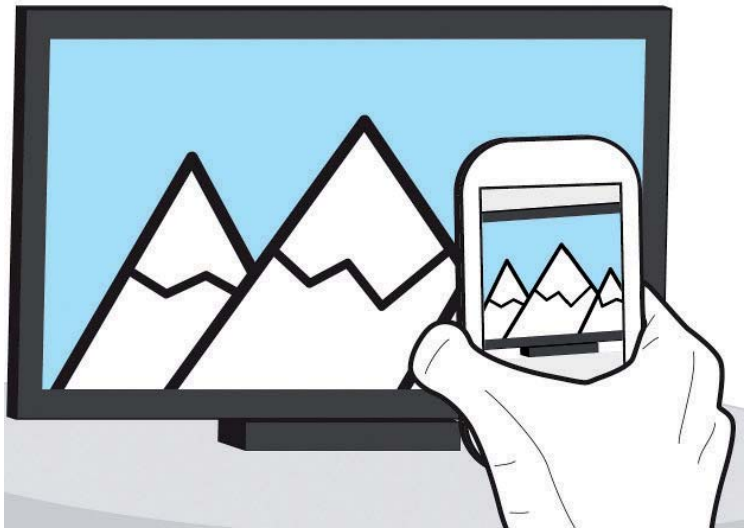
JYVÄSKYLÄ STUDIES IN COMPUTING
178

Markus Salo

Explaining Users' Critical Incidents of Physical Mobile Interactions



JYVÄSKYLÄN YLIOPISTO

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JYVÄSKYLÄ 2013

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ABSTRACT

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At times, users have critical incidents with information systems (IS). Critical incidents are single experiences, which the user considers outstandingly positive or negative. For example, a critical incident may exceed one's desires by unusual success and joy or tear one apart because of failures and frustration. Previous research has found critical incidents highly influential and powerful for customer relationships, and thus crucial for product and service providers. In the context of IS and mobile applications, researchers have studied thoroughly neither the process of critical incidents nor user behaviors after such incidents. For instance, there are no explanations as to why critical incidents occur in the first place and how the situational context influences users' post-experience behaviors. To address the identified gap in the research, this thesis investigates qualitatively and quantitatively several hundred descriptions of critical mobile incidents collected with the critical incident technique (CIT) from actual users of mobile applications. The focus lies particularly on applications that users employ to physically interact with surrounding real-world objects and places. The results attempt to extend current knowledge in the form of a new process model for mobile experiences (MEP), providing rich insights about each of the model's six elements: trigger, interaction, positive/negative perception, situational context, peak moments, and post-experience behaviors. One interesting finding is that users are less likely to engage in negative behaviors after negative critical incidents that take place outdoors or in vehicles than after indoor incidents. In the theoretical implications, it is argued that researchers should acknowledge six meaningful elements regarding critical IS-related incidents instead of studying just one or a limited set of elements. As practical implications, application providers and other industry stakeholders are encouraged to systematically analyze each element of the MEP model one by one, reflect the element and its insights with an application of their interest, and then take the necessary actions.

Keywords: critical incident, user behavior, user experience, information systems usage, mobile service, mobile application, physical mobile interactions

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I am indebted to my colleagues and the co-authors. We have shared numerous rich discussions especially with Panu Moilanen, Tiina Parkkonen, Markus Makkonen, Thomas Olsson, Arto Ojala, Ville Seppänen, Erkka Peitso, Teija Palonen, Jussi Ojanen, and Matthias Baldauf. I wish to pay special respect to the professors Airi Salminen, Pasi Tyrväinen, Jukka Heikkilä, Tuure Tuunanen, and Mikko Siponen for their solid support and ideas. I am also grateful to the reviewers, Professor Virpi Kristiina Tuunainen and Professor Hans van der Heijden, for their wise insights and evaluation of the thesis. It is an honor to have Professor Matti Rossi as the opponent. In addition, the coffee room people of our department and the lunch crew of the faculty merit a well earned thank you. Naturally, my warmest appreciation goes to my friends and family.

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I have learned so much but at the same time I feel *"it's just begun"*...

Jyväskylä, November 2013
Markus Salo

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I. Salo, M. 2013. Explaining Extreme Mobile Experiences. International Journal of Human-Computer Interaction. (In press, available online)

II. Salo, M. & Frank, L. 2013. User Behaviors After Critical Mobile Incidents: The Influence of Situational Context. (Submitted to Information Systems Journal)

III. Salo, M., Olsson, T., Makkonen, M., Hautamäki, A. & Frank, L. 2013. Consumer value of camera-based mobile interaction with the real world. Journal of Pervasive and Mobile Computing, 9(2), 258-268.

IV. Salo, M. 2013. Sources of Dissatisfaction: Mobile Interaction with the Real World and Other Mobile Internet Applications. In R.H. Sprague Jr. (Ed.), Proceedings of the 46th Hawaii International Conference on System Sciences (HICSS). IEEE Computer Society, 1113-1122.

V. Salo, M., Baldauf, M., Fröhlich, P. & Suette, S. 2013. Peak Moments of Physical Mobile Interaction Techniques. In Proceedings of the 19th Americas Conference on Information Systems (AMCIS).

VI. Salo, M., Olsson, T., Makkonen, M. & Frank, L. 2012. User Perspective on the Adoption of Mobile Augmented Reality Based Applications. In I. Lee (Ed.), Strategy, Adoption, and Competitive Advantage of Mobile Services in the Global Economy. United States: IGI Global, 165-188.

The first author did the majority of work regarding each article. With article II, the second author assisted in methodological issues and reporting. With article III, the co-authors assisted in collection of empirical evidence, interrater analysis, and overall guidance. With article V, the co-authors designed and implemented the studied mobile prototypes as well as collaborated in arranging the user study and collecting empirical evidence. With article VI, one co-author ran the statistical analysis as the other co-authors assisted in collection of empirical evidence and overall guidance.

1 INTRODUCTION

Researchers and practitioners in the field of information systems (IS) have continuously highlighted the importance of understanding IS usage and users' behavioral aspects (Straub & Del Giudice 2012). We have known for a long time that it is old-fashioned to think that engineers and designers should build IS without involving the users in the development processes. However, what the IS research community has debated is whether researchers should stress scientific rigor, practical relevance, or both in their craft (Benbasat & Zmud 1999; Lyytinen 1999; Robey & Markus 1998; Straub & Ang 2011). Traditionally, researchers have been advancing knowledge of usage aspects and user perceptions with rigor but rather parsimonious theories involving abstract and general constructs. However, such approaches have to deal with a number of challenges regarding the relevance and the practicality of the research results (Lee 2010). To complement abstract and general approaches, there has been a recent call for more relevant and accurate knowledge that could be better applied in the field of IS (Lyytinen 2013; Venkatesh, Thong & Xu 2012). That is also why IS researchers are currently encouraged to orient towards context-specific and in-depth approaches (Lyytinen 2013). One way to address this call is to examine users' actual experiences with particular IS products and services.

1.1 Background and research context

Single experiences of IS products and services are one of the building blocks of users' overall product and service perceptions. Critical incidents are defined here as single product and service experiences that stand out from ordinary experiences as *"unusually positive or negative"* (Edvardsson & Roos 2001, 253; Flanagan 1954). As an example of a positive critical incident, a mobile Internet

application[1] could enable a surprising discovery of a good, old friend living in the same neighborhood. A corresponding example of a negative critical incident could involve a failed stock trade and a notable loss of money because an application could not function properly.

Researchers have highlighted that studying critical incidents is important for both research and practice. There are at least three central arguments for the importance of the topic. First, critical incidents are highly influential and powerful (Flanagan 1954). For example, one extremely negative perception may overrule a set of ordinary positive experiences and cause discontinued use of a service or a product (Cenfetelli 2004). Second, critical incidents play a crucial role in shaping customer relationships and user perceptions of products, services, and their providers (Edvardsson & Strandvik 2000; Payne, Storbacka & Frow 2008). Third, by thorough examination of critical incidents, researchers have been able to maintain both rigor and relevance and to present both theoretical and practical implications for service design, management, and marketing (Bitner, Booms & Tetreault 1990; Edvardsson & Strandvik 2000; Serenko & Turel 2010).

In service research and the traditional service industry, critical incidents have been a popular research topic (for an overview, cf. Gremler 2004). With IS-related usage, studies have investigated critical incidents of self-service technologies (Meuter, Ostrom, Roundtree & Bitner 2000), websites (Sweeney & Lapp 2004), online shopping (Holloway & Beatty 2008), online transactions (Massad, Heckman & Crowston 2006), online travel services (Serenko & Stach 2009), email notifications and usage (Serenko 2006; Serenko & Turel 2010), and mobile services (Gummerus & Pihlström 2011).

These IS-related studies provide valuable insights on the antecedents of critical incidents, but they are missing the next steps: IS-related studies have not sufficiently explained the process around critical incidents nor investigated thoroughly users' post-experience behaviors. Typically, the key contribution of the prior studies involves developing a rather static categorization of sources affecting (dis)satisfaction, quality, or value with a variance-like approach. As we now know a thing or two about these aspects, researchers are able to extend this theoretical knowledge and answer questions regarding how and why critical incidents *"emerge, develop, grow, or terminate over time"* by implementing the mentality of process approach (Van de Ven 2007). More specifically, with a process approach it is possible to reveal why critical incidents take place, in which situational context they occur, what kind of interaction they involve, and how they affect users' post-experience behaviors. Theoretical explanations to these questions assist researchers and practitioners in IS design, management, and marketing. For example, knowledge of users' post-experience behaviors can be used to distinguish which critical incidents are the most crucial ones and demand managerial actions.

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[1] A mobile (Internet) application is defined as software installed in mobile or tablet devices (utilizing Internet connection). An application can be pre-installed or downloaded from an application marketplace such as the Apple App Store, Google Play, or Nokia Ovi Store. Mobile service, in turn, is a broader concept for all mobile functionalities delivered via mobile or tablet devices.

There are several reasons for choosing to study the context of mobile applications: there often are many alternative applications to which it is easy for users to switch (Zhou 2011); the mobile context involves unique characteristics compared to other IS contexts, since mobile applications are highly personal, have multiple use purposes, and function presumably anywhere anytime (Hong & Tam 2006); users behave differently with mobile applications than with other IS as they tend to be more spontaneous and require time criticality (Anckar & D'Incau 2002); the importance of mobile user behavior and commerce has been demonstrated by special issues in recognized journals (Kourouthanassis & Giaglis 2012; van der Heijden & Junglas 2006); and the huge growth of mobile use is anticipated to continue (Morgan Stanley Research 2011). This thesis concentrates particularly on physical mobile interactions (PMI), through which users can physically interact and form connections between their mobile devices and real-world objects or surroundings (Rukzio 2007). For instance, a user may read a product barcode with a mobile device to reach additional information about the product at hand. PMI techniques are introduced further in Section 2.5.5. Previously, research on PMI has focused on technical development of various prototypes and their respective user studies, but more research is needed on the actual and real use situations of the currently emerging application area.

In terms of practice, context-specific examination and rich descriptions of critical mobile incidents assist at least five groups of stakeholders: application providers, content providers, device manufacturers, mobile network operators, and users. Context-specific knowledge helps application and content providers access potential rewards by promoting positive experiences and reduce potential risks by avoiding negative experiences. Device manufacturers and mobile network operators, in turn, can learn many lessons from users' detailed experiences that indicate how mobile devices and networks are being used and implement these lessons into device and service design. Such managerial actions by the four industry stakeholder groups support users' desires in accessing user-friendly applications with which they will assumedly witness more positive and less negative experiences than earlier.

1.2 Objectives and scope

Given the importance of the topic and the context, this thesis aims to fill the identified research gap by explaining the process around single critical mobile incidents and providing context-specific knowledge on PMI. The focus lies on mobile Internet applications available for all users rather than organizational applications. The analysis falls upon the level of individual users. The specific research questions (RQs) are presented as follows:

- RQ 1: How and why do critical mobile incidents take place and proceed? *(addressed in article 1)*

- RQ 2: How and why do specific characteristics of the situational context influence different types of mobile users' post-experience behaviors? *(article 2)*
- RQ 3: What are the sources of positive critical incidents of PMI, and why? *(article 3)*
- RQ 4: What are the sources of negative critical incidents of PMI, and why? *(article 4)*
- RQ 5: What are the sources of users' peak moments with different PMI techniques? *(article 5)*
- RQ 6: What kinds of overall perceptions do users have on the strengths, the weaknesses, and the constructs affecting usage of PMI? *(article 6)*

To address these questions, this thesis sums up the content of six completed research articles. Figure 1 illustrates the positioning of the RQs and articles. RQs and articles 1–4 are attached to the level of single experiences and critical incidents as the main focus of this thesis. The fifth article contributes to RQ 5 by investigating detailed time frames during single experiences—peak moments. The sixth article answers RQ 6 by studying experiences, attitudes, and beliefs on an overall level.

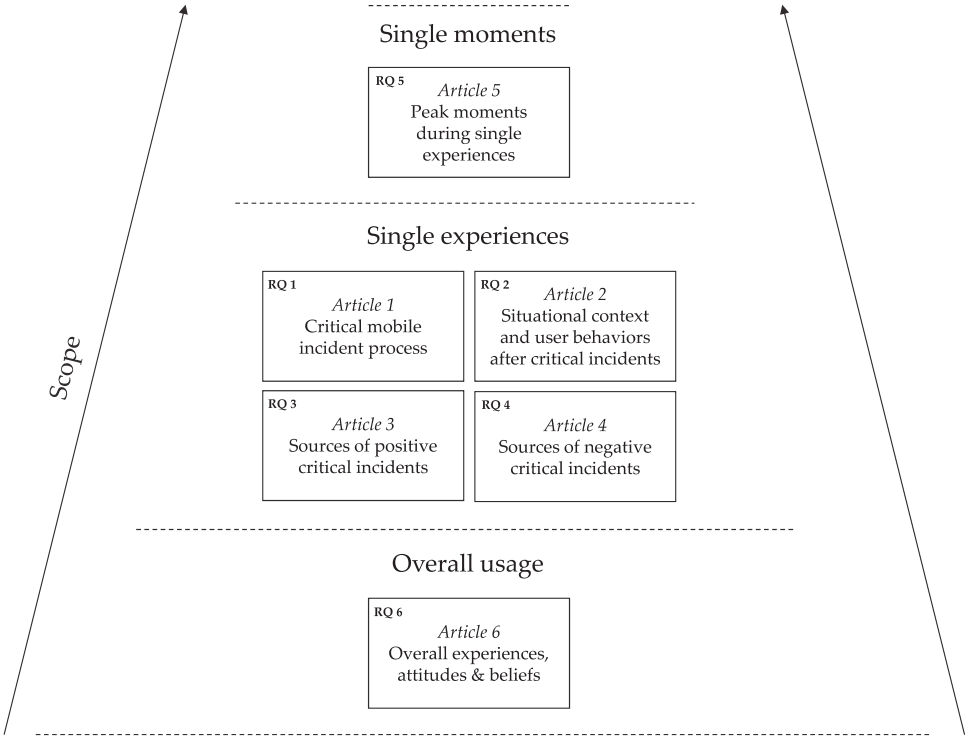

FIGURE 1 Understanding user perceptions of PMI

RQ 1 and article 1. To the author's best knowledge, there exists no comprehensive process theory or model for explaining critical IS or mobile incidents. Researchers have indeed emphasized the importance of critical IS-related incidents and explored users' immediate actions (Serenko & Turel 2010) and feelings (Serenko & Stach 2009). But, for instance, previous studies have not presented any explanations on why critical IS incidents occur in the first place. To extend the current knowledge and to understand different elements during critical incidents, it is needed to explain why and how critical mobile incidents take place and proceed.

RQ 2 and article 2. Other mobile studies have highlighted the importance of the situational context for mobile user behaviors and provided valuable findings, but they have been limited in either treating the situational context as only one abstract construct or considering only one type of user behavior. Specific answers to the research question assist both researchers and practitioners in distinguishing which critical incidents are more crucial than others and particularly need managerial actions. Therefore, the aim of the second research question is to extend this knowledge by uncovering and explaining the relationships between specific situational characteristics and different types of post-experience behaviors.

RQs 3 & 4 and articles 3 & 4. These research questions focus on explaining one particular element of the process: users' positive/negative perception. Many researchers have noted the asymmetry of positive and negative perceptions (Meuter et al. 2000; Oliver 1977; Vargo, Nagao, He & Morgan 2007). For example, some issues "*when present, discourage use, but when absent, make no difference*" (Cenfetelli 2004, 474). Hence, independent investigation of both positive and negative experiences is advisable.

There is a lack of rich descriptions and context-specific knowledge on the sources of critical PMI incidents. However, in IS and its reference disciplines, there are rather general and abstract theoretical explanations on the sources of positive and negative perceptions related to (dis)satisfaction, value, and quality. These theoretical frames can be applied to acquire detailed findings regarding critical incidents in the context of PMI. By articles 3 and 4, we investigate what are the specific sources of positive and negative critical incidents in the context of PMI, and why.

RQ 5 and article 5. Users constantly evaluate the service process by momentary positive and negative perceptions during single experiences (Johnston 1995). By investigating the detailed level of the most positive and negative moments, it is possible to assess the range of user's different perceptions and compare different PMI techniques. There is a set of prior comparison studies of PMI techniques, but they have not presented a comprehensive categorization for user perceptions nor included all currently available PMI techniques. In this thesis, investigation of users' peak moments aims to form a categorization for user perceptions, reveal context-specific findings on different types of PMI techniques, and open possibilities for comparing the techniques.

RQ 6 and article 6. Numerous researchers have examined users' overall perceptions on the constructs affecting usage intentions in the context of innovations and IS (Rogers 1995; Tornatzky & Klein 1982; Venkatesh, Morris, Davis & Davis 2003) as well as mobile applications and services (Hsu, Lu & Hsu 2007; Jayasingh & Eze 2009; Kaasinen 2005; Kowatsch & Maass 2010; Lopez-Nicolas, Molina-Castillo & Bouwman 2008; Mallat, Rossi, Tuunainen & Öörni 2008, 2009; van der Heijden, Ogertschnig & van der Gaast 2005; Yang 2005). As PMI represents a recent paradigm of more interactive applications that are often used on the move, the context of PMI is substantively different from other IS and mobile contexts. Therefore, it needs to be confirmed whether or not the existing knowledge on overall perceptions and usage intentions holds in the context of PMI.

The remainder of the thesis is structured as follows. The next section reviews related literature and summarizes the theoretical aspects of the thesis. The third chapter describes the research approach, methodology, and design. The fourth chapter contains the results of each article. Finally, the fifth chapter discusses the theoretical and practical implications, the limitations, and future research topics. The original articles are attached as appendices.

2 REVIEW AND THEORETICAL FOUNDATION

This chapter reviews relevant studies and presents the theoretical foundation of this thesis. First, the chapter discusses general research on IS usage and user experience. This is followed by a more specific analysis of studies that have investigated critical IS-related incidents. Finally, a process model for mobile experiences is proposed on the basis of the introduction of each process element.

2.1 Information systems usage

IS researchers have examined IS usage, adoption, and other related human behavior to a great extent. There is a stream of recognized theories with their illustrative models predicting which general constructs affect intentions to adopt, use, or continue using IS (Bhattacherjee 2001; Davis 1989; DeLone & McLean 1992; 2003; Moore & Benbasat 1991; Rogers 1995; Venkatesh et al. 2003). These theories—often originating from reference disciplines such as psychology and sociology—have managed to offer valuable knowledge about the importance of rather abstract and general constructs, such as usefulness, ease of use, and compatibility. However, measuring only the influence of such constructs on usage intentions does not open any black boxes (Benbasat & Barki 2007; Straub & Burton-Jones 2007). So, researchers have suggested that these theories could be further advanced by combining them (Venkatesh, Thong, Chan, Hu & Brown 2011) or highlighting the context in question (Venkatesh et al. 2012), the nature of particular IS (van der Heijden 2004), individual preferences and habits (Gefen 2004; Venkatesh et al. 2012), trust dimensions (Gefen, Karahanna & Straub 2003), and the asymmetry of positive and negative constructs (Cenfetelli & Schwarz 2011). As a result, researchers have extended the theories to predict, for example, the usage of consumer-oriented and hedonic IS (van der Heijden 2004; Venkatesh et al. 2012) and the asymmetric effect of negative constructs (Cenfetelli & Schwarz 2011). These extensions represent the first steps of the recent push towards *"theories that focus on a specific context and identify relevant predictors and*

mechanisms" because they are *"vital in providing a rich understanding of a focal phenomenon and to meaningfully extend theories"* (Venkatesh et al. 2012, 158).

Even though the upgraded and tweaked models tend to explain greater variance in IS usage, the major stream of IS usage research remains at a rather general and abstract level. Therefore, the push could be taken even further to a more specific and concrete level of rich description by explaining users' actual experiences with IS in a given context.[2] Some researchers have managed to do this as they have investigated, for instance, the use of email (Serenko & Turel 2010) and online transaction services (Massad et al. 2006). Such context-specific efforts are beneficial for increasing theoretical knowledge and improving practical IS management, because researchers have been able to maintain both *"rigor and relevance"* (Serenko & Turel 2010, 182) and to reach *"an insight into specific events"* as well as *"a deeper understanding of the complexities of conducting business on the Internet"* (Massad et al. 2006, 97). Yet, there still remains a lack of knowledge of understanding different elements of users' single experiences with IS and mobile applications.

2.2 User experience

As a sub-domain (or sister domain) of IS, human-computer interaction (HCI) has taken a step towards the context-specific and practical investigation of IS usage. Even though traditional HCI research has focused strongly on preventing usability problems and negative user perceptions, researchers have started to also take positive aspects into account (Hassenzahl & Tractinsky 2006). In addition to economic prospects of organizations offering IS-related products and services, approaches that also recognize positive aspects can contribute to the development of better products and services for humans as well as perceptions of efficiency and joy (Blythe, Overbeeke, Monk & Wright 2003). While IS usage research has traditionally been positively-oriented (Cenfetelli 2004) and HCI negatively-oriented (Hassenzahl & Tractinsky 2006), it seems advisable to study both positive and negative aspects of IS usage.

One both positively and negatively oriented approach is user experience. In short, user experience can be defined as the holistic combination of user perceptions on the instrumental, emotional, and experiential aspects of products and services within the context in question (Hassenzahl & Tractinsky 2006). Moving on from usability, one of the main characteristics of user experience is that it conjoins the traditional utilitarian and pragmatic usability aspects with enjoyment-related hedonic aspects (Battarbee & Koskinen 2005; Hassenzahl 2008; Jordan 2002). Another fundamental characteristic is the subjectivity of us-

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2 However, it must be noted that studying users' practical experiences and rather general prediction models are not mutually exclusive. For example, single experiences of users can be used to form a general model explaining the usage of IS. Or, general factors can be (but are rarely) applied to study specific and detailed aspects in a given context.

er experience (Battarbee & Koskinen 2005; Law, Roto, Hassenzahl, Vermeeren & Kort 2009). Therefore, user experience comprises the user, the characteristics of the system, and the context (Hassenzahl & Tractinsky 2006; Roto 2006).

Importantly, single product and service experiences should be distinguished from the overall user experience of a product or a service. According to Roto (2006), there is an iterative cycle between single experiences and the overall experience: single product or service experiences accumulate into the overall user experience, which affects perceptions concerning future single experiences, for example, by forming expectations. Hence, it is valuable to study more closely the actual core of user experience: users' single experiences.

2.3 Single experiences and critical incidents

A single experience *"can be articulated or named," "has a beginning and an end,"* and *"is schematized with a particular character in one's memory"* (Forlizzi & Battarbee 2004, 263). A critical incident is defined as a single experience, which a person perceives as *"outstandingly effective or ineffective"* (Flanagan 1954, 338) or *"unusually positive or negative"* (Edvardsson & Roos 2001, 253). A critical incident does not fit into one's personal zone of tolerance (Figure 2): it exceeds a desired level of performance in positive cases but does not reach an acceptable level of performance in negative cases (Johnston 1995; Odekerken-Schröder, Van Birgelen, Lemmink, De Ruyter & Wetzels 2000; Zeithaml & Bitner 2003). As critical incidents can reflect many types of extreme human experiences (e.g., organizational events) and outcomes (e.g., organizational change), the focus of this thesis is particularized on single product and service experiences leading to extremely satisfactory or dissatisfactory perceptions.

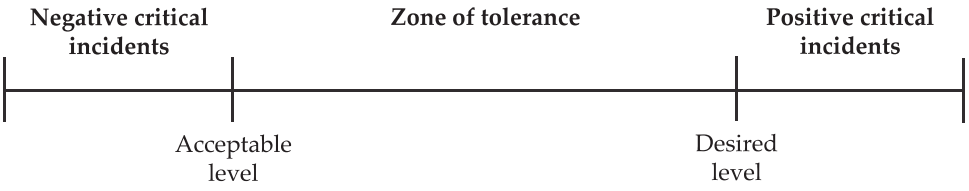

FIGURE 2 Critical incidents and zone of tolerance, based on Odekerken-Schröder et al. (2000) and Zeithaml and Bitner (2003)

2.4 Studies on critical IS-related incidents

There are some studies that have examined critical IS-related incidents. Webster and Watson (2002) encourage researchers to use inclusion criteria for reviewing relevant studies. To be included in this review, a research article was required to study critical incidents of IS products and services as single use experiences

or situations. Such research articles were then searched from journals and conference proceedings. To complement the search, two recruited students looked for articles with the particular inclusion criteria. Most of the prior studies do a good job of finding antecedents of positive and negative incidents regarding (dis)satisfaction, quality, or value. However, the previous studies are missing the next steps as they have not sufficiently addressed the process of how and why critical incidents take place and proceed, users' post-experience behaviors, and their relationships with situational context, as illustrated in Table 1.

TABLE 1 Studies on critical IS-related incidents

Study	Topic / context	Positive or negative	Explanation of:			Relevant findings
			The process	Post-experience behaviors	…and situational context	
Sweeney & Lapp (2004)	Quality of web-sites	Both	No	No	No	Ease of use, content, and process affect service quality.
Massad, Heckman & Crowston (2006)	(Dis)satisfaction with electronic services	Both	No	No	No	Some sources are more likely to satisfy than dissatisfy and vice versa.
Holloway & Beatty (2008)	(Dis)satisfaction with Internet shopping	Both	No	No	No	Sources of (dis)satisfaction have industry-specific differences.
Gummerus & Pihlström (2011)	Value of mobile services	Positive	No	No	No	Value comprises context value and in-use value.
Meuter, Ostrom, Roundtree & Bitner (2000)	(Dis)satisfaction with self-service technologies	Both	No	**Yes**	No	Different negative sources have different influence on post-experience behaviors.
Serenko & Turel (2010)	Critical online travel service incidents, word-of-mouth, and loyalty	Both	**Partial**	**Yes**	No	Context-specific findings on post-experience behaviors of email usage incidents.
Serenko (2006)	Description of critical email agent incidents	Both	**Partial**	**Yes**	No	Context-specific scenarios of email agent incidents.
Serenko & Stach (2009)	Description of critical online travel service incidents	Both	**Partial**	**Yes**	No	Context-specific paths of online travel service incidents.

Three of the articles focus on (dis)satisfaction, one on perceived value, one on quality, one on word-of-mouth and loyalty, and two articles investigate critical incidents per se. Sweeney and Lapp (2004) propose several subcategories of ease of use, content, and process affecting service quality perceptions on websites. Massad et al. (2006) show that with electronic services, some sources seem to have a greater effect on satisfaction than dissatisfaction, and vice versa. Holloway

and Beatty (2008) present that satisfaction and dissatisfaction drivers are not equivalent and have industry-specific differences. Gummerus and Pihlström (2011) underline the importance of the situational context with mobile services.

Meuter et al. (2000) have examined critical incidents of self-service technologies and the influence of (dis)satisfaction sources on complaints and other future behaviors. They conclude that service-design, process, and technology failures led to complaints more often than did technology-design or customer-driven failures. With future behaviors (consisting of purchase intentions and word-of-mouth recommendations compiled into one construct), they found that users were more likely to engage in positive behaviors after negative incidents caused by technology or customer-driven failures than after process, service-design, and technology-design failures. However, they found no differences within source categories for positive experiences. Serenko (2006) and Serenko and Turel (2010) have studied post-experience behaviors in the context of email usage and constructed scenarios. According to the scenarios, for instance, if the email agent acts highly intrusively, the user most likely decides to permanently terminate usage. However, the scenarios do not include any explanations on why a critical incident occurs in the first place. A study by Serenko and Stach (2009) presents paths for critical incidents and involves a general investigation about user's initial intentions and expectations in the beginning of the incident. But, the study is missing any further description of why a critical incident takes place.

These studies present several interesting findings on IS-related incidents, but they have not covered the process of critical incidents. Additionally, none of the studies have investigated the relationship between the situational context and post-experience behaviors.

2.5 Process elements of single experiences

The conceptual model of this thesis, mobile experience process model (MEP), is portrayed in Figure 3. To address the recognized research gap, critical mobile incidents are considered in this thesis as processes involving different elements. The procedure of identifying the key process elements was iteratively inductive-deductive by nature: it initially started from empirical evidence and continued by moving back and forth between empirical evidence and the related literature. The formation of the MEP model also evolved during the entire period of writing the six articles of this thesis. The connections between the process elements and the RQs and articles are marked in the figure. Since there seems to be no established templates for reporting iteratively inductive-deductive approaches, this thesis first reports the conceptual model and then the empirical evidence.

There does not seem to exist any prior complete process models for explaining the essential elements of critical IS-related incidents. To the author's best knowledge, such models or theories have not been introduced to explain users' single mobile experiences. Therefore, it is reasonable to draw from related IS, HCI, and service research studies that contain knowledge on separate elements of

such a process. A single experience is a micro-process, an episode of essential elements, including a trigger, critical steps, and an outcome (Edvardsson & Strandvik 2000; Olsen 1992). A mobile experience thus begins with an important element, *trigger*, which then leads to the user's *interaction* with the application in question. The interaction, in turn, builds the foundation for a user's *positive or negative perception* about the experience (Forlizzi & Battarbee 2004; Mahlke 2008). During the experience, users have their positive and negative *peak moments*. There is also the *situational context* in which the use experience takes place (Mallat 2007; Mallat et al., 2009; van der Heijden et al. 2005; Yang, Lu, Gupta & Cao 2012). Subsequently, a single experience and its situational context affects users' *post-experience behaviors* (Mahlke 2005, 2008; Meuter et al. 2000; Serenko & Turel 2010). These six elements of the MEP model are discussed as follows.

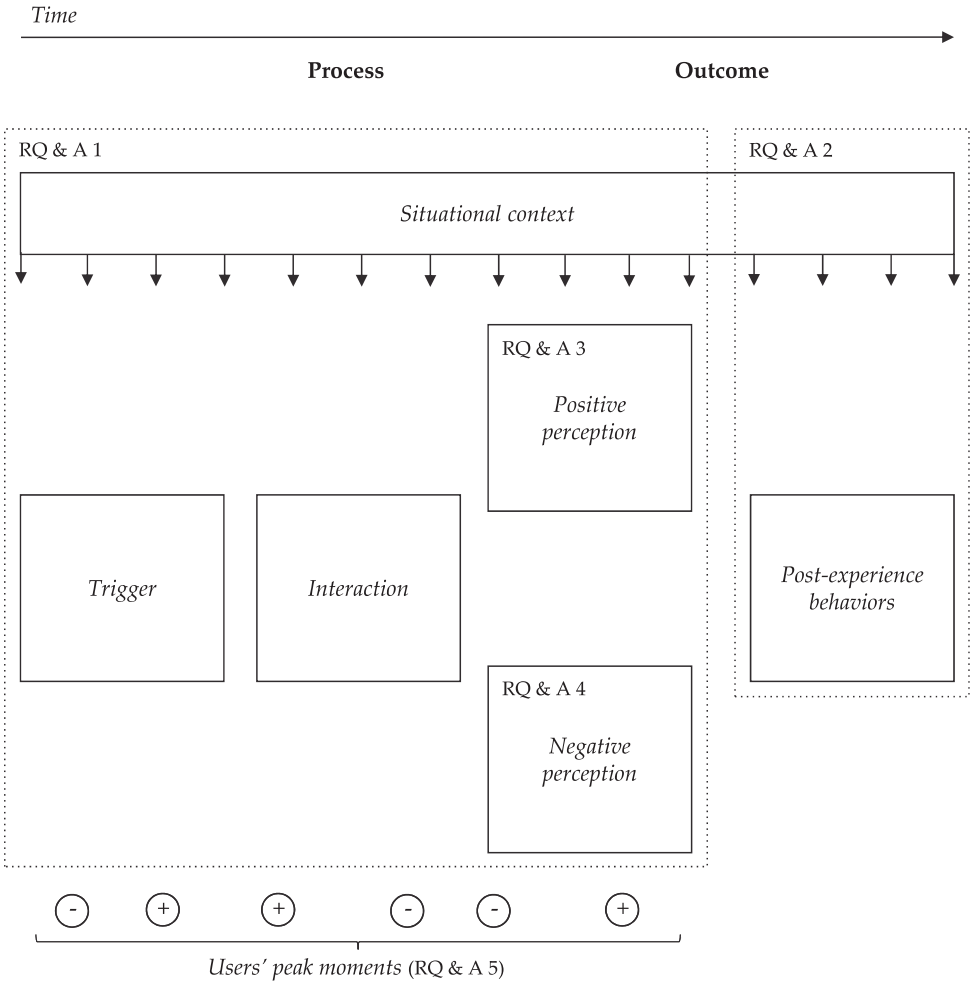

FIGURE 3 The MEP model and the focus of related RQs and articles (A)

2.5.1 In the beginning: Trigger

A trigger launches an episode of events and covers the reasons why a single service process occurs (Edvardsson & Strandvik 2000).[3] Researchers have identified two types of triggers in different contexts: internal and external (Wansink 1994a, 1994b; Youn & Faber 2000; Dawson & Kim 2009, 2010). More specifically, these triggers can arise from the user, the service provider, the interaction with a product or service, or the environment (Edvardsson & Strandvik 2000; Gardial, Flint & Woodruff 1996).

Internal triggers consist of a person's state of mind, such as feelings, moods, and emotions, while external triggers include environmental and sensory factors (Wansink 1994a; Youn & Faber 2000; Dawson & Kim 2009, 2010). For example, the feeling of hunger is internal and a surrounding sound is external. In this sense, internal triggers are self-generated, while external triggers derive from elsewhere. This thesis emphasizes the level of single experiences and specific situations in time, even though internal and external triggers are not always mutually exclusive (Wansink 1994a). Thus, triggers are external only when one's surroundings explicitly cause an interaction with a product or a service in the given situation and internal when one's own thoughts are the primary source of an interaction at the particular moment.

2.5.2 In the middle: Interaction

After the trigger, the next phase comprises the user's interaction with a service or a product. There have been several efforts to explain and categorize the different types of interactive behaviors with products and services. One comprehensive way to capture IS users' behavioral states is Apter's (1989) reversal theory, because of its strengths in explaining "*the dynamic aspects of human experience and behavior*" (Deng & Poole 2010, 715). The reversal theory has been adopted in IS and HCI (Deng & Poole 2010; Hassenzahl 2003; Hassenzahl, Kekez & Burmester 2002).

Apter's (1989) reversal theory suggests that everyone has a pair of metamotivational systems: the goal-oriented telic state and the activity-oriented paratelic state. Telic interaction primarily concentrates on a certain goal, task, or aim, whereas paratelic interaction focuses on the activity itself in a more unconcerned way (Apter 1989; Sit & Lindner 2005). An individual prefers low arousal in the task-oriented state but high arousal in the activity-oriented state (Apter 1989; Deng & Poole 2010). The user's interaction state can change from one state to the other, for example, by an internal or external trigger (Apter 1989; Rodgers & Thorson 2000; Sit & Lindner 2005).

In the context of IS, examples of telic scenarios include solving specific tasks online, such as buying presents or finding particular information, while

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[3] Sometimes triggers are treated as comprehensive reasons for broad behaviors such as service switching (e.g., Roos & Friman 2008), but this thesis focuses on triggers of single experiences as specific situations in time.

paratelic scenarios consist of just surfing online and exploring websites (Deng & Poole 2010; Hassenzahl et al. 2002). Though these examples are obvious, Hassenzahl (2003) notes that the product itself does not define the interaction state: a user may operate a gaming product also in a goal-oriented telic state or an office software product in an activity-oriented paratelic state. He emphasizes the strength of this categorization as it is not restricted to any pre-defined assumptions of work versus leisure categorization. Instead, a user's interaction state depends on the situation (Van Schaik & Ling 2009) and one's subjective basis.

2.5.3 At the end: Either positive perception…

Researchers have found that there are different and asymmetric effects of positive and negative sources on (dis)satisfaction and IS use (Cenfetelli & Schwarz 2011; Meuter et al. 2000). For example, there are sources that *"increase dissatisfaction when absent but do not increase satisfaction when present"* and vice versa (Vargo et al. 2007). That is why this thesis presents positive and negative perceptions separately.

A large set of studies in IS, HCI, and business acknowledge two fundamental aspects affecting positive perceptions on products and services: utility (or pragmatic or extrinsic) and enjoyment (or hedonic or intrinsic) (Harbich & Hassenzahl 2011; Hassenzahl & Tractinsky 2006; Hertzum & Clemmensen 2012; Hirschman & Holbrook 1982; Holbrook 1996, 1998; Lee, Kim & Kim 2005; Magni, Taylor & Venkatesh 2010; O'Brien 2010; van der Heijden 2004). Utility refers to the appreciation of products' and services' pragmatic capability, such as usefulness, ease of use, and social utility to serve one's own benefit, while enjoyment involves perceptions related to fun, beauty, affection, and ethics. These sources are not mutually exclusive and can appear simultaneously (Holbrook 1996, 1998). Enjoyment has played a rather minor role with traditional, work-related IS but a more essential role with mobile technologies (Wakefield & Whitten 2006). Additionally, perceptions of utility and enjoyment are not predetermined by the product characteristics. For example, enjoyment has been linked even to formal mobile services such as mobile banking (Laukkanen 2006).

2.5.4 At the end: …or negative perception

In general, the opposite of utility, disutility, can be a source for negative perceptions. However, with enjoyment, there seems to be no such relationship.[4] According to Oliver (1977), there are three sources of dissatisfaction on an abstract level: external (other-oriented), situational (context), and internal (user mistakes). External sources, originating often from the product or service itself, are commonly highlighted, even though researchers should also take situational and internal sources into account.

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[4] On rare occasions, researchers have found kinds of negative counterpoints for enjoyment in the form of, for example, addiction.

In the mobile domain, researchers have identified a set of sources of negative perceptions and dissatisfaction. These sources include technology, interaction, content, customer service, value for money, privacy, context, and the user itself (Chae, Kim, Kim & Ryu 2002; Koivumäki, Ristola & Kesti 2008; Kuo, Wu & Deng 2009; Park, Heo & Rim 2008; Vlachos & Vrechopoulos 2008). Each of these is a potential source for negative perceptions regarding single mobile experiences. Recently, researchers have been encouraged to direct towards context-specific sources of both negative and positive perceptions (Vargo et al. 2007).

2.5.5 Context-specific positive and negative perceptions

There is a set of HCI studies that has investigated users' positive and negative perceptions in the context of this study, PMI. According to an established classification, there are four general PMI techniques to physically interact with real-world objects and surroundings. As illustrated in Figure 4, users can currently link with their surroundings by using their mobile phones to point objects, touch objects, scan their surroundings, or manually type input into their mobile phones (Rukzio, Broll, Leichtenstern & Schmidt 2007; Rukzio et al. 2006). Pointing is typically associated with capturing visual tags (e.g., QR and 2D codes), recognizing images, or using laser pointers, while touching is often applied with near field communication (NFC) and radio-frequency identification (RFID) tags.[5] Scanning may use Bluetooth or Wi-Fi to form a list of objects from which the user can select and connect to an object. Manual input often involves typing the identification information of an object as text or numbers. For more detailed descriptions and examples of each PMI technique and other related concepts, please see the comprehensive work by Rukzio (2007).

FIGURE 4 PMI techniques. From left: pointing (image recognition), pointing (QR codes), touching (NFC), scanning (Bluetooth), manual input (text typing)

Prior HCI studies focusing specifically on comparing different PMI techniques have considered users' positive and negative perceptions as follows. The main strengths of the touching technique compared to other techniques are its speed, simplicity, cognitive effortlessness, naturalness, and reliability (Broll et al. 2007; Mäkelä, Belt, Greenblatt & Häkkilä 2007; Rukzio et al. 2007; Von Reischach et al. 2009). Overall, users have preferred touching specifically over pointing (Broll et al. 2007; Mäkelä et al. 2007), even though pointing might outshine touching in

[5] Despite the name (touching technique), NFC and RFID require only close proximity between the objects, not necessarily touching.

some aspects such as lower physical effort (Rukzio et al. 2007). The lower physical effort is also an advantage for scanning, but the other aspects of scanning are considered mediocre (Rukzio et al. 2007). As expected, the manual input technique is considered slower and more difficult to use compared to touching and pointing (Rukzio et al. 2007; Von Reischach et al. 2009). Surprisingly in some cases, users have liked manual input because of its speed or familiarity (Broll et al. 2007; O'Neill, Thompson, Garzonis & Warr 2007).

Social acceptance affects user perceptions, especially in public places (O'Neill et al. 2007; Riekki, Salminen & Alakarppa 2006). Users have reportedly felt embarrassed or awkward when applying the touching technique in public places because it might draw some unwanted attention (O'Neill et al. 2007; Riekki et al. 2006). The pointing technique is sometimes preferred as more socially acceptable (Mäkelä et al. 2007; Välkkynen, Niemelä & Tuomisto 2006). There seems to be less negative issues of social acceptance with the scanning and manual input techniques, because they are typically used in a similar way with other common features of a mobile phone.

In addition to these main aspects, there are other less-studied issues. First, users have control, security, and privacy concerns about PMI in public places (Mäkelä et al. 2007; O'Neill et al. 2007; Riekki et al. 2006; Välkkynen et al. 2006). Some users worry about movement monitoring, misuse of personal information, and receiving harmful content via visual or RFID tags (Günther & Spiekermann 2005; Mäkelä et al. 2007; O'Neill et al. 2007). There is also a risk of mobile phone theft in public places (O'Neill et al. 2007). Second, for enjoyment, fun, and innovative-related properties, Rukzio et al. (2007) rate touching, pointing, and scanning highly, while only manual input is rated as low. Similarly, Broll et al. (2007) confirm that users enjoy using the touching technique but not the manual input technique. Mäkelä et al. (2007) have reported user insights about the visual appeal of 2D codes, but other visually aesthetical aspects of PMI techniques seem to remain unreported in prior comparison studies.

2.5.6 During the experience: Peak moments

Single product and service experiences are already entities of their own, but on a more detailed level, users involve themselves in a constant stream of evaluation during each single experience. The evaluation of one single experience or service process may involve momentary positive, negative, or neutral perceptions (Johnston 1995). The stream of evaluations then affects the overall evaluation of a single experience. Thus, users' most positive and negative moments, as peak moments, represent the range of perceptions during single experiences, as demonstrated in Figure 5.

Understanding this detailed level of single experiences opens many possibilities for management. For example, Johnston (1995) demonstrates that managers of amusement parks could do their best to increase the odds for visitors' positive perceptions at the end of their experiences. These efforts at such a critical stage could be memorable for visitors and would leave a positive impression on them. With rather new and unexplored IS products and services, it is essen-

tial to find out what users really think during their experiences. The moment-based detailed inspection can reveal information that might be missed with other overall evaluation approaches.

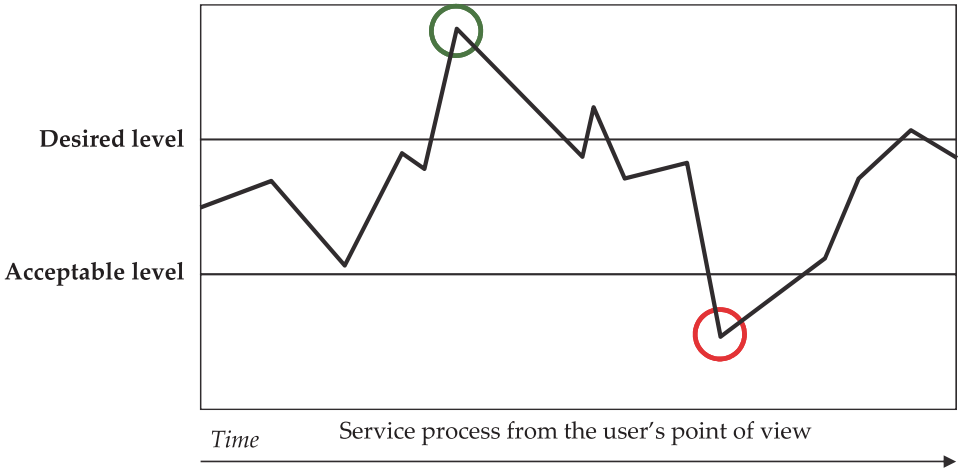

FIGURE 5 An example illustration of users' peak moments during a single experience, inspired by Johnston (1995), Odekerken-Schröder et al. (2000), and Zeithaml and Bitner (2003)

2.5.7 Behind the experience: Situational context

Every single product or service experience always occurs in a certain surrounding situational context (Belk 1975). Prior studies have identified influential characteristics of the situational context regarding consuming in general as well as IS and mobile use. This thesis focuses on three specific situational characteristics: place as physical surroundings (Belk 1975; Coursaris & Kim 2011; Jumisko-Pyykkö & Vainio 2010; Lee et al. 2005; Mallat et al. 2009), sociality (Belk 1975; Coursaris & Kim 2011; Jumisko-Pyykkö & Vainio 2010; Lee et al. 2005; Mallat et al. 2009), and application type as technology (Coursaris & Kim 2011; Hong & Tam 2006; Jumisko-Pyykkö & Vainio 2010; Venkatesh et al. 2011). In the selection of these three characteristics, the attempt was to combine the most central characteristics mentioned in the prior literature that were not covered by other elements of MEP.

First, place has been mentioned as one of the unique characteristics compared to the other IS contexts, since mobile applications can be used anywhere (Coursaris & Kim 2011; Hong & Tam 2006; Lee et al. 2005). For example, users may employ mobile applications indoors, outdoors, and in a vehicle (Lee et al. 2005). Second, each use situation of a mobile application involves a certain level of sociality (Lee et al. 2005; Mallat et al. 2009). A user can employ a mobile application completely alone, among other people and passers-by, or collaboratively with other persons. The influence of others affects, for instance, privacy perceptions (Lee et al. 2005). Thus, researchers have taken notice of co-

experiences and shared experiences in the mobile domain (Battarbee & Koskinen 2005; Jacucci, Oulasvirta & Salovaara 2007; Teevan, Karlson, Amini, Bernheim Brush & Krumm 2011). Third, the situational context involves the technology itself (Coursaris & Kim 2011). Nowadays, there are application types with numerous use purposes (Hong & Tam 2006). Each application type has its own special characteristics. For example, PMI applications depend highly on the context as they are based on real-world interactions and are often used on the move. They typically require specific features or their combinations (e.g., camera, microphone, compass, and Internet connection).

2.5.8 After the experience: Post-experience behaviors

The widely recognized behaviors after product or service experiences include use continuance (or repurchase), word-of-mouth, and complaints (Holloway & Beatty 2008; Meuter et al. 2000; Serenko & Stach 2009; Zeithaml, Berry & Parasuraman 1996; Zhou 2011). In IS, use continuance refers to whether the user continues to use the IS artifact in question after the initial adoption or not (Bhattacherjee 2001). Positive (or negative) word-of-mouth is defined as communicating positive (or negative) information or recommendations about a product or service to other(s) (Serenko & Stach 2009; Zeithaml et al. 1996). By following Bougie, Pieters and Zeelenberg (2003), complaints refer here to behavior in which the user initiatively complains about a negative experience to the product or service provider. IS researchers have typically concentrated only on one of these behaviors—use continuance—often neglecting the other behaviors (Kim & Son 2009). Researchers should widen such a narrow focus, since studying the three different post-experience behaviors makes it possible to detect more specific findings and implications.

Zeithaml et al. (1996) have grouped use continuance and positive word-of-mouth as favorable behaviors from the perspective of the product or service provider. Similarly, they have categorized use discontinuance, negative word-of-mouth, and complaints as unfavorable behaviors. These behaviors, of course, have effects on maintaining old and acquiring new customer relationships. Researchers have highlighted the importance of post-experience behaviors, especially with electronic services and mobile applications: the absence of social interaction with staff can lead to greater negative effects and use discontinuance, while word-of-mouth and complaints can spread rapidly with the help of mobile networks, social technologies, and user-generated content (Chea & Luo 2008; Zhou 2011).

2.6 Summary of the review and theoretical foundation

While the major research stream on IS usage has remained at a rather abstract and general level, some studies have emphasized the importance of in-depth insights and rich descriptions of single critical incidents. Still, current

knowledge lacks a thorough understanding of the different elements of critical IS-related incidents. To the author's best knowledge, there is no comprehensive process model or theory explaining critical IS-related incidents or single mobile experiences.

Therefore, this thesis identifies six meaningful elements that all play their roles in the formation of single mobile experiences. The elements are combined in the MEP model. The core of the process starts from trigger, continues with interaction, and ends with positive/negative perception. During an experience, a user lives through momentary evaluations including peak moments. Each experience occurs in a certain situational context and influences users' post-experience behaviors. These elements are empirically examined in the thesis with the methodological approaches to be presented in the next section.

3 RESEARCH METHODOLOGY

This chapter presents the methodological aspects of the thesis. The section begins with an introduction and justification of the selected research approaches and continues with a brief discussion of the underlying philosophical assumptions. Then, the collection of empirical evidence and its analysis are described.

3.1 Research approach

There are three general approaches included in this thesis: 1) creating theoretical knowledge, 2) applying and deepening theoretical knowledge, and 3) testing theoretical knowledge. For the most part, this thesis aims at explaining and predicting a certain phenomenon, as classified by Gregor (2006), and reflects *"qualitative, interpretive and new theories creating research,"* as categorized by Järvinen (2001, 62). With creating theoretical knowledge in the form of explaining critical mobile incidents (article 1) and peak moments during single experiences (article 5), the aim lies in exploring and understanding reality with theoretical explanations derived from the empirical evidence and reflected on prior literature (inductive-deductive approach). To apply and deepen the existing theoretical foundations for users' post-experience behaviors (article 2) and sources of positive and negative experiences (articles 3 & 4), context-specific knowledge is reached with the help of pre-defined theoretical lenses (deductive-inductive approach). Both creating and deepening theory rely in these cases on *"identification (and categorization) of elements, and exploration of their connections"* and *"the comprehension of the meaning of text [or] action"* (Tesch 1990 according to Järvinen 2001, 63 and Miles & Huberman 1994, 7). With these types of research, researchers are able to inspect human experiences and their possible patterns, categories, and relationships as well as structures in conceptualization (Järvinen 2001). For testing theory, it is examined whether the existing knowledge on

overall perceptions affecting IS usage holds in the context of PMI (article 6, deductive approach).

The major part of the thesis applies a phenomenographic approach (articles 1, 3–5).[6] It is a suitable approach to study single critical incidents and experiences of mobile users, since it *"has human experience as its research object"* (Limberg 2000, 56) and focuses on explaining how humans differently experience a certain phenomenon (Bruce 1999; Åkerlind 2012). Particularly, there is a difference between how the phenomenon actually exists and how humans experience it; phenomenography can be used to answer the latter question (Limberg 2000; Marton 1981). Phenomenography rests on empirical examination and interpretation of human perceptions of reality (Bruce 1999; Järvinen 2001). In a phenomenographic analysis, the researcher concentrates on interpreting meanings of single informants and comparing their similarities and differences within the whole (Limberg 2000; Åkerlind 2012).

The minor part of the thesis is based on survey methods and opinion research. In contrast to phenomenography, survey methods are typically applied to provide generalizable results about the research object (Gable 1994). As a quantitative research method, opinion research can be used to study beliefs and attitudes of participants (Jenkins 1985; Straub, Gefen & Boudreau 2004). In this thesis, these methods are used to complement the phenomenographic approach by understanding and explaining relationships (article 2) and testing existing theory in the context of PMI (article 6).

The underlying philosophical assumptions of the research has been a popular topic of discussion among IS scholars. Sarker, Xiao and Beaulieu (2012) suggest that it is helpful to report such assumptions. Myers (1997) has adopted Orlikowski and Baroudi's (1991) categorization of the three research epistemologies: positivist, interpretive, and critical. The positivist approach is based on an assumption that the world can be objectively measured by hypothetical-deductive logic. The interpretive approach refers to assumptions of socially constructed reality, highlighting humans' lived experiences and their subjective meanings. The critical approach, in turn, stems from its attempt to evaluate and change reality by finding contradictions. Even though there are no clear boundaries for each of the three philosophical assumptions in practice (Miles & Huberman 1994; Myers 1997; Weber 2004), this thesis can be positioned into two epistemologies: phenomenography is often considered interpretive (Weber 2004) while quantitative approaches are positivist (Straub et al. 2004). The main epistemology of the thesis, interpretive research, can provide in-depth knowledge for IS management and development (Klein & Myers 1999). Table 2 presents the research approach, collection of evidence, and analysis technique for each article.

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6 Phenomenographic approaches often focus solely on the empirical evidence, but in this case, both the evidence and prior literature guided the analytic process and the formation of categories.

TABLE 2 Methodological aspects of each article

Article	*Approach*	*Collection of evidence*	*Analysis*	*Unit of analysis (N)*
1	Creating theoretical knowledge	Questionnaire 1: Critical incident technique (CIT) with open questions	Inductive-deductive content analysis	Single critical incident description (606)
2	Applying and deepening theoretical knowledge	Questionnaire 1: CIT with closed and open questions	Statistical analysis (tests) and content analysis	Response set from a respondent (605)
3	Applying and deepening theoretical knowledge	Questionnaires 2 & 3: CIT with open questions	Deductive-inductive content analysis	Single critical incident description (107)
4	Applying and deepening theoretical knowledge	Questionnaires 2 & 4: CIT with open questions	Deductive-inductive content analysis	Single critical incident description (181)
5	Creating theoretical knowledge	CIT interviews	Inductive-deductive content analysis	Single moment description (226)
6	Testing theoretical knowledge	Questionnaire 2: Closed survey instrument and open questions	Statistical analysis (SEM) and content analysis	Response set from a respondent (90)

3.2 Collection of empirical evidence

The collection of empirical evidence from actual mobile users was done in several phases during 2011 to 2012. Critical incident technique (CIT) was applied in the forms of four online questionnaires including both open and closed questions (articles 1–4) and qualitative interviews (article 5). Additionally, a quantitative questionnaire instrument was used to collect PMI users' overall experiences, attitudes, and beliefs (article 6).

The respondents' characteristics are well in line with the purpose of studying mobile Internet use and PMI. The group of Finnish respondents regarding articles 1 and 2 is fairly similar to the population of Finnish mobile Internet users in terms of age and gender (cf. Statistics Finland 2012). With article 5, the carefully selected sample group of Austrian participants matches the demographics (age and gender) of Austrian smartphone owners. For articles 3, 4, and 6, the objective was to invite as many PMI users as possible to answer the questionnaires. More detailed descriptions of the respondents' characteristics are included in the attached articles.

In all questionnaires, the respondents answered questions by naming one particular mobile Internet application they had previously used. It was required that the respondents had more experience with the applications than just trials. The responses relate to dozens of applications. The most frequently mentioned

PMI applications include visual code, image, and music recognition (e.g., QR Reader, Google Goggles, and Shazam) and augmented reality-like browsers (e.g., Layar). With the articles involving also other mobile Internet applications, some of the most frequent applications relate to social networking (e.g., Facebook), location-based applications (e.g., Sports Tracker), and Web browsers (e.g., Safari). With article 5, the participants used prototypes of five different PMI techniques developed and setup for the study.

3.2.1 Critical Incident Technique (CIT)

The well-established CIT fits the purpose of collecting actual experiences from mobile application users. Originated by Flanagan (1954), the idea of CIT is to ask respondents to describe their single crucial incidents, moments, or situations, such as outstandingly positive and negative experiences with products and services. Along with self-reported descriptions of critical incidents, CIT can be used to ask questions concerning users' pre-experience conditions (cf. Serenko & Stach 2009) and post-experience behaviors (cf. Meuter et al. 2000). Previously, CIT has been used widely in traditional service research to assess customer evaluations of service (Gremler 2004). To summarize, CIT involves *"a set of procedures"* (Flanagan 1954, 327) *"to collect, content analyze, and classify observations of human behavior"* (Gremler 2004, 66; Grove & Fisk 1997, 67).

There are at least six general strengths of CIT. First, researchers can create theoretical knowledge of relatively unexplored phenomena (Gremler 2004; Keaveney 1995; Meuter et al. 2000), such as critical incidents of PMI. Second, CIT enables researchers to find issues that might be missed with other techniques (Serenko & Stach 2009), since the technique does not force responses into any pre-defined perspective or framework. Third, respondents only report the aspects that are particularly relevant and important for them, since they already have processed each reported experience cognitively. For example, the traditional qualitative interview would often be more time-consuming or constricting: the researcher has to either limit the interview themes or spend long hours afterwards defining what is relevant and important. Fourth, critical incidents are easy to describe in the respondents' own words without being restricted to the researchers' model or technology terminology (Gruen, Rauch, Redpath & Ruettinger 2002; Holloway & Beatty 2008; Serenko & Stach 2009). Fifth, stories have been named as *"a powerful artifact"* in IS-related research and design (Gruen et al. 2002, 504). Finally, CIT makes it possible to access users' actual behavior (although often reported), thus avoiding some of the tensions between actual behavior versus prospective and ideal behavior. van der Heijden (2012) identifies such tensions as one of the problems of IS usage research.

Nonetheless, there are also some weaknesses with CIT: ordinary experiences are left unexplored, recall bias might be present, and the analysis may have shortages due to its subjective nature (Bitner et al. 1990; Gremler 2004; Johnston 1995; Serenko & Stach 2009). These weaknesses are addressed in the following ways: this thesis particularly focuses on critical incidents, respondents were encouraged to take time to properly recall the incident and describe it

in great detail, and analysis processes are presented transparently with the measurements of interrater reliability.

3.2.2 CIT questionnaires and interviews

The iterative processes of designing CIT questionnaires and interviews included pre-tests and pilot-phases with fellow researchers and potential respondents. A set of widely recognized studies (Bitner et al. 1990; Johnston 1995; Meuter et al. 2000) paved the way for using certain wording in asking the respondents to *"think of a time when you had an outstandingly positive or negative experience"* with the mobile application in question. After the respondents chose to describe either a positive or a negative incident, and had named the associated application, they described the incident in their own words by answering several open questions concerning their perceptions and different phases during and after the incident. In the questionnaires, the respondents also answered structured multiple-choice questions about when, in which surrounding environment, and in what kind of social setting the incident took place. Finally, the respondents of the main questionnaire (1) answered questions regarding the actual and intended post-experience behaviors. Statements for measuring intended behaviors were adapted and modified from validated instruments presented in prior studies (Bhattacherjee 2001; Bougie et al. 2003; Chea & Luo 2008; Lang 2009; Mathieson 1991; Zeithaml et al. 1996; Zhou 2011).

To ensure the quality of the empirical evidence, researchers should define criteria for including and excluding respondents' critical incidents (Bitner et al. 1990; Gremler 2004; Sweeney & Lapp 2004). Therefore, to be included in the analysis, a description by the respondent was required to be about a single outstandingly positive or negative experience; be related to a specific mobile application; and be described in sufficient detail. Although CIT already filters outstanding incidents from ordinary experiences, we wanted to confirm the criticality of the incident perceptions by asking respondents of the main questionnaire to rank how much (dis)satisfaction the reported experience caused (from 1 = *"not at all,"* to 5 = *"extremely much"*). The high means of these ratings emphasize that the collected incidents really were critical.

3.3 Analysis

All articles utilize *content analysis*, which was selected because of its ability to sort out the empirical evidence into categories or themes for drawing meaningful conclusions. Researchers have found content analysis particularly suitable for analyzing and organizing the respondents' qualitative incident descriptions derived with CIT (Bitner et al. 1990; Butterfield, Borgen, Amundson & Maglio 2005; Gremler 2004). Articles 2 and 6 include *statistical analysis*, which herein focuses on testing and confirming relationships between dependent and independent variables.

3.3.1 Content analysis

In general, the content analysis procedures followed the guidelines presented by Gremler (2004), and Srnka and Koeszegi (2007). The procedures included reading and rereading the empirical evidence, reflecting the evidence with prior studies, developing, modifying or applying a categorization by recurring themes, discussing the categories with other scholars, coding the evidence into the categories to report the results, and measuring interrater reliability. Table 3 exemplifies the content analysis procedure regarding one article. With inductive-deductive articles (1 and 5), the iterative analysis process initiated from the empirical evidence and proceeded by moving back and forth between the evidence and prior literature. The aim was to find as representative as possible—but, at the same time recognized—frames for the evidence. With deductive-inductive articles (3 and 4), the analysis started with theory-driven categories into which the empirical evidence was assigned. The categories were modified when needed, and finally, context-specific sub-themes and insights were marked. In order to enhance the transparency, as suggested by Sarker et al. (2012), the articles include illustrations and appendices in the form of exemplar quotations and categorization schemes.

TABLE 3 An example: The steps of content analysis regarding article 1

Step 1: Identifying elements	The author read and reread the empirical evidence thoroughly to find recurrent elements in the respondents' stories for single critical incidents. These elements were reflected with prior research. As a result, three elements were identified: trigger, interaction, and positive/negative perception.
Step 2: Screening prior research	For each of these identified elements, numerous theoretical perspectives were screened from prior research regarding perceptions, motivations, and experiences of products and services in general.
Step 3: Reflecting schemes	Potential alternative categorization schemes were reflected with the empirical evidence and discussed further with other scholars to develop the most representative process model. Some of the considered but dropped views and frameworks included gradual versus abrupt triggers by Gardial et al. (1996); fluent, cognitive, and expressive interaction types by Forlizzi and Battarbee (2004); and connection, content, interaction, and contextual perceptions by Chae et al. (2002).
Step 4: Forming final categorization	The final selection of the categorization was done with a few necessary additions and modifications, and the resulting process model was discussed with other scholars. The author organized the empirical evidence in its final form to be reported in the results section.
Step 5: Measuring interrater reliability	One independent coder, blind to the author's codings, coded 70 incidents according to the final categorization. We measured the consensus estimates with percent-agreement figure and Cohen's Kappa (trigger: 91.2%, 0.80; interaction: 91.4%, 0.82; positive perception: 88.6%, 0.76; negative perception: 91.4%, 0.81). These values are sufficient or "*almost perfect*" (Gremler 2004; Landis & Koch 1977, 165; Stemler 2004), and indicate that the coders deliver information consistently (Stemler 2004).

With all articles including content analysis as the primary analysis technique, interrater reliability for the codings was assessed. The applied consensus estimates include calculating and evaluating the percent-agreement figure and Cohen's Kappa. As the values exceeded the sufficient limits (suggested by Gremler 2004; Landis & Koch 1977; Stemler 2004), the high consensus indicates that the categorizations are appropriate and the coders are *"essentially providing the same information"* (Stemler 2004).

3.3.2 Statistical analysis

Article 2 applies statistical significance tests to examine whether there are statistically significant differences related to the characteristics of the situational context and user behaviors after critical incidents. Regarding intended behaviors, we calculated mathematical means of the items for each dependent variable. We used a *t*-test for independent variables with two nominal categories, and analysis of variance (ANOVA) tests for independent variables including three nominal categories. For actual behaviors, which were measured with nominal scales, we used crosstabs. For 2x2 tables, we examined Yates's Continuity Correction. For tables larger than 2x2, we investigated Pearson's chi-square or Fisher's exact test.

Article 6 investigates five constructs affecting use intentions by structural equation modeling (SEM) with partial least squares (PLS) estimation. PLS was chosen because of its suitability for small sample sizes. The evidence was collected with a questionnaire based on a validated instrument by Moore and Benbasat (1991), and its follow up by Hsu et al. (2007).

In terms of constructs and their items for both articles, the values of Cronbach's alpha (article 2) and composite reliability (article 6) indicate that the constructs are reliable and internally consistent (cf. Nunnally & Bernstein 1994). Additionally, with article 6, indicator reliabilities, convergent validity, discriminant validity, and construct unidimensionality were assessed, as suggested by Urbach and Ahlemann (2010). The attached articles include further detailed descriptions regarding statistical analysis.

4 RESULTS

This chapter summarizes the key results and contributions of the six attached articles. Articles 1–4 examine the level of single critical mobile incidents. Article 5 investigates even shorter time frames, the users' peak moments, while article 6 examines user experiences, attitudes, and beliefs on the level of overall perceptions.

4.1 Article 1: The core process of critical mobile incidents

Salo, M. 2013. Explaining Extreme Mobile Experiences. International Journal of Human-Computer Interaction. (In press, available online)

RQ 1: How and why do critical mobile incidents take place and proceed?

Based on the iteratively inductive-deductive content analysis of 606 actual critical mobile incidents, the first article introduces a process model for explaining mobile experiences with in-depth descriptions. Such experiences begin with a trigger, continue with interaction, and end with a positive/negative perception. Based on the empirical evidence, these core elements of the MEP model are presented in Table 4 and are discussed below.

Internal triggers derive from the user: critical mobile incidents can start with carefully planned decisions, habits, or spontaneous ideas and curious trials. For example, a person may internally decide to track one's running exercise or check the status updates of friends. Correspondingly, *external triggers* consist of surrounding objects and places, other people, and the mobile device itself. Examples of external triggers include products, songs, and attractions that reach one's attention. According to the evidence, external triggers launch most PMI experiences, while internal triggers launch most experiences with other mobile Internet applications. To continue from the trigger to the next phase, there has to be a match between the situational interest of the user and the purpose of the

trigger (situation-fit). Additionally, an external trigger has to reach the attention of the user.

TABLE 4 Process elements, distribution, and illustrative quotes

Process element	Category	Illustrative quote from the empirical evidence	Percentage
Trigger	Internal	*"I routinely launched the app."*	56%
	External	*"I didn't know the name of a painting [in a waiting room]. I took a picture of it and the app recognized it splendidly."*	44%
Interaction	Telic	*"I need precise weather information in my work, so I monitored the speed of wind and temperature [with the app]. The information was necessary and benefited my performance."*	59%
	Paratelic	*"I explored different augmented reality views and objects that the app showed."*	41%
Positive perception	Utility	*"I found [the information I was looking for] easily and quickly. Normally, I would have to ask my friends and search the Web for it. It took less than a minute."*	87%*
	Enjoyment	*"I cycled my longest trip of the summer [because] tracking was so much fun that I didn't want to stop. =) I found it delightful that I got a nice recorded memory of my trip."*	23%*
Negative perception	Dysfunctionality	*"[The app] couldn't read a barcode. Excluding [the basic instructions], it gave no feedback on my effort and didn't signal any activity."*	72%
	Disutility	*"My account looked different from the traditional computer version, and especially, it was difficult to log out."*	28%

* In this categorization, positive perception can reflect both utility and enjoyment.

Telic interaction reflects experiences in which the user applies a mobile application as a means to an end of information acquisition or getting something done. *Paratelic interaction* contains no specific or pre-defined goal or task, but highlights an activity such as browsing, surfing, consuming content, chatting, and gaming.[7] Interestingly, with telic interaction, users tend to have higher pre-defined requirements regarding a single experience. Correspondingly, with paratelic interaction, users seem to be receptive for unexpected and surprising episodes that may pop up during the experience. To move on from the interaction to the next phase, a user has to be able to compare the interaction to his/her previous expectations, or form new expectations based on the interaction.

Utility, the most dominant positive perception category, refers to the instrumental ability and performance of the application. For example, perceived quickness, easiness, and reliability can reflect utility. *Enjoyment* covers the pleasure and beauty of exploring content, trialing new applications, and playing games, but it may also arise from social experiences, surprises, self-growth, and evoked memories. Some experiences reflect both utility and enjoyment. For

7 It is important to note that all of these activities can also reflect telic interaction, if the activity is done for a certain goal. For example, a user might play a game and concentrate solely on achieving a new point record.

PMI, positive perceptions of utility are often all about single, quite rare, and disconnected use experiences. In contrast, many of the experiences with other mobile Internet applications link with longer-lasting utility through well-designed use purposes. With PMI, perceptions of enjoyment seem to link quite closely with exploration and novelty, aspects that are expected to lose some of their appeal over time. With other mobile applications, enjoyment may appear through strong social and other features. In sum, it seems that many users have not yet found long-lasting value for using PMI applications.

Negative perception caused by *dysfunctionality* reflects cases in which an experience reaches an end but remains incomplete from the user's point of view (e.g. the application crashes or lacks content). Respectively with *disutility*, the experience can be considered complete but poor due to, for example, slowness or inconsiderate design. This new perspective for categorizing negative experiences based on their degree of completeness could help researchers to examine user behaviors from a fresh point of view, and help practitioners to prioritize different developmental needs. With PMI, a great share of negative perceptions reflects dysfunctionality by remaining incomplete from the user's point of view. The high tendency toward incomplete experiences seems to be explained by two issues. First, the functionality of PMI applications often requires quite sophisticated interplay of the application, the device features such as camera, GPS, and compass, and the use context. Second, PMI application providers tend to launch their applications as soon as the beta version is ready. Thus, it is perhaps not the best strategy for application providers to introduce their applications to the general public by a beta release. Instead, PMI application providers could run a thorough closed beta test for limited number of test users before the public launch.

The article contributes to the understanding of single critical mobile incidents by presenting a new process model with detailed evidence regarding each core element. For example, the evidence unveils rich descriptions of various triggers covering the reasons why critical incidents occur in the first place. In general, the findings suggest that mobile experiences are not presumable at all. That is why researchers and practitioners should be careful in making any assumptions about expected experiences of mobile applications because of their use purposes. Even if each application type has its own characteristics, it seems that nearly any mobile application can be linked to any trigger, interaction, and perception category.

4.2 Article 2: Users' post-experience behaviors: the influence of situational context

Salo, M. & Frank, L. 2013. User Behaviors After Critical Mobile Incidents: The Influence of Situational Context. (Submitted to Information Systems Journal)

RQ 2: How and why do specific characteristics of the situational context influence different types of mobile users' post-experience behaviors?

The second article examines behavioral outcomes following critical mobile incidents. Users' post-experience behaviors assist researchers to sort out which incidents are the most crucial and allow practitioners to define which ones need managerial attention. The article attempts to produce new knowledge from the perspective of two aspects. First, research on critical IS-related incidents completely lacks understanding of the relationships between the situational context and post-experience behaviors. Second, studies on mobile use in general have recognized the influence of context on use behaviors. Even though these studies have succeeded in providing interesting insights, they have been limited in considering situational characteristics as only one abstract construct (e.g., Liu & Li 2011; Mallat et al. 2008, 2009; Yang et al. 2012; Wang & Yi 2012) or its effect on only one type of behavior (e.g., Liang & Yeh 2011; Xu & Yuan 2009). Hence, the article attempts to uncover and explain the influence of specific situational characteristics (namely place, sociality, and application type) on users' intended and actual behaviors after critical incidents (namely use continuance, word-of-mouth, and complaints). Based on the quantitative and complementary qualitative analysis of 605 critical incidents, the findings are summarized in the resulting research model (Figure 6).

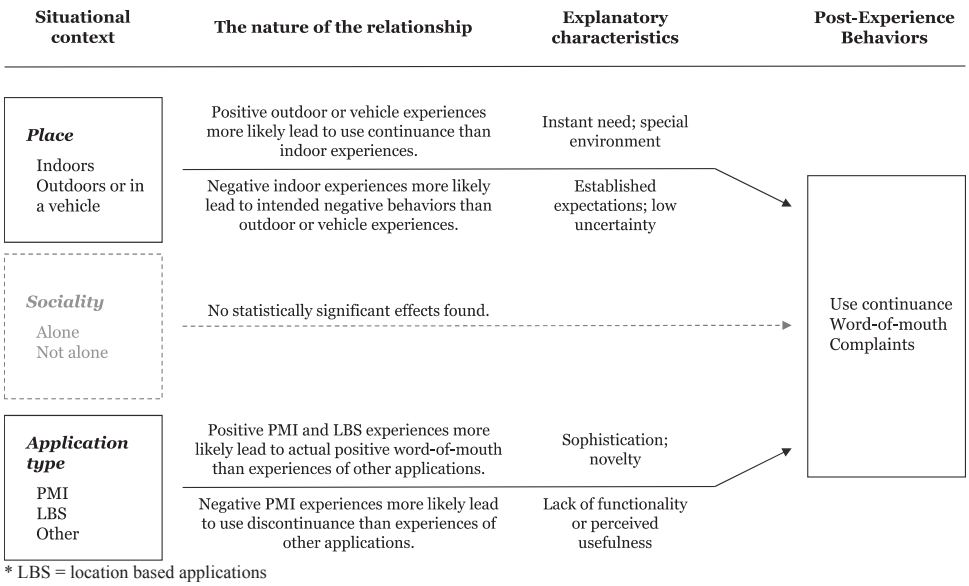

FIGURE 6 The influence of situational context on post-experience behaviors

Place. In terms of place, users were more likely to continue use in positive cases and less likely to engage in negative behaviors in negative cases after incidents that happened outdoors or in vehicles. Based on the empirical evidence, positive outdoor and vehicle incidents resolving an instant need or succeeding in a special place impressed users and encouraged them to engage in positive behaviors. In contrast, established expectations and low uncertainty of indoor incidents seem to be the main reasons why users more likely had negative behav-

ioral intentions after negative indoor incidents. In practice, industry stakeholders may position outdoor and vehicle settings as higher reward–lower risk environments from the standpoint of post-experience behaviors.

Sociality. For the level of sociality, we found no statistically significant effects. The finding is unexpected, since prior literature has emphasized the role of co-experiences (Battarbee & Koskinen 2005; Teevan et al. 2011). However, the results hint that there might be some differences regarding negative incidents. We encourage researchers to examine these potential differences by a larger set of negative incidents and more categories for different levels of sociality.

Application type. Regarding application type, users are more likely to communicate positive word-of-mouth after positive PMI incidents compared to other mobile Internet applications. Based on the respondents' descriptions, perceptions of novelty and sophistication regarding PMI often made it appealing for the users to communicate positive word-of-mouth. Nevertheless, the users also were more likely to quit using the application after negative PMI experiences. It appeared to us that at times the users do not perceive long lasting functionality or usefulness to support use continuance after negative experiences (as found in article 1 as well). These findings indicate that there seem to be both high rewards and high risks for PMI applications. To address the high rewards and risks, PMI application providers should ensure the readiness of their applications right from their launch. In cases of negative experiences, PMI application providers should encourage users to continue using the applications by offering service recovery.

The findings also reveal an interesting general notion about critical mobile incidents: only a tiny share of the users (6%) complained after negative critical incidents. The percentage in the mobile context is evidently lower than the corresponding percentage for self-service technologies (51%), as found by Meuter et al. (2000), using the same technique for collecting the evidence. Such a low number of complaints indicate fewer possibilities for service recovery to compensate the users for their negative experiences. Indeed, mobile application providers could enable service recovery by making feedback options easily available for their users. This, in turn, may encourage users to complain about their negative incidents directly to application providers instead of sharing their worries with other potential users as negative word-of-mouth.

In sum, the article takes the first steps in closing the gap regarding specific situational characteristics and different types of user behaviors. Our resulting research model aims to advance current theoretical knowledge by illustrating the nature of these particular relationships with explanations. In general, the empirical evidence shows that critical mobile incidents are highly influential in terms of users' post-experience behaviors, except for complaints.

4.3 Article 3: Sources of positive critical incidents of PMI

Salo, M., Olsson, T., Makkonen, M., Hautamäki, A. & Frank, L. 2013. Consumer value of camera-based mobile interaction with the real world. Journal of Pervasive and Mobile Computing, 9(2), 258-268.

RQ 3: What are the sources of positive critical incidents of PMI, and why?

The third article identifies and explains the sources of users' positive critical incidents in the context of PMI.[8] This is done with the help of a consumer value typology, a holistic framework by Holbrook (1996, 1998). Using the framework in categorizing 107 positive critical incidents makes it possible to inspect context-specific incidents within general value types. Table 5 presents the distribution of the sources of positive critical incidents with illustrative quotes.

TABLE 5 Sources of positive critical incidents of PMI

Source		Illustrative quote from the empirical evidence	Percentage*
Utility	Self-oriented	*"It translated a blurb at the back of a book with surprisingly good [optical character recognition]*	86%
	Other-oriented	*"It's also the one program most guaranteed to get 'wow's out of relatives when showing off my smartphone"*	3%
Enjoyment	Self-oriented	*"Experienced the existence of a truly 3D virtual world around me. The satisfaction of being surrounded, and having the possibility to really walk around the objects, made the virtual environment very real"*	24%
	Other-oriented	*"I was able to help someone, who wasn't from my city, to get to the hospital, using [the application] to point them in the right direction"*	6%

* In this categorization, each critical incident can reflect one or more sources.

A majority (86%) of the reported incidents reflect self-oriented utility, which captures the instrumentality of the application affecting the user himself/herself. These positive perceptions highlight the efficiency or excellence of the application in task completion or assistance within a number of use purposes: everything from information search and directions to shopping assistance. In this category, the users particularly appreciated simplicity and speed, presentation and immersion, real-time functionality, and data processing.

A considerable number (24%) of the incidents reflected self-oriented enjoyment derived from fun-and-play feel and visual appeal. The more specific sources included visualization, immersion, novelty, game elements, and the interaction paradigm itself. While games, quizzes, and art are often obviously linked to enjoyment, we found this capability of PMI bringing fun into formal use purposes, such as information search, as well.

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8 In articles 3 and 4, the term *mobile interaction with the real world* is considered a synonym for PMI.

Only small shares of the incidents reflected other-oriented aspects of utility (3%) and enjoyment (6%). Other-oriented aspects of utility included impressing other people or boosting one's status by using new and innovative features of PMI applications. Correspondingly, other-oriented enjoyment appeared in a few cases where the user had helped others with the application or made a passive contribution to a mixed reality, without necessarily knowing whom it may affect.

The findings of the article contribute to research by contradicting some of the earlier studies that have tried to classify use purposes or consumption types of mobile applications to utility and enjoyment. For example, prior studies have classified search services and various information services to reflect utility (Lee et al. 2005). According to our empirical evidence, search services and other formal activities can reflect both enjoyment and utility. Fundamental attributes of PMI seem to be able to generate diverse value with nearly any application and purpose of use. Especially, PMI provides efficiency and excellence on the go by doing things that have been unprecedented for most users. Additionally, the fundamental attributes, such as visualization and immersion, can also highlight enjoyment. Since users seem to like PMI because of the superior technological capabilities, game-likeness, and visual appeal, they are aspects that application providers could be taking advantage of.

4.4 Article 4: Sources of negative critical incidents of PMI

Salo, M. 2013. Sources of Dissatisfaction: Mobile Interaction with the Real World and Other Mobile Internet Applications. In R.H. Sprague Jr. (Ed.), Proceedings of the 46th Hawaii International Conference on System Sciences (HICSS). IEEE Computer Society, 1113-1122.

RQ 4: What are the sources of negative critical incidents of PMI, and why?

Correspondingly, with the previous article, the fourth article identifies and explains the sources of users' negative critical incidents. The article develops a categorization scheme based on earlier studies and reports results from the content analysis of 181 users' negative critical incidents descriptions. The study includes a comparison between PMI and other mobile Internet applications.

Based on the results, all of the nine proposed sources are relevant in the context of mobile applications (Table 6). The three most dominant negative sources are technical functionality, content, and interaction. Technical functionality can arise from both application and device issues, and such issues are most influential in time-critical situations. Content may cause negative critical incidents if it does not match the user's personal preferences and the situation at hand; there might be too much or too less content, or it may not be up-to-date or local. Interaction, in turn, may not be intuitive, responsive, easy, pleasant, understandable, or properly finalized.

The results aim to extend current knowledge on negative PMI perceptions and their differences compared to the negative perceptions regarding other

mobile Internet applications. Researchers and practitioners are encouraged to apply the table as a checklist for sources of negative experiences. They could also take notice of several context-specific differences between PMI and other mobile Internet applications. First, PMI applications have teething problems and still face many basic-level failures in technical functionality. There are also problems with other applications that are more mature and used more frequently, since sudden changes in interaction may cause feelings of confusion and lack of control. Second, PMI applications are struggling in terms of content. There are many cases where the format, the amount, or the specificity of the content does not meet the acceptable level. Third, interaction is much more of a concern for other applications than PMI. PMI applications could therefore compete with other applications by showcasing physical, natural, and fascinating interaction. Fourth, privacy concerns are relatively low with PMI. The level of user involvement may explain this difference. For example, with social networking applications, it is the high level of user involvement and personal information that causes privacy concerns.

TABLE 6 Sources of negative critical incidents of mobile applications

Source	Illustrative quote from the empirical evidence	Percentage*
External		
Technical functionality	*"The app crashed"*	52%
Content	*"The app didn't find any information that I expected."*	30%
Interaction	*"These apps are fun, but the interface is inconvenient."*	17%
Privacy	*"The lack of privacy protection. Certain privacy settings did not act as I wished or understood."*	6%
Compatibility	*"The lack of deep integration, i.e. my calendar and [to-do-list], cannot interact with [the application]."*	5%
Overall usefulness	*"In general, the lack of utility."*	4%
Customer service	*"I was frustrated that the [content creation] process wasn't clearly documented yet."*	2%
Internal		
User	*"I used to click the wrong button each time and started a layer, although I just wanted to read more information about it."*	4%
Situational		
Context	*"The amount of light was not enough for the camera to see anything.*	6%

* In this categorization, each critical incident can reflect one or more sources.

Further, the article proposes a fresh finding that negative critical incidents occasionally contain combinations of sources having causal relationships. According to our empirical evidence, some context-related problems lead to poor technical

functionality, which, in turn, can cause content failures. These initial insights on the combination chains open opportunities for future research.

4.5 Article 5: Users' peak moments with different PMI techniques

Salo, M., Baldauf, M., Fröhlich, P. & Suette, S. 2013. Peak Moments of Physical Mobile Interaction Techniques. In Proceedings of the 19th Americas Conference on Information Systems (AMCIS).

RQ 5: What are the sources of users' peak moments with different PMI techniques?

As articles 1–4 investigate PMI applications as a whole and compare them with other mobile applications, it is needed to distinguish the different types of PMI techniques and study their context-specific differences. Hence, the fifth article sets up prototypes of five different PMI techniques and examines users' extremely positive and negative moments during single use experiences of them. The typical PMI techniques include pointing QR codes, touching NFC tags, scanning a Bluetooth for a list of objects, and manually typing input directly to the device (as introduced in Section 2.5.5). A set of prior user studies has compared these different techniques, but none of the comparison studies has presented a comprehensive categorization for user perceptions, nor has a study included a more recent form of the pointing technique: image recognition. Image recognition notably differs from the other techniques, since it is a more recent interaction concept in which an object of interest is identified through the camera of the mobile device. In short, the article presents a comprehensive categorization for sources of users' peak moments with PMI techniques, describes the differences between the techniques, and positions image recognition among other techniques.

Based on a content analysis of 226 moment descriptions from 33 users, we formed six categories for users' peak moments: *simplicity*, *speed*, *reliability*, *control*, *fun,* and *achievement*. Our categorization realizes the need for complementing the categorizations presented in prior comparison studies with one added category: achievement. Achievement relates to the enjoyment of self-growth and the success of achieving something. In our empirical evidence, users enjoyed such achievement especially when they had to make some effort to overcome challenges or learn how to use a previously unfamiliar technique. Additionally, the results helped us recognize the importance of control, even though it has been often understated in prior comparison studies. Users had a mix of control-related concerns including feeling restricted, losing privacy, and fearing accidents.

On a more detailed level, we observed that each PMI technique has its typical strengths and weaknesses, by examining the content and the distribution of the moment descriptions (Figure 7). On the one hand, the more recent tech-

niques (image recognition and NFC) fare great in simplicity, speed, reliability, and fun. On the other hand, the older but familiar techniques (scanning and manual input) outshined the more recent techniques in terms of control. Some of these findings are in line with prior studies, but it seems that the techniques raise contradictory perceptions. For example, one user perceives the scanning technique to be slow because of the connection process's overall duration, while another user considers the same technique fast because each event in the process progresses quickly. This finding suggests that researchers and practitioners should carefully acknowledge not only one, but also many possible dimensions of each category rather than just measuring one dimension of a pre-defined category.

The contribution of the article includes an improved categorization for perceptions of PMI users and new context-specific knowledge of each of the techniques. The sources of users' peak moments include technique-specific descriptions. Image recognition, in particular, has several strengths over other techniques, beside the few control-related weaknesses. Researchers and practitioners could recognize all identified categories and their technique-specific contents when investigating and designing PMI.

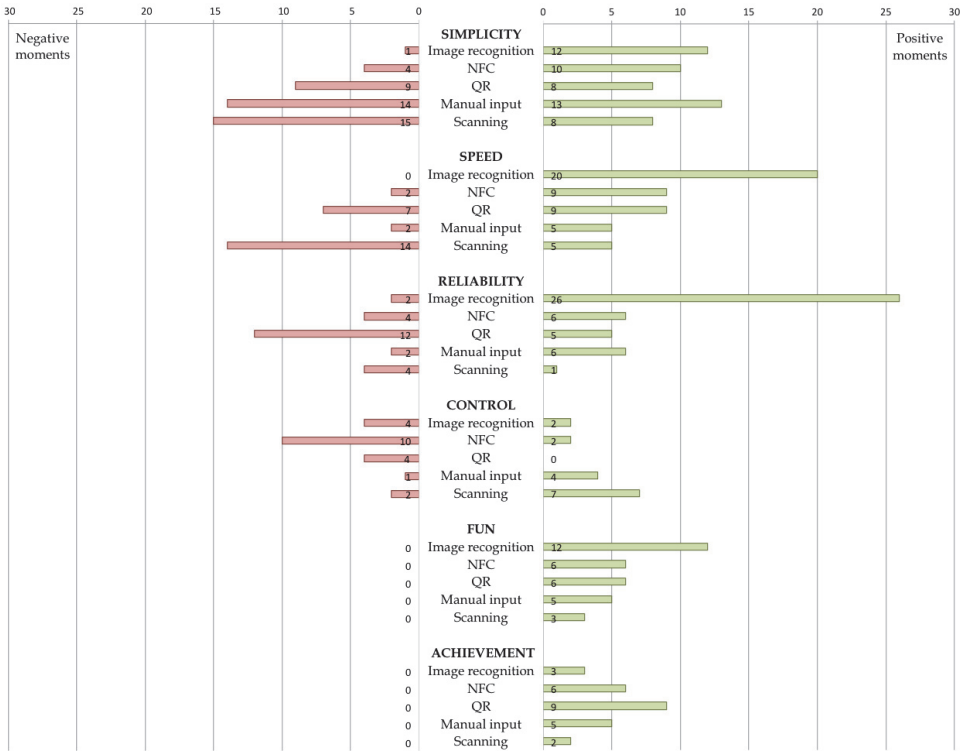

FIGURE 7 Distribution of peak moments regarding PMI techniques and source categories

4.6 Article 6: Overall experiences, attitudes, and beliefs

Salo, M., Olsson, T., Makkonen, M. & Frank, L. 2012. User Perspective on the Adoption of Mobile Augmented Reality Based Applications. In I. Lee (Ed.), Strategy, Adoption, and Competitive Advantage of Mobile Services in the Global Economy. United States: IGI Global, 165-188.

RQ 6: What kinds of overall perceptions do users have on the strengths, the weaknesses, and the constructs affecting usage of PMI?

The sixth article examines 90 actual users' overall perceptions on PMI. Since PMI is substantively different from other IS and mobile contexts, this confirmatory research piece aimed to find out whether the existing knowledge on the strengths, the weaknesses, and the constructs affecting usage intentions holds in the context of PMI. More precisely, the context of the study involves augmented reality-like applications, such as point-of-interest and recognition-based applications. With point-of-interest applications users are able to use their camera-view to browse their surroundings through a dynamic layer containing digital information. Recognition-based applications connect specific digital information with surrounding objects, products, and other targets, with which the user can interact.

As a theoretical frame, we applied the diffusion of innovations theory (Rogers 1995). It suggests that the following five characteristics of an innovation affect the intention to continue or discontinue its use: relative advantage, ease of use, compatibility, trialability, and observability. To complement the quantitative five-construct model, we also collected qualitative evidence and conducted a content analysis of users' perceptions on the strengths and the weaknesses related to PMI.

Based on the results, we found that the five-factor model explains 68% of the variance for the intention to use the PMI application named by the user. Relative advantage, ease of use, and observability had statistically significant and positive relationships with intention to use, but compatibility and trialability did not have such relationships with intention to use. These findings are partly in line with prior studies that have found relative advantage, ease of use, and compatibility as the most consistent constructs affecting IS adoption (e.g. Mallat et al. 2009; Tornatzky & Klein 1982). However, with PMI, observability seems to have an effect, which could be explained by the contextual and visible nature of the application area.

The content analysis of open-ended written evidence further revealed that, for relative advantage, PMI applications have strengths in providing relevant, filtered, and interesting content with unique features compared to other types of applications. The weaknesses related to relative advantage are comprised of technology and hardware issues, application concepts, and content. For example, the users witnessed technical failures and overly demanding device requirements; a lack of actual need for such applications; and poor situation-fit of the content. For ease of use, the selfsame users perceived both strengths and

weaknesses simultaneously. On the one hand, the users considered the applications simple and their interfaces convenient; on the other hand, the users criticized the current ways of presenting information.

As the five-factor model left some variance unexplained, we found that some users appreciated *enjoyment*, as in the joy of using the application, at times even more than the usefulness of the application. The finding confirms that enjoyment is a relevant addition to the theoretical explanations of IS usage in the context of PMI. The inclusion of enjoyment has been proposed for hedonic and leisure IS by, for example, van der Heijden (2004), Abad, Diaz, and Vigo (2010), and Tuunanen, Myers, and Cassab (2010).

5 DISCUSSION

The key results attempt to advance theoretical knowledge of IS usage at the level of explaining critical mobile incidents by presenting new and improved *"understanding of how things are"* and *"why they are as they are"* (Gregor 2006, 624). As is typical for theoretical knowledge at the level of explanation, this thesis aims to offer some generality of the findings but, importantly, presents a rich variety of detailed perceptions, experiences, and explanations. These aspects may be further utilized in practical and managerial actions. Additionally, a part of this thesis also aims to generalize outcomes of critical mobile incidents at the level of explanation and prediction. Such addition of predictive power strives for generalization of *"what will be"* (Gregor 2006, 626). Altogether, the research questions, related results, and contributions are summarized in Table 7.

5.1 Theoretical implications

This thesis demonstrates that single critical mobile incidents are highly meaningful and influential in terms of users' perceptions and behaviors. To take a closer look at these powerful positive and negative incidents, the thesis attempts to present new theoretical explanations for the process of single mobile experiences, as illustrated by the MEP model. Compared to prior research on critical IS-related incidents, the MEP model extends our knowledge by investigating what really happens during crucial experiences more precisely. This approach reveals that critical incidents consist of *many* meaningful elements, even though prior research has typically considered only *one* element or *a limited set* of elements at a given time. Thus, it is suggested that researchers should focus on many process elements simultaneously in addition to just examining rather static constructs affecting (dis)satisfaction, value, or quality. Such a focus has many potential benefits for advancing theoretical knowledge about user perceptions on mobile applications. For example, it can change prevailing assump-

tions; we found that users could associate nearly any mobile application with any type of trigger, interaction, and positive/negative perception.

TABLE 7 Research questions and summary of results and contribution

Research question	*Summary of results and contribution*
RQ 1	
How and why do critical mobile incidents take place and proceed?	A new process model is formed to explain the core elements of mobile experiences: single experiences start with internal/external triggers, continue with telic/paratelic interaction, and end with positive/negative perception. The MEP model aims to extend current knowledge by allowing researchers and practitioners understand *different elements* of single experiences.
RQ 2	
How and why do specific characteristics of the situational context influence different types of mobile users' post-experience behaviors?	Place and application type affect users' post-experience behaviors. For example, users are more likely to communicate word-of-mouth after positive PMI incidents than others. The new results may assist researchers and practitioners in distinguishing which critical incidents are more crucial than others and particularly need managerial attention.
RQ 3	
What are the sources of positive critical incidents of PMI, and why?	PMI can reflect diverse sources with nearly any use purpose. Dominantly, positive critical incidents of PMI derive from improved efficiency and excellence. Additionally, PMI incidents can fascinate users and result in enjoyment. The results point out fundamental characteristics of PMI, such as presentation and immersion capabilities, of which the application providers could take greater advantage.
RQ 4	
What are the sources of negative critical incidents of PMI, and why?	Of the nine-category checklist, the three most cogent sources of negative critical incidents of PMI are technical functionality, content, and interaction. The results reveal new insights on the differences between the perceptions of PMI and other mobile applications.
RQ 5	
What are the sources of users' peak moments with different PMI techniques?	A comprehensive categorization is formed to complement prior comparison studies on different PMI techniques. It adds a category (achievement) that has not been covered in prior comparison studies. The findings include fresh context-specific and comparative insights on each PMI technique.
RQ 6	
What kinds of overall perceptions do users have on the strengths, the weaknesses, and the constructs affecting usage of PMI?	The five-factor model explains 68% of variance in intentions to use PMI and confirms the effects of relative advantage, ease of use, and observability. In addition, the inclusion of enjoyment is suggested. Furthermore, the results present users' argumentation on the strengths and the weaknesses of PMI.

The insights gained and the MEP model could be extended and modified from critical mobile incidents to other IS contexts as well. The MEP model need not be restricted necessarily to the context of mobile or PMI applications, nor experiences that meet the criteria of critical incidents. Therefore, researchers could

attempt to use the MEP model to reach context-specific knowledge and rich descriptions in any given context of IS usage.

It would be tempting to apply the general frame of the MEP model in studying single experiences of any self-services and physical products. The process elements and their main principles of the MEP model are assumed to hold within the contexts of using other self-services and physical products, even though the specific effects and findings may differ among different contexts (e.g., the influence of situational context). Therefore, the general theoretical implications of this thesis may be applicable in those areas of business, sociology, and psychology that investigate user or consumer perceptions. By noting this, the aim is to estimate the potential of the findings in contributing back to the reference disciplines of IS. Researchers have yearned for such contributions, since there is typically only one-way flow from the reference discipline to IS (Lyytinen 2013).

On a more detailed level, the results uncover knowledge concerning the relationships of situational characteristics and user behaviors after critical mobile incidents. As context was established as an important construct regarding mobile usage (Mallat et al. 2009; van der Heijden et al. 2005; Yang et al. 2012), its specific effects on post-experience behaviors needed to be examined more closely. Place and application type have effects on users' post-experience behaviors. Interestingly, there was no statistically significant effect for the level of sociality, even though co-experiences have been highlighted previously in the mobile domain (Battarbee & Koskinen 2005; Teevan et al. 2011). The illustration of the nature of these relationships and their explanations act as the first step in creating new theoretical understanding about the influence of specific situational characteristics and different types of post-experience behaviors. Yet, there is a need for further studies to confirm these first findings.

As far as PMI are concerned, critical incidents of PMI versus other mobile Internet applications have differences in all phases of the experience process. For example, critical PMI incidents begin more often with external triggers than other incidents, and result more likely in word-of-mouth after positive cases. There also seems to be a wide set of reasoning behind the sources of users' positive and negative perceptions of PMI. In the case of PMI, the reasoning is partially similar, but otherwise recognizably distinct, when compared to other mobile Internet applications. These essential differences exist because of the fundamental characteristics of PMI and the novelty of the application area. When creating, modifying, or confirming theoretical knowledge in mobile contexts, these differences among application types should be considered carefully.

The findings also point out a new problem needing a theoretical explanation. Even though half of the users tend to engage in complaining behavior after outstandingly negative experiences of self-service technologies (Meuter et al. 2000), that is not the case with mobile applications. It was discovered that only 6% of the negative mobile critical incidents led to actual complaints. Since the reasoning as to why users *do not* complain about their negative critical incidents

goes beyond the scope of this thesis, researchers are encouraged to search for a theoretical explanation for this finding.

The minor, confirmatory piece of this thesis shows that the rather abstract and general constructs (namely relative advantage, ease of use, and observability) manage to explain much of the variance (68%) for the users' intentions to use PMI. Although those constructs seem to be chosen well and result in a high percentage, they do not uncover many interesting insights or explanations of the actual phenomenon. Thus, it is our own initial piece of research demonstrating that many of the abovementioned detailed issues would have been left uncovered if the research process had continued without diving deep into the context and rich experience descriptions. As the research on IS usage has matured, this thesis also encourages IS researchers to address the call for (qualitative or quantitative) context-specific and in-depth investigation (as mentioned in Section 1).

5.2 Practical implications

The findings contribute to practice by the potential implications for five stakeholder groups: application providers, content providers, device manufacturers, mobile network operators, and users. This thesis demonstrates that the industry stakeholders—application and content providers, device manufacturers, and mobile network operators—should consider not only users' overall perceptions, but also their single experiences and moments. By concentrating merely on overall perceptions (e.g., by using abstract statements in customer satisfaction questionnaires and feedback forms), industry stakeholders might miss the great variety of perceptions behind the overall perception of any certain issue. With the help of the MEP model, industry stakeholders can systematically analyze the elements one by one, reflect each element and its insights within the application of their interest, and then conduct the necessary actions.

To the author's best knowledge, there have been no explanations regarding why critical IS incidents occur in the first place. The new insights on what kind of triggers launch critical incidents may assist industry stakeholders at least with two issues. First, they can engage in communication efforts to ensure that users are aware of the situations wherein they could use their applications. Second, recognizing and utilizing effective external triggers helps them to persuade users to employ their devices and applications. The latter issue is especially relevant with PMI applications, since most of the critical incidents of PMI start with external triggers deriving from the surroundings of the user.

The results note that users interact with mobile applications either in goal-oriented telic, or in activity-oriented paratelic states. With goal-oriented interaction, users tend to have higher pre-defined requirements regarding the experience. Correspondingly, with activity-oriented interaction, users seem to be open to unforeseen, and often quite surprising, events. The findings are new, although researchers have previously found partially similar results; web site us-

ers prefer low arousal in a goal-oriented state and high arousal in an activity-oriented state (Deng & Poole 2010), and users tend to emphasize enjoyment in an activity-oriented state, but both utility and enjoyment in a goal-oriented state (Hassenzahl et al. 2002). With several examples of mobile applications, Venkatesh et al. (2012) recently concluded that the level of a user's overall experience history with the particular technology should steer managerial actions: firms should design and market their technologies differently for inexperienced users than for more experienced users. We would like to attempt to take this conclusion further by adding that mobile applications could be designed and marketed not only by static user profiling, but also by the dynamic interaction state of the user. Since there are differences in whether the user is in goal-oriented or activity-oriented states, the application providers could tune their applications to match the current interaction state of the user. However, identifying the interaction states in design is challenging and may require help or tips from the user.

Regarding user perceptions, this thesis presents numerous potential sources of positive and negative critical incidents that industry stakeholders could note. When compared to other mobile Internet applications, PMI applications struggle with novelty aspects in positive cases and confront teething problems in negative cases. Positive critical incidents of PMI are at times linked with hedonic enjoyment and wow-feelings that might vanish after time has passed. Application providers should aim to turn this novelty value into long-lasting enjoyment through the fundamental strengths of the interaction paradigm (e.g., presentation and immersion capabilities). Negative critical incidents of PMI, in turn, often suffer from incomplete experiences due to rather primitive issues such as bugs and crashes. This finding encourages application providers to test their new and innovative applications thoroughly before market launch, even though PMI providers typically hurry their applications into the highly competitive market.

Given the new insights regarding various characteristics of the situational context, industry stakeholders could avoid potential risks and reach potential rewards. For example, mobile use in outdoor or vehicle settings is considered to have lower risks and higher rewards in terms of favorable post-experience behaviors. To enhance the possibilities for favorable behaviors, application providers could test their applications properly in such demanding surroundings, and cooperate with content providers, device manufacturers, and mobile network operators to ensure all basic functionalities.

The widespread lack of complaints ironically presents a problematic issue for mobile Internet applications, since industry stakeholders learn from complaints (Chea & Luo 2008) and try to convert dissatisfied users to neutral or satisfied users through complaint-based service recovery (Kau & Loh 2006). If users do not complain after negative critical incidents, there are fewer chances for implementing learned lessons and conducting service recovery. The issue is especially relevant with PMI applications, because PMI users tend to discontinue use after negative critical incidents. Therefore, besides the general feedback

options at the application marketplaces, application providers could make specific feedback options easily available for their users. Further, application providers could share this feedback with content providers and device manufacturers to address potential content or device issues.

Finally, this thesis has at least two practical implications for the last stakeholder group: users. First, there are possibilities for participatory users to make efforts and share their views to bridge the gap between industry stakeholders and users. For example, users can communicate their willingness to take part in closed beta tests or give detailed feedback on the versions already in the market. Active user participation is a rich source of information and can contribute to IS success (Ravichandran & Rai 1999, 2000; Venkatesh et al. 2011). Second, the suggested managerial actions of the industry stakeholders can contribute to user behaviors by promoting efficiency and joy, as well as reducing distrust and frustration. Such actions will result, hopefully, in an increased number of positive and a decreased number of negative experiences.

5.3 Limitations

There are several limitations regarding this thesis. First, the MEP model does not fully cover some aspects. For example, the interrelationships between the process elements have been briefly described, but such underlying mechanisms could be specified further in the future. Moreover, the model's current form does not include users' pre-experience conditions and their effects on other elements, per se, although some of the conditions appear in other elements of the model. In addition, the examination of positive and negative perceptions is not symmetric because we selected the approaches that seemed to be the most suitable ones in light of the empirical evidence. As we notice the potential of generalizing the main elements of the MEP model to other IS contexts as well as other self-services and physical products, several issues influence the specific effects and detailed findings (e.g., mobile application type and situational context). Thus, researchers and practitioners should evaluate the suitability of their context of interest before utilizing the results.

Second, the majority of the empirical evidence was collected via online questionnaires, which might make it difficult to ensure the quality and the criticality of the respondents' incidents. To ensure quality, we defined and applied criteria for inclusion, as suggested by several researchers (Bitner et al. 1990; Gremler 2004; Sweeney & Lapp 2004). To back up the criticality of the critical incidents, each respondent rated the level of (dis)satisfaction caused by the incident. The high means of the ratings indicate that the reported incidents indeed were critical. The few other weaknesses of CIT are addressed in Section 3.2.1.

Third, the collected critical incidents related to a variety of applications, but some of the applications were relatively frequent. Although such applications may be the most commonly used and memorable for users, the quantity of

their appearance might have affected some findings by emphasizing certain aspects. It is noteworthy that a balanced distribution of the reported applications would be impossible to reach without forcing respondents to answer about a pre-defined application. This thesis is restricted to single experiences of single applications, although a single experience in some cases may involve the use of several applications or several devices simultaneously.

Fourth, we did overcome the typical limitations of collecting only behavioral *intentions* by collecting also *actual* post-experience behaviors. Nevertheless, both intentions and actual behaviors were self-reported. To complement our evidence, it might be useful to collect actual usage data, for example, with the help of application logs. Additionally, the length of time since the reported incident occurred might have affected actual behaviors, although we documented the times when the incidents had taken place and checked that the characteristics of the situational context had not been centered on any specific time frame.

Fifth, there are challenges related to the content analysis due to its subjective nature. We addressed these challenges by following guidelines presented by Gremler (2004) and Srnka and Koeszegi (2007). Coding the evidence can be especially difficult since boundaries with categorization are "*fuzzy*" (Jacob 2004, 528). To demonstrate that the categorization schemes are proper and applicable with the empirical evidence, we measured consensus estimates of interrater reliability.

In general, other issues related to the quality of the study are discussed in Section 3 and in the articles. The main efforts in ensuring quality include: following guidelines by Gremler (2004) and Srnka and Koeszegi (2007) (articles 1–5); collecting evidence with well-established procedures and wording adapted from prior studies (all articles); matching the group of participants with target population (articles 1, 2, and 5); applying inclusion criteria (articles 1–4); reporting precise and transparent description of each phase of the research process (all articles); discussing methodological issues with other scholars (all articles); measuring interrater reliability (articles 1, 3–5), Cronbach's alpha (article 2), composite reliability, indicator reliabilities, convergent validity, discriminant validity, and construct unidimensionality (article 6); reporting detailed descriptions of the qualitative results (articles 1, 3–6); and finally, presenting descriptions of categorization schemes and quotations (articles 1–5). In spite of the identified limitations, this thesis manages to answer its research questions and provide new theoretical explanations and accurate, practical insights.

5.4 Future research topics

The thesis and its findings open new avenues for future research. First, as the thesis focuses only on single experiences, it would be beneficial to study over time how single experiences link with users' mental aspects, overall perceptions, and subsequent single experiences. For example, it has been suggested that

there are feedback loops between users' post-adoption behaviors, individual cognitions, and (dis)confirmation (Jasperson, Carter & Zmud 2005).

Second, researchers are encouraged to study the impact of already occurred prior use of relevant applications on critical incidents. Research on prior use could consider a longer time period than what this thesis considered by investigating only triggers. These aspects include use history and habits (Gefen 2004; Jasperson et al. 2005; Venkatesh et al. 2012).

Third, the results indicate that each of the core process elements (trigger, interaction, and positive/negative perception) may actually comprise several tiny events. For example, we found out that a chain of events can sum up a negative perception: poor lighting as a contextual issue may cause a failure in technical functionality, which, in turn, may result in failed content delivery. Thus, in the future, researchers can apply even more-detailed inspection of each core element of the process, as well as interrelationships among these elements.

Fourth, the experience descriptions of the respondents hint about a tempting yet excluded issue regarding the pervasive nature of mobile usage: attention. As devices and surroundings flood users with requests and interruptions, users have been reallocating their attention as a limited resource (Rheingold 2012; Vertegaal 2003). For example, it would be timely to study whether the abundance or lack of attention to the IS application in question contributes to the outcomes of a single experience.

Fifth, the results reveal interesting initial insights on critical incidents occurring in a rather unusual situational context for IS: vehicles. It seems that, after critical incidents taking place in vehicles, users might be more likely to engage in favorable behaviors in positive cases and less likely to engage in unfavorable behaviors in negative cases. Unfortunately, the small share of such special incidents in the evidence does not offer any generalizations. Therefore, more research is needed on this special use environment, in which more and more users are nowadays employing their mobile applications.

YHTEENVETO (FINNISH SUMMARY)

Ihmisten näkemykset tuotteita ja palveluita kohtaan rakentuvat osittain yksittäisistä kokemuksista, jotka voidaan jakaa kahteen kategoriaan: tavallisiin kokemuksiin ja kriittisiin kokemuksiin. Kriittiset tuote- ja palvelukokemukset eroavat tavallisista kokemuksista, sillä ne koetaan epätavallisen positiivisina tai negatiivisina. Esimerkiksi yksittäinen tuote- tai palvelukokemus voi saada aikaan suunnatonta hyötyä ja iloa tai vastaavasti aiheuttaa varsin voimakasta suuttumusta ja turhautumista.

Aiempi tutkimus on todennut kriittisten kokemusten olevan erittäin merkittäviä ja vaikutusvaltaisia tuotteiden ja palveluiden käyttäjien sekä niiden tarjoajien välisten suhteiden kannalta. Siksi kriittisten kokemusten tarkastelu onkin ratkaisevaa palveluiden ja tuotteiden tarjoajien kannalta. Kriittiset kokemukset ovat olleet suosittu tutkimuskohde perinteisten palveluiden piirissä jo 90-luvulta lähtien, mutta tietojärjestelmien ja mobiilisovellusten osalta tutkimus on ollut huomattavasti vähäisempää. Edeltävät tutkimukset ovat edistäneet teoreettista ymmärrystä löytämällä kokemuksista esimerkiksi uudenlaisia tyytyväisyyden ja tyytymättömyyden lähteitä. Tietojärjestelmien ja mobiilisovellusten osalta tutkijat eivät ole kuitenkaan vielä kiinnittäneet huomiota kriittisten kokemusten prosessiin ja sen eri osiin. Esimerkiksi kokemusten käynnistymisen syitä tai ympäröivän tilanteellisen kontekstin ja kokemusten jälkeisen käyttäytymisen suhteita ei ole tutkittu. Näitä asioita selvittämällä saataisiin kuitenkin tarkkaa tietoa, jota voidaan hyödyntää tietojärjestelmien suunnittelussa, muotoilussa ja hallinnassa.

Tämä väitöskirja tarttuu havaittuun, varsin tutkimattomaan aihealueeseen selittämällä kriittisiä mobiilikokemuksia kattavasti ja yksityiskohtaisesti. Väitöskirjassa esitetään sadoilta käyttäjiltä kerättyjen, todellisten kriittisten kokemusten avulla yksittäisen mobiilikokemuksen prosessimalli ja kuvaus sen osista. Tutkimus keskittyy erityisesti fyysisen vuorovaikutuksen mobiilisovelluksiin, joiden avulla käyttäjä voi ottaa yhteyden ympäröiviin esineisiin, asioihin tai paikkoihin. Mobiilisovellusten alueella yksittäisten kokemusten merkitys korostuu muun muassa vaihtoehtojen runsauden ja pienten vaihtokustannusten vuoksi. Lisäksi, etenkin fyysisen vuorovaikutuksen mobiilisovellusten todellisten käyttötilanteiden tutkimus on ollut vähäistä.

Tutkimuksen empiirinen osuus koostuu sekä laadullisista että määrällisistä osatutkimuksista, jotka on raportoitu kuudessa tieteellisessä artikkelissa. Tutkimus on ottanut vahvasti vaikutteita fenomenografisesta lähestymistavasta, jonka avulla pyritään ymmärtämään ihmisten moninaisia ja erilaisia kokemuksia tutkittavasta ilmiöstä. Tutkimuksen aineisto on hankittu pääasiassa kriittisen tapahtuman tekniikalla (*eng. critical incident technique*), joka on vakiintunut keino yksittäisten kriittisten kokemusten keräämiseen suoraan käyttäjiltä. Aineistoon on pureuduttu pääosin sisällönanalyysilla, jonka lisäksi tutkimuksessa on hyödynnetty tilastollisia analyysimenetelmiä.

Empiirisen aineiston ja aiemman tutkimuksen peilaamisen perusteella yksittäiset kokemukset koostuvat kuudesta osasta. Kriittinen kokemus alkaa

käynnistäjästä, jota seuraa varsinainen käyttäjän ja mobiilisovelluksen välinen *vuorovaikutus*. Vuorovaikutuksen perusteella käyttäjälle muodostuu joko *positiivinen tai negatiivinen näkemys* kokemuksesta. Kokemuksen aikana käyttäjän näkemykset vaihtelevat jatkuvasti, mihin liittyen käyttäjän kaikista positiivisimpia ja negatiivisimpia hetkiä voidaan kutsua *huippuhetkiksi*. Yksittäiset kokemukset ohjaavat *jatkokäyttäytymistä*: käyttäjä voi kokemuksensa jälkeen jatkaa tai lopettaa sovelluksen käyttämisen, kehottaa muita käyttämään tai olemaan käyttämättä sovellusta ja negatiivisen kokemuksen tapauksessa myös valittaa kokemuksestaan. Sekä jatkokäyttäytymiseen että kokemukseen itseensä vaikuttaa taustalla vallitseva, ympäröivä *tilanteellinen konteksti*. Kukin näistä kuudesta osasta on kuvattu yksityiskohtaisesti keskittyen erityisesti fyysisen vuorovaikutuksen mobiilisovellusten erityispiirteisiin. Esimerkkinä erityisen mielenkiintoisesta tuloksesta on se, että sovelluksen käytön jatkuminen on todennäköisempää positiivisen kokemuksen tapahtuessa ulkona tai kulkuneuvossa kuin sisätiloissa.

Tutkimuksen avulla muodostettu teoreettinen malli ja sen osien yksityiskohtaiset kuvaukset laajentavat nykyistä tietämystä yksittäisten mobiili- ja tietojärjestelmäkokemusten kulusta. Kokonaisvaltainen teoreettinen selitys on tarpeen, sillä tutkijat ovat aiemmin keskittyneet tarkastelemaan kokemusten yhtä osaa tai osien rajallista joukkoa. Tutkimuksen perusteella suositellaankin, että tutkijoiden tulisi huomioida kaikki löydetyt yksittäisten kokemusten osat erityispiirteineen. Ammatinharjoittajat, kuten sovellusten ja sisältöjen tarjoajat sekä laitevalmistajat, voivat hyödyntää saavutettua tutkimustietoa analysoimalla mallin eri osat systemaattisesti, peilaamalla tutkimustuloksia kustakin osasta heidän omaan tai heihin liittyvään sovellukseen ja ryhtymällä tarpeen mukaisiin toimintoihin.

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