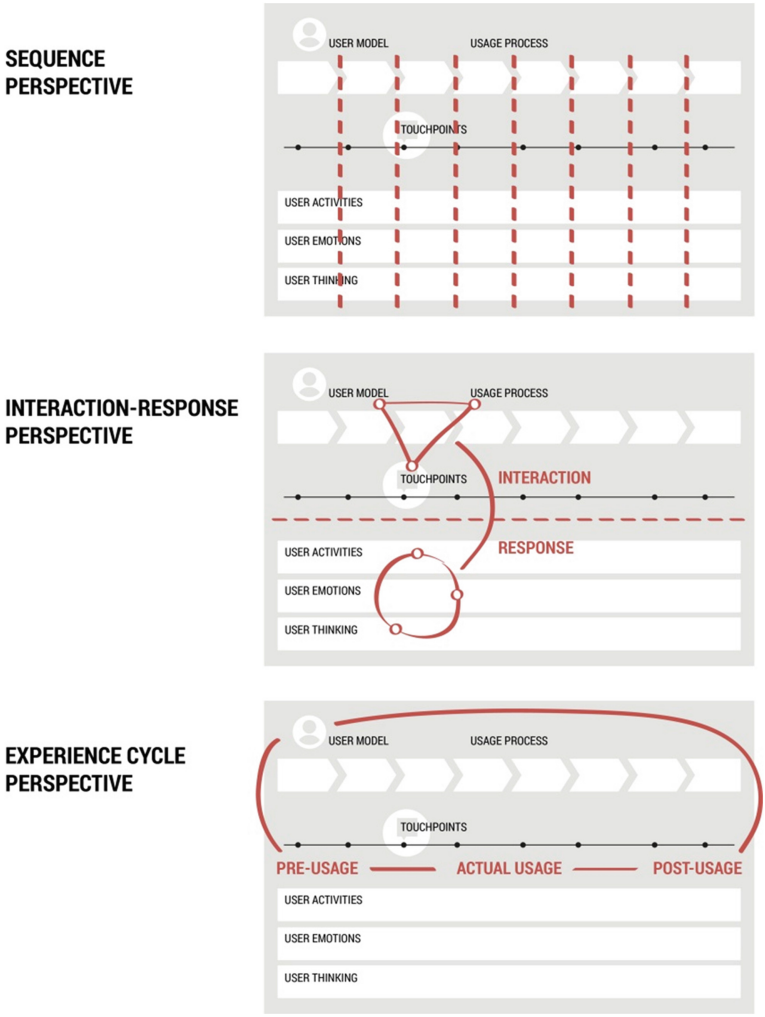

Fig. 2. Three perspectives for understanding mobility experience maps

workload for the users increases. This workload is reflected in a large number of cognitive and physical activities for the users and possibly through increased resource input. Both can influence the mobility experience.

Analog to the workload in the usage process, the rhythm of a mobility service also becomes visible when the touchpoints in a *mobility experience map* are related to each other. The rhythm shows the user involvement per period in usage process. A decisive factor for mobility experience is thereby the intensity of interaction, which can be described by the frequency and the extent of the interactions between users and mobility providers. According to the experts, the timing of the interaction also plays an important role. During the usage process, so-called key moments arise, in which the

user perceives the mobility service particularly positively or negatively. The experts have cited, for example, changing trains or disruptions in the public transport as critical moments.

Interaction-Response Perspective. In the interviews with the experts, it was often discussed how an interaction at a touchpoint affects the mobility experience of a user. To reveal these effects, the *mobility experience map* can be divided vertically into two areas: Interaction area and response area. This contrast compares the relevant components for an interaction (upper part of the *experience map*) with the user's responses to an interaction (lower part). From the human-machine-interaction perspective, an interaction is characterized by the interplay of the three factors: Human – task – technique [17]. Transferred to the *mobility experience map*, an interaction can be described by the three basic elements: Descriptive user model – Goal of usage phase – Touchpoint. For the service providers, the goal is to design an optimal interplay of the three factors within every single interaction. So that, for example, even occasional users can easily find a suitable alternative travel connection with their mobile passenger information application in the event of a disruption in public transport.

In the lower part of an *experience map*, there arises the question of how users perceive the interplay between the three factors and how they response to it. If, for example, occasional users do not find current information about the disruption, they wonder (cognitive response) whether they are looking in the wrong place in the application. As a result, they quit the interaction (physical response) frustrated without having found the information (emotional response). The example shows that the analysis of the user's cognitive, emotional, and physical responses provides an understanding in which way the interaction has an impact on the mobility experience. In a *mobility experience map*, these responses are covered by the basic elements user emotions, user thinking, and the resulting user activities.

Experience Cycle Perspective. An *experience map* tends to focus on the depiction of the usage phase of an user journey. However, the usage phase is only one part of the user's experience perception and processing. Rather, the user's experience perception and processing can be interpreted as a cycle. In order to understand this experience cycle, it is necessary to consider not only the actual use of a mobility service, but also the assumptions and expectations prior to use as well as the reflection after the actual use [cf. 18]. In relation to the *mobility experience map*, it is therefore advisable to divide the process into the phases: *Pre-usage – Actual usage – Post-usage*.

The experience cycle closes when analysing how the mobility experience after the usage affects a user and may influence his or her expectations, beliefs, and future behaviour. In the context of the experience map, this means that the perceived and processed experience may lead to the reshaping of the user description created at the beginning. As a result, the user description in the *mobility experience map* is both the starting point and the end point of the experience cycle.

5 Discussion - Contributions to Designing for Mobility Experience

The *mobility experience map* enables the user-centered visualization of complex intermodal mobility services. Thus the visualization represents the mobility experience that is formed through interactions with multiple services from multiple organizations that go beyond the provider's offerings [cf. 19]. In doing so, the method helps to consider service concepts and touchpoints in the holistic context of the mobility experience and contribute a crucial support for design activities, such as understanding existing experience, exploring service ideas and communicating service concepts.

The *mobility experience map* contributes to a change in the way of thinking and thus promotes holistic design decisions. From now on, a design solution will not be evaluated on the basis of its performance at a single touchpoint, but on the basis of its contribution to the holistic mobility experience along the entire intermodal journey. In addition, the *experience map* can also serve as a source of inspiration and provide valuable insights for the identification of new service ideas and further developments. The experience map reveals during which phase of a journey barriers and problems arise for the user. At the same time, it also becomes apparent to what extent users are supported by the existing touchpoints, or whether these user barriers have not been addressed at all so far. This systematic decomposition based on the travel chain also helps to determine and prioritize user needs during requirements engineering for new services. Beyond the understanding and exploring of the mobility experience, the method also contributes to the communication. The method creates a common ground and understanding for the user's perspective in complex mobility systems in terms of a visual language. The visualization provides a rapid introduction to complex mobility systems so that different members of multidisciplinary teams can use the *experience map* to comprehend and communicate design issues in every stage of the development process.

In additional to the contributions to the design, the expert study also reveals the limitations of the framework. According to the experts, adapting the *mobility experience map* to the intended use can be beneficial. For example, when communicating with external stakeholders, information must be focused on the essentials. For this purpose, a kind of experience indicator could be introduced in the framework. The objective of these indicators is to describe the experience in a compressed form with the help of a certain scale.

When creating a *mobility experience map*, experts also see a challenge in how to show the insights in the visual layout. This question was not explicitly addressed in this study. In practice, the layouts vary widely. For the visualization of the user emotions, for example, the authors use bar charts, plane diagrams, and curve representations or descriptions of the experience through phrases. Further investigations are required to identify visual presentations that can highlight the essential features of the mobility experience and their interrelationships and de-emphasize less important details.

6 Conclusion

Creating a holistic mobility experience has been gaining increasing attention from mobility providers. However, there has been a dearth of adequate methods for analysing and communicating the holistic mobility experience.

Therefore, the article investigates the method of the *experience map* in order to use it in the field of mobility. In the best practice analysis conducted at the beginning, the article examines currently used *experience maps*. Based on these findings, the two-stage expert study reveals the basic elements of the *mobility experience map*. The expert study also shows which perspectives are suitable for analysing an experience map in order to increase the understanding of the holistic mobility experience. As the result of this research, the seven basic elements together with the three perspectives build a framework for *mobility experience maps*. Subsequently, the article discusses the implications for the analysis of the holistic experience and the limitations of the presented framework, highlighting those that are especially in need of further research.

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