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RESEARCH ARTICLE

THE INTERPLAY OF IT USERS' COPING STRATEGIES: UNCOVERING MOMENTARY EMOTIONAL LOAD, ROUTES, AND SEQUENCES[1]

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Despite the positive aspects of information technology (IT) use, it is common for users to experience negative IT incidents. Examples of negative IT incidents include getting lost in an unfamiliar country due to a dysfunctional map application and missing a monetary insurance benefit due to the failure of an activity tracker application. Such incidents can harm IT providers by giving rise to user dissatisfaction, discontinued use, switching, and negative word-of-mouth. To minimize this harm, it is important to understand how users cope after negative incidents. Specifically, information systems (IS) researchers have called for research that uncovers the complex interplay of IT users' coping strategies (e.g., users' coping efforts after employing one strategy and combinations of several consecutive strategies). To address these calls, we conducted a mixed methods study that examined mobile application users' coping strategies after highly negative incidents. We developed a model that explains how users navigate between problem-focused strategies, emotion-focused strategies, and appraisals. As theoretical contributions, we identify coping sequences and distinct routes from the coping strategies, uncover the role of momentary emotional load, and present IT-specific insights. As practical implications, we identify favorable and unfavorable coping strategies and sequences from both the IT providers' and the users' perspectives.

Keywords: Coping, route, sequence, problem-focused, emotion-focused, appraisal, IT incident, IT use

[1]Jason Thatcher was the accepting senior editor for this paper. Corey Angst served as the associate editor.

Introduction

In addition to its many benefits, information technology (IT) use can trigger negative incidents for its users. As IT has become an integral part of users' lives and everyday routines, these negative incidents have become extremely common. For instance, over 80% of mobile application users have abandoned applications because of poor performance (Appdynamics 2017), and 27% have at least one problem every week (Dimensional Research 2015). Examples of negative incidents include getting lost in an unfamiliar area for more than an hour because of a dysfunctional map application and missing an insurance benefit worth $200 due to failure of an activity tracker application (further examples are available in Appendix A). Such incidents can give rise to frustration and anger so intense that users throw their smartphones across the room in exasperation.

Users' negative incidents with IT can cause substantial harm to IT providers: they can result in user dissatisfaction, decreased or discontinued use, increased switching to competitors, and negative reputation (Salo and Frank 2017; Serenko and Stach 2009; Vedadi and Warkentin 2016). These all contribute to user churn, revenue losses, and, eventually, IT providers' inability to support their business and employees. The problem is further exacerbated by the fact that many IT providers operate in highly competitive and overcrowded markets (e.g., the mobile application market), where negative incidents are almost inevitable, alternatives are easy to find, and users are known for their quick use decisions (Appdynamics 2017; Xu et al. 2014). To retain users and remain competitive, IT providers must understand how users cope with negative incidents so they can address users' responses and minimize harm to their business, offerings, and reputation.

Information systems (IS) researchers have emphasized the importance of understanding how users cope with IT (Beaudry and Pinsonneault 2005; Stein et al. 2015; Tarafdar et al. 2019). The concept of coping refers to an individual's changing cognitive and behavioral attempts to manage demanding situations, while coping strategies refer to specific ways of actualizing such attempts in practice (e.g., an attempt to fix an IT failure) (Lazarus and Folkman 1984). Recent IS studies have advanced knowledge about how users cope with negative IT incidents and events (e.g., Beaudry and Pinsonneault 2005; Bhattacherjee et al. 2018; Liang and Xue 2009; Stein et al. 2015). These studies have been valuable in identifying users' appraisals (i.e., an individual's evaluations about an incident) as well as the problem-focused and emotion-focused coping strategies related to them: Primary appraisal (i.e., the personal relevance of an IT incident) and secondary appraisal (i.e., an individual's confidence or control over an IT incident) influence whether users focus on handling the problem or managing their negative emotions. Prior IT coping studies have traditionally viewed the selection and use of a specific coping strategy as the end point of the coping process, although, in reality, coping is a complex and dynamic process that can include several iterations between the strategies and the appraisals (Calmeiro et al. 2014; Folkman 2011; Lazarus 1993). Thus, these studies have not explored various *coping routes*, by which we refer to the ways in which individuals progress from using one problem-focused or emotion-focused coping strategy to using another strategy and/or reappraising the incident (e.g., to reappraise an incident as no longer relevant). Nor have they explored different *coping sequences*, by which we refer to the combinations of two or more consecutive coping strategies that individuals may use (e.g., the use of a problem-focused strategy after an emotion-focused strategy). Table 1 summarizes the study's key concepts.

As such, a gap and a call for research regarding "the sequencing and interplay of problem- and emotion-focused" coping strategies still exist (Beaudry and Pinsonneault 2005, p. 519; Stein et al. 2015). Understanding these complexities is important for several reasons. First, IT users may engage in unfavorable coping, causing harm to IT providers' business. Second, the dynamic nature of coping is emphasized in the IT use context—with many technologies such as mobile applications, users are remarkably impatient (e.g., 49% of users expect mobile applications to respond within two seconds), often experience intense negative emotions (e.g., frustration), and are aware of not only potential helpful updates but also various alternatives from competitors (Appdynamics 2017; Dimensional Research 2015). Third, the research gap reflects an argued mismatch between IT use theories and how IT is actually used in real life (Ortiz de Guinea and Webster 2013). Altogether, users' multifaceted coping strategies and their interplay constitute a critical building block of IT use (Beaudry and Pinsonneault 2005; Stein et al. 2015), which is one of the most central concepts in the IS field (Burton-Jones et al. 2017; Straub and del Giudice 2012). Indeed, it would be impossible to achieve a comprehensive understanding of post-adoptive IT use without considering the complexity of users' coping activities after negative IT incidents.

To address the research gap, we ask two research questions:

(1) How do IT users navigate between problem-focused coping strategies, emotion-focused coping strategies, and appraisals?
(2) What kinds of routes and sequences do the problem-focused strategies, emotion-focused strategies, and appraisals enable?

Table 1. Summary of the Central Concepts with Examples

Concept	Description	Illustrative Example
Coping	The overall set of an individual's dynamic cognitive and behavioral efforts for managing demanding situations.	An overall set of a user's reactions and responses to a mobile application failure.
Coping strategy	A specific way of actualizing a coping attempt in practice.	A user's attempt to fix a mobile application failure by clearing the application's cache and memory.
Appraisal	An individual's subjective (implicit or explicit) evaluations about an incident or a situation in relation to her/himself.	A user's assessment of whether a mobile application failure is relevant in terms of the user's daily activities.
Coping route	The way in which an individual progresses from a problem-focused or emotion-focused coping strategy (e.g., to a reassessment of appraisal or to another coping strategy).	A user's progression from downplaying a personally relevant mobile application failure to reassessing the failure as no longer relevant for her/himself.
Coping sequence	A combination of using two or more consecutive coping strategies.	A user's efforts in responding to a mobile application failure by first venting emotions, then attempting to fix a failure without success, and finally switching to an alternative application.

To answer these questions, we conducted a mixed methods study to develop a model about the interplay of coping strategies and to provide support for the model with a wider population of mobile application users. We chose to focus on the context of mobile applications used for personal purposes for the following reasons:

(1) The mobile application context currently represents one of the most popular forms of IT and reflects many main characteristics of contemporary IT use (e.g., mobility and personalization).

(2) This context highlights common types of negative incidents (e.g., malfunctions) and coping strategies (e.g., switching to an alternative application or downplaying the importance of applications).

(3) Users can often voluntarily decide how their personal mobile applications are used, thus increasing their options for engaging in various coping strategies and sequences.

Our contribution to the IT coping literature is threefold. First, we provide new explanations for the previously unexamined area of how coping potentially continues after an IT user employs a coping strategy. We achieve this by uncovering six popular coping routes and four types of coping sequences that explain how users navigate between problem-focused strategies, emotion-focused strategies, and appraisals. In contrast to previous IT coping studies that treat coping as a rather static, straightforward, and unidirectional phenomenon, our findings about dynamic, complex, and multidirectional coping routes and sequences improve the current understanding of how post-adoptive IT use emerges in reality. The dynamic, complex, and multidirectional nature of coping has received limited attention in many other scholarly domains (Calmeiro et al. 2014; Folkman 2011; Litt et al. 2011). Our study also introduces a technique for collecting sequential real-life data about such coping routes and sequences. Second, our findings provide new insights into (1) the role of momentary emotional load **before** users select their coping strategies (in contrast to the emotions **while** employing the strategies, which has been the focus of several prior studies) and (2) the importance of the **intensity** of emotions (in contrast to the **type** of emotions, which has been the focus of some prior studies). Third, we were able to extract IT- and mobile-specific characteristics related to coping. Such findings contribute to the calls for providing contextualized insights on coping and IT use (Burton-Jones et al. 2017; Lazarus 1993; Venkatesh et al. 2012). As practical implications, we point out favorable and unfavorable coping sequences and strategies from the IT providers' and users' perspectives. The findings increase the potential of IT providers to achieve successful product or service recovery by identifying both problematic and desirable coping sequences and strategies.

Theoretical Background

Theory of Coping

Coping is defined as "constantly changing cognitive and behavioral efforts exerted to manage specific external and/or

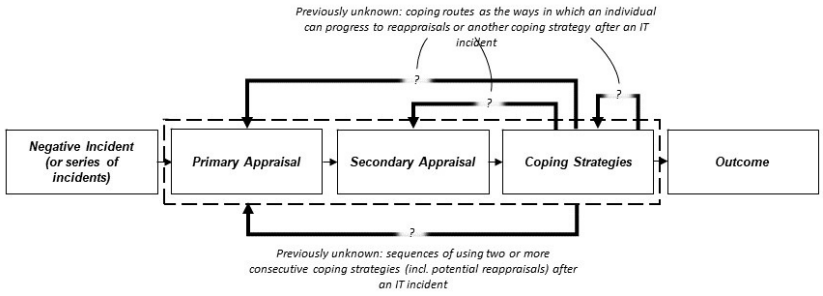


Figure 1. Simplified Illustration of the Coping Process and Research Gaps

internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus and Folkman 1984, p. 141). In the context of IT use, such demands can derive from IT incidents that occur in a user's environment (Beaudry and Pinsonneault 2005; Elie-Dit-Cosaque and Straub 2011). Accordingly, coping refers to a situation in which a user deals with those demands—for instance, by (re)shaping her/his IT use (Beaudry and Pinsonneault 2005; Stein et al. 2015). While positive IT incidents can also reflect many types of user responses and behaviors (Tarafdar et al. 2019), this study focuses on negative IT incidents because of their problematic consequences for IT providers and users.

We chose to apply the theory of coping (Lazarus and Folkman 1984) as our theoretical lens for the following reasons. First, the theory specifically focuses on how individuals deal with negative incidents that derive from their interaction with the environment, thus allowing for an examination of both the IT (i.e., the potential trigger of negative incidents in the IT use context) and the user (i.e., users' responses and behaviors). Second, the theory identifies the key elements that explain how individuals appraise emerging incidents and how such appraisals shape complex responses and vice versa (Folkman and Moskowitz 2004; Lazarus 1993). Third, the theory has provided a useful foundation for understanding behavior in psychology (Folkman 2013; Folkman and Moskowitz 2004; Lazarus 1993) and post-adoptive use in IS (Fadel and Brown 2010; Ortiz de Guinea and Webster 2013).

According to the seminal work by Lazarus and Folkman (1984), the coping process consists of four main steps: a negative incident/situation, appraisals, coping strategies, and an outcome (see also Beaudry and Pinsonneault 2005; Folkman and Moskowitz 2004; Liang and Xue 2009; Ortiz de Guinea and Webster 2013). Coping is typically initiated by a certain incident (or a series of incidents) that conflicts with an individual's goals. As the primary appraisal, an individual (implicitly or explicitly) evaluates the incident's personal relevance and significance (Folkman 2013; Lazarus and Folkman 1984). Further appraisals or coping efforts become salient only if the incident is considered relevant (Lazarus and Folkman 1984). As the secondary appraisal, an individual (implicitly or explicitly) estimates her/his confidence, self-efficacy, and control over the situation (Beaudry and Pinsonneault 2005; Lazarus and Folkman 1984). While the terms *confidence*, *self-efficacy*, and *control* are at times used interchangeably, we employ the term confidence and specify it to refer to an individual's perceptions of her/his ability to handle a negative IT incident. The secondary appraisal influences the individual's selection between the two main coping strategies: problem-focused coping and emotion-focused coping (Carver et al. 1989; Lazarus and Folkman 1984; Liang and Xue 2009). Even though previous research has reported mixed findings, the sense of confidence, self-efficacy, and control tend to lead to problem-focused strategies, while the sense of not having these is associated with emotion-focused strategies (Folkman and Moskowitz 2004). With problem-focused strategies, an individual attempts to address the problem at hand instrumentally and concretely. For example, a user can try to switch to an alternative mobile application after using a failing application. In contrast, an individual engaging in emotion-focused coping aims to address her/his emotions associated with the problem. For instance, a user can air out her/his emotions about an IT incident.

The coping strategies may interplay and appear in sequences (Folkman and Moskowitz 2004; Lazarus 1993; Lazarus and Folkman 1984). Prior studies imply theoretically possible options. For instance, an individual can navigate between problem-focused and emotion-focused strategies when responding to a negative incident (Ben-Zur 2009). The sequences of coping strategies can be based on different routes, including complementary approaches (e.g., handling emotions first and then tackling the problem), reappraisal approaches (e.g., using emotion-focused strategies to reconsider the relevance of the incident), and trial-and-error approaches (e.g., failing to tackle the problem with one strategy and then trying another problem-focused strategy or

managing one's emotions) (Lazarus 1993; Lazarus and Folkman 1984). The ideal outcome of the coping process is closure, meaning there is no longer a prevailing problem or need for coping. However, coping processes do not always end with a clear closure, and individuals can remain stuck with coping (Lazarus 1993).

While prior research in psychology and other domains has presented such initial insights and ideas about the interplay of coping, it has largely overlooked the multidirectional, dynamic nature of coping (Folkman 2011; Litt et al. 2011). For instance, there is limited empirical evidence regarding the recursive interplay between appraisals and coping strategies, individuals' alterations between different coping strategies, and the sequencing of several consecutive coping strategies (Calmeiro et al. 2014; Holt and Dunn 2004). Figure 1 summarizes the coping process and related research gaps.

Prior Studies on Coping with IT

Table 2 summarizes the main findings of prior IT coping research and further illustrates the research gap related to the interplay and sequencing of coping strategies within the context of IT use.[2] Overall, the studies on IT coping posit that users' coping begins with negative or disruptive IT incidents. Examples of these include system failures, user failures, complexity, security issues, and other IT-related changes with adverse outcomes for the user. In line with the theory of coping, the incidents are followed by appraisals as well as the use of problem-focused and emotion-focused strategies.

Consistent with the coping research in psychology (see Folkman and Moskowitz 2004; Lazarus 1993) prior studies on IT coping have found that appraisal plays a key role in steering users toward problem-focused or emotion-focused strategies. Importantly, users' perceptions of high IT confidence, self-efficacy, and control tend to promote problem-focused strategies, while low IT confidence, self-efficacy, and control appear to resonate with emotion-focused strategies. These findings have been demonstrated in the contexts of bank systems (Beaudry and Pinsonneault 2005), enterprise resource planning systems (Elie-Dit-Cosaque and Straub 2011), and administrative software packages (Stein et al. 2015). Both problem-focused and emotion-focused strategies appear to be available regardless of whether the users perceive negative IT incidents as threats or opportunities (Beaudry and Pinsonneault 2005; Elie-Dit-Cosaque and Straub 2011; Liang and Xue 2009; Stein et al. 2015).

Only a few of the IT coping studies include preliminary suggestions about the interplay and the sequencing of appraisals and coping strategies. For example, users' coping efforts in relation to IT incidents can change while they process the situation (Ortiz de Guinea 2016), and coping-related use patterns can appear and disappear when different IT incidents emerge (Ortiz de Guinea and Webster 2013). In a similar way, Stein et al. (2015) reveal that users can have a uniform or mixed-emotion appraisal: they do not necessarily have a static perception about the meaning of the incident. A study by Bhattacherjee et al. (2018) provides initial insights regarding the interplay of different coping strategies; it reports "tentative support" (p. 16) for three transitions in which users can shift from deviant to reluctant responses, from reluctant to compliant responses, and from compliant to engaged responses. Their study further suggests that the transitions are associated with changing appraisals. However, prior studies do not explain exactly how such transitions take place, what other transitions could be possible, or how users progress between different strategies and appraisals.

In sum, we build on the theory of coping and prior studies by applying the recurrent elements of coping: appraisals, problem-focused strategies, and emotion-focused strategies. While many of the prior studies appear to portray IT coping as a straightforward phenomenon with simplified diagrams, they simultaneously acknowledge that there are potentially several routes and sequences regarding the main elements of coping. However, the prior studies are limited in terms of explaining them. Thus, we aim to contribute to the IT coping research by exploring these complexities with our empirical study.

Methods

Explaining the complexity of users' coping processes required detailed data about their real-life responses to negative IT incidents. Therefore, we chose to conduct a study with a qualitative focus because such approaches are deemed useful in uncovering rich information and generating theoretical explanations about complex IT use in real-life contexts (Berg 2004; Venkatesh et al. 2013). We supplemented our qualitative data with quantitative data collected from 750 users to provide wider support for the emerging findings. In short, we conducted a three-phase collection of data (Table 3) about users' appraisals and coping efforts after negative mobile application incidents and analyzed them by applying the theory of coping (Lazarus and Folkman 1984) as an overarching theoretical lens.

[2]We searched for relevant articles in the following ways (Webster and Watson 2002): We sought articles that examine coping in relation to an IT artifact (in a way that fits with the definition of coping presented earlier); identified key articles in premier outlets (e.g., Beaudry and Pinsonneault 2005; Stein et al. 2015); utilized citation searches; and conducted further keyword searches with combinations of the terms "coping," "cope," "information systems," and "information technology" to complement our review.

Table 2. Summary of Central IT Coping Research

Study	IT Context	Main Coping-Related Findings	Interplay and Sequencing of Coping Strategies
Beaudry and Pinsonneault 2005	Account management systems for bank employees	Coping model of user adaptation: identification of four strategies for coping with IT based on primary and secondary appraisals	
Beaudry and Pinsonneault 2010	Applications to support bank account managers	The linkages of four types of emotions with primary and secondary appraisals	
Bhattacherjee et al. 2018	Physicians' use of a hospital patient system	Identifying four user responses to IT: engaged, compliant, reluctant, or deviant	Direct transition possibilities from A) deviant to reluctant, B) reluctant to compliant, and C) compliant to engaged
Burns et al. 2017	Organizational IS	The relationships between psychological capital, coping appraisals, and information security protection	
D'Arcy et al. 2014	Systems emphasizing information security	The effect of security stress and moral disengagement on violation of information security policy	
D'Arcy et al. 2018	Systems emphasizing information security	Replication of the findings of D'Arcy et al. (2014) in a context of a single organization	
Elie-Dit-Cosaque and Straub 2011	An ERP system that changed the ways of working	Developing measures for the model by Beaudry and Pinsonneault (2005) and testing it	
Fadel and Brown 2010	Electronic medical system in a university healthcare department	The relationship between UTAUT factors with primary and secondary appraisals	
Liang and Xue 2010	Spyware and anti-spyware software	The relationship between threat perception and avoidance	
Liang and Xue 2009	*Theoretical*: Safeguarding/ malicious IT	Users' perceptions of the avoidability of IT threats steers the selection of problem-focused and emotion-focused strategies	
Ortiz de Guinea 2016	Work software; word processing software	Conditions for engagement and disengagement strategies	Possibility from engagement to engagement/disengagement
Ortiz de Guinea and Webster 2013	Pager and word processing software	Uncovering of two IT use patterns: adjusting patterns, which turn into automatic patterns over time	
Stein et al. 2015	An administrative software package for universities	Identifying how cues and uniform vs. mixed affective responses yield different IT use patterns	
Tu et al. 2015	Mobile and laptop devices	The relationships between information sources and coping with risk of device loss/theft	
Wang et al. 2017	Phishing emails	Identify three coping responses and related appraisals for phishing detection	
Yin et al. 2018	Use of mobile technologies for work	Information processing timeliness and job control assistant support can increase job satisfaction	

Table 3. Summary of the Data Collection Phases

Phase	Procedure	Users (N)	Goal
1	CIT questionnaire with open-ended questions: preliminary data about users' negative IT incidents	89	To gather preliminary information for understanding users' negative IT incidents and post-incident behaviors
2	Interviews: in-depth insights about users' negative IT incidents and coping efforts	30	To gather detailed information for developing an initial model explaining coping after negative IT incidents
3	CIT questionnaire with open-ended and closed-ended questions: users' coping efforts within a wider population of users	750	To provide support for the emerging model and findings and to complement them

Data Collection

Phase 1. We used an online questionnaire to collect preliminary data about mobile application users' negative incidents with the critical incident technique (CIT). A critical incident is defined as a single experience that a person perceives to be "unusually positive or negative" (Edvardsson and Roos 2001, p. 253). The well-established CIT, originally developed by Flanagan (1954), has several strengths: The incidents are based on real-life instead of hypothetical situations, the technique sorts out critical incidents from other incidents, users can easily report the incidents in their own words, CIT has been found useful for studying emotions, and the descriptions are open and are thus not limited to the researcher's terminology (Butterfield et al. 2005; Gremler 2004; Holloway and Beatty 2008; Serenko and Stach 2009). We adapted wording from previous studies (e.g., Bitner et al. 1990; Meuter et al. 2000) and asked the respondents to "think of a time when [they] had an outstandingly positive or negative experience" with a mobile application. In this study, we only examined the descriptions of negative incidents. We asked the respondents to describe their experiences with details and answer open-ended questions about their efforts and emotions related to the incidents. We distributed the questionnaire to Finnish mobile application users in 2012 via online channels and forums related to news, sports, hobbies, parenting, family, women's magazines, seniors, technology, gaming, business, science, and agriculture. We received descriptions of negative incidents from 89 respondents. Of these, 58 were men and 31 were women; 22 respondents were aged 24 years or under, 33 were aged between 25 and 34 years, 23 were aged between 35 and 44 years, and 11 were aged 45 years or over. Additional details about Phase 1 are available in Appendix B.

Phase 2. We wanted to deepen the insights gained in Phase 1 by interviewing 30 Finnish mobile application users (28 individual interviews and one interview with two users); 23 of the users were interviewed face-to-face and 7 via video. We deliberately sought information-rich mobile application users by using the following criteria: The interviewee had to (1) possess evident experience of using mobile applications in their daily life (more than just testing the applications), (2) have first-hand experiences of negative mobile application incidents, and (3) have the ability to describe their incidents and coping efforts in detail. We contacted potential interviewees by harnessing our networks (e.g., sending interview invitations through social networking services) as well as employing the snowballing technique (Patton 1990). We avoided situations where the interviewer would know the interviewee personally. We followed the main guidelines of interviewing by Myers and Newman (2007). We conducted semi-structured interviews, used the insights gained from our preliminary data, and always left room for new themes to emerge from the interviews (Myers and Newman 2007). We aimed to reduce social dissonance by appearing diplomatic, empathetic, and trustworthy (Myers and Newman 2007). To provide context for our data, we asked the interviewees to describe their background related to IT use and mobile applications. We also asked them various questions about their highly negative incidents with mobile applications, how they had dealt with the incidents, their efforts and behaviors during and after the incidents, and how they felt about the incidents. With our questions, we aimed to gain sequential views of how the interviewees' negative incidents and coping efforts occurred (i.e., narratives). We employed the mirroring technique to focus on the interviewees' own language (Myers and Newman 2007). We conducted interviews until a sufficient level of saturation had been reached—that is, when essentially no new information emerged for the purpose of this study and the benefit of conducting further interviews was deemed marginal. The interviews—conducted in Jyväskylä and Helsinki (Finland) between 2013 and 2016 (due to the evolution of our research project) and lasting 45 minutes on average—were recorded and transcribed for the relevant parts. Of the interviewees, 13 were women and 17 were men. The age of the interviewees ranged from 14 to 53 years. The interviewees varied in terms of IT use experience. Their occupational status varied and included employed, unemployed, student, and pupil. A summary of each interviewee's coping strategies is presented in Appendix B.

Table 4. Phase 3: Background Information of the Questionnaire Respondents (N=750)			
	Frequency		**Frequency**
Gender		**Country of residence**	
Male	415 (55.3%)	USA	750 (100%)
Female	335 (44.7%)	**Mobile application use frequency**	
Age		Daily	731 (97.5%)
18–29	228 (30.4%)	Weekly	16 (2.1%)
30–39	306 (40.8%)	Monthly	3 (0.4%)
40–49	136 (18.1%)	**Self-evaluated level of expertise related to using mobile applications**	
50–59	63 (8.4%)		
60 and over	17 (2.3%)		
Types of mobile applications being used		Very low	4 (0.5%)
		Low	12 (1.6%)
Browsers	700 (93.3%)	Moderate	167 (22.3%)
Video and music	663 (88.4%)	High	269 (35.9%)
Social networking	647 (86.3%)	Very high	298 (39.7%)
Utilities (e.g., email, maps, etc.)	624 (83.2%)	**Mobile device with which the reported application failure incident occurred**	
Shopping	558 (74.4%)		
Games	523 (69.7%)		
Leisure and hobbies	379 (49.3%)	Smartphone	706 (94.1%)
Health	398 (46.9%)	Tablet	44 (5.9%)

Phase 3. Finally, we examined the appraisals, coping strategies, and their interplay with a wider population of mobile application users from the United States. As the data from phases 1 and 2 enabled us to develop a model about the interplay of users' coping strategies (elaborated in the "Data Analysis" section), we employed a CIT questionnaire to provide support for the model and to complement it. In the questionnaire, we asked the respondents to think of a specific time when they had an outstandingly negative experience caused by a mobile application failure (see Bitner et al. 1990; Meuter et al. 2000), name the application, and describe the failure incident. We operationalized the constructs of our model (see Figure 4 in the "Results" section) and asked closed-ended questions about the respondents' initial appraisals of the incident (i.e., personal relevance, momentary emotional load, and confidence for overcoming the IT incident), the coping strategies they employed after the incident (one by one in a temporal order), and their subsequent (re)appraisals after each employed coping strategy. In cases where the respondent reportedly experienced high momentary emotional load, we additionally asked whether the choice of coping strategy was influenced more by her/his momentary emotional load or by her/his confidence for overcoming the IT incident (or lack thereof). We chose to use yes/no answer options for personal relevance, momentary emotional load, and confidence because they enabled us to gain explicit answers to what we really wanted to measure in this particular study. The respondents were also asked to describe why they had employed each coping strategy and to briefly describe their final thoughts and feelings about the failure incident. We constructed the questionnaire to be interactive so that the subsequent questions were based on each respondent's previous answers (i.e., they first selected all coping strategies they had employed and then elaborated on them one by one). An exemplar scenario of the questionnaire's flow is presented in Appendix C. We used our data and the previous literature to carefully select the wording for the questionnaire and made refinements after a pre-test (4 persons) and a pilot test (40 persons). We also consulted a professional proofreader for the phrasing of the questions and instructions. We then launched the questionnaire in early 2019 via the online crowdsourcing platform Amazon Mechanical Turk, which is advantageous for studies that target a large number of people, requires no unique expertise from the respondents, and offers the benefit of anonymous responses (e.g., to minimize the effect of social desirability) (Lowry, D'Arcy et al. 2016; Lowry, Zhang et al. 2016). The behavior of Mechanical Turk users in the United States is comparable to other online and offline settings (Mason and Suri 2012). Details about our quality control procedures are available in Appendix B. We collected data until we reached 750 valid responses. In addition to these, the data collection resulted in 149 invalid responses, which were excluded for various reasons (e.g., no application specified, no incident description, or irrelevant/

inadequate incident description). Because we wanted to focus on personally relevant incidents that require coping, we also excluded responses stating that the described incident was not relevant in the first place. Table 4 presents the background information of the respondents in Phase 3.

Data Analysis

We used established procedures for content analysis (Berg 2004, pp. 285-287): identify overarching categories (e.g., from theory), establish data-driven categories, determine coding scheme and sort the data according to it, and search for patterns. The unit of analysis was the user's perception of coping with negative mobile application incidents. We used the Phase 1 and Phase 2 datasets to develop an initial model, which we then assessed and complemented with the larger dataset from Phase 3.

As advised by Berg (2004), we extracted three overarching categories from the theory of coping (Lazarus and Folkman 1984): appraisals, problem-focused strategies, and emotion-focused strategies. These provided a general structure for analyzing the data. We then read and reread the datasets from phases 1 and 2 to understand them on a more specific level. These examinations enabled us to form data-driven subcategories under each of the three overarching categories (Berg 2004). In practice, we went through the data row by row, coded each relevant text portion (a set of words, a sentence, or a set of sentences) into a subcategory with NVivo software, and followed Berg's advice in assigning the subcategories descriptive labels by using keywords from the data. Appendix B presents details on the development of the subcategories.

To assess the subcategories, we constantly compared whether newly collected evidence supplemented or challenged our previous analyses (Berg 2004). We drafted hand-written memos (i.e., lists of keywords, suggestions for subcategory names, brief descriptions of the content for each subcategory, and visual illustrations of their potential relationships) to sketch candidates for the subcategories, compared them with the data, and refined them to propose a categorization that would best capture the data. We also measured interrater reliability (see Stemler 2004): an independent analyst, blind to the initial codings, coded 50 text portions, of which each reflected one of the four problem-focused or one of the four emotion-focused strategies. The resulting values for the percent-agreement figure (96%) and Cohen's kappa (0.95) indicate a very high level of agreement (Gremler 2004; Stemler 2004). As a result, we formed a coding scheme that contained subcategory names, descriptions, and examples for three appraisals, four problem-focused strategies, and four emotion-focused strategies (Table 5).

We then paid attention to the emerging patterns in the data (Berg 2004). As we had already mapped the main process of coping based on literature, which also gained support from our data, we began to pay closer attention to how the mobile application users proceeded with their coping. Although it may be impossible to identify exclusive paths that perfectly determine human behavior, distinctive patterns emerged. Appendix D presents an example of a coping sequence from one interviewee's narrative.

By **appraisal condition** (see Figure 2), we refer to the situational state of a user's specific appraisal (e.g., high personal relevance). We used the coping literature suggesting that personal relevance is a primary appraisal and is the most principal evaluation of the situation, while other appraisals carry weight only if an incident is perceived as relevant (Lazarus and Folkman 1984). Further, we discovered that momentary emotional load tended to blur the user's mind and impede the evaluation of confidence for overcoming the IT incident. This new finding suggested that momentary emotional load, when prompted, was an important contributor for selecting a coping strategy and that the evaluation of one's confidence tended to be influential mainly in situations with relevant incidents and no overwhelming emotional load. We observed that the data included references to a high level of emotional load coupled with references to emotion-focused strategies (e.g., descriptions of rage paired with venting and descriptions of frustration paired with blaming the IT/oneself). With the absence of momentary emotional load, the users tended to refer to the evaluation of their confidence. In line with the coping literature (Folkman and Moskowitz 2004), high confidence linked especially with problem-focused strategies (e.g., descriptions of high IT-related self-assurance paired with fixing the IT).

For **coping routes** (see Figure 2) and **coping sequences** (see Figure 3), we focused on what happened after users employed the initial problem-focused or emotion-focused strategy. Several tentative routes emerged from the Phase 1 and Phase 2 datasets. For instance, successfully conducted problem-focused strategies could result in a much desired closure (e.g., descriptions of how switching resulted in using another application that worked flawlessly). However, unsuccessful attempts of using problem-focused strategies forced the users to continue the coping process (e.g., descriptions of how switching resulted in using another application that also failed). Regarding emotion-focused coping, we noted a route of emotional rationalization when the users described how they reappraised an incident that was previously perceived as highly relevant (e.g., descriptions of reasoning that diminished the importance of the incident). We also identified emotional unloading, as users described how they released their emotional load and then continued coping (e.g., blaming the IT to

Table 5. Coding Scheme: Categories, Descriptions, and Examples from the Data

Category	Description	Example Based on the Data
Appraisals		
Personal relevance	User's view about the importance of the experienced incident and its consequences for them (i.e., impact and immediacy).	*"[My applications] are of huge importance .... [The big failures] are significant for me."* *"[A payment application] was failing to log in to my account despite correct login information. I was attempting to pay for something very important."*
Momentary emotional load	User's perceived temporary state of feeling intense negative emotions triggered by the incident.	*"The application was so damn slow and clumsy .... It got on my nerves, and I was outraged."* *"I was so pissed off that the app failed me at the worst possible time."*
Confidence for overcoming the IT incident	User's perceptions of their abilities to handle the negative IT incident.	*"I knew how to do [a hard restart], and I was very confident that it would fix the problem."* *"I'm usually good at fixing these types of things."*
Problem-Focused Coping Strategies		
Fixing the IT	User's effort toward applying repair techniques and workarounds to solve the incident.	*"This was the trick .... So I changed the country [in the settings] during the [operating system's] update. So that made [the application] keep on running and working."* *"I tried to clear [the] cache and cookies."*
Adjusting own use to the IT	User's effort toward settling and changing use routines to match the demands of the IT.	*"For the application's battery [draining problem], I have to shut down the application completely [when not using it] or else it will drain the battery entirely."* *"The GPS search in [a browser app] registers me as being in Dallas, Texas. That's a big problem because I live in Ohio … I had to just type in my city into google manually in order to find the appropriate [information]."*
Restraining until updates	User's effort toward waiting for the IT provider's system solution for the incident.	*"In that situation I was kind of thinking that they were 'teething problems,' so I waited thinking that they would be rectified automatically [via an update]."* *"I was hopeful that the developers would quickly come out with an update that would solve the problems with the app."*
Switching the IT	User's effort toward replacing the current IT with a substitute.	*"I had that old [music] application with only old songs [failing to offer new songs]. I got tired of the [old songs] … I just had to get new music, and, therefore, I chose to download the [alternative application]."* *"I switched because there were other apps with higher ratings that worked just fine."*
Emotion-Focused Coping Strategies		
Empathizing with the IT provider	User's effort toward accepting the incident by trying to understand the IT provider's view.	*"With technology, I accept the deficiencies kind of automatically. It's like rooted in my mind that I can't demand first-class quality [from the IT providers]."* *"I found that the developer had abandoned the app. I accepted that and understood their reasons for doing so."*
Downplaying the problem/IT	User's effort toward diminishing the importance of the incident or the meaning of the IT in one's life.	*"I tried to make myself feel better and try not to worry about [a failure of a bank application] so much. It really isn't THAT important, I thought."* *"I perceived [the problem] as a non-significant matter, then. Like this application, so perhaps I just tried to forget it .... Especially for me, it's not that important."*
Blaming the IT/oneself	User's effort toward accusing the IT or themselves for causing the incident.	*"I suspect that [the problem] emerged because I had wrong, old versions [of an operating system or an application] in this device."* *"I felt it was the app's fault because it has issues all the time."*
Online/offline venting	User's effort toward airing out emotions about the incident (alone or with others).	*"[Cursing] In the internet relay chat, I moaned about the dysfunctionality of the supposed standardized [IT]."* *"I was frustrated, and I wanted to let my frustrations out."*

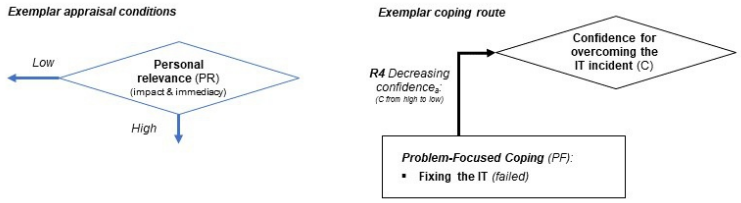


Figure 2. Illustrative Examples of Appraisal Conditions and a Coping Route

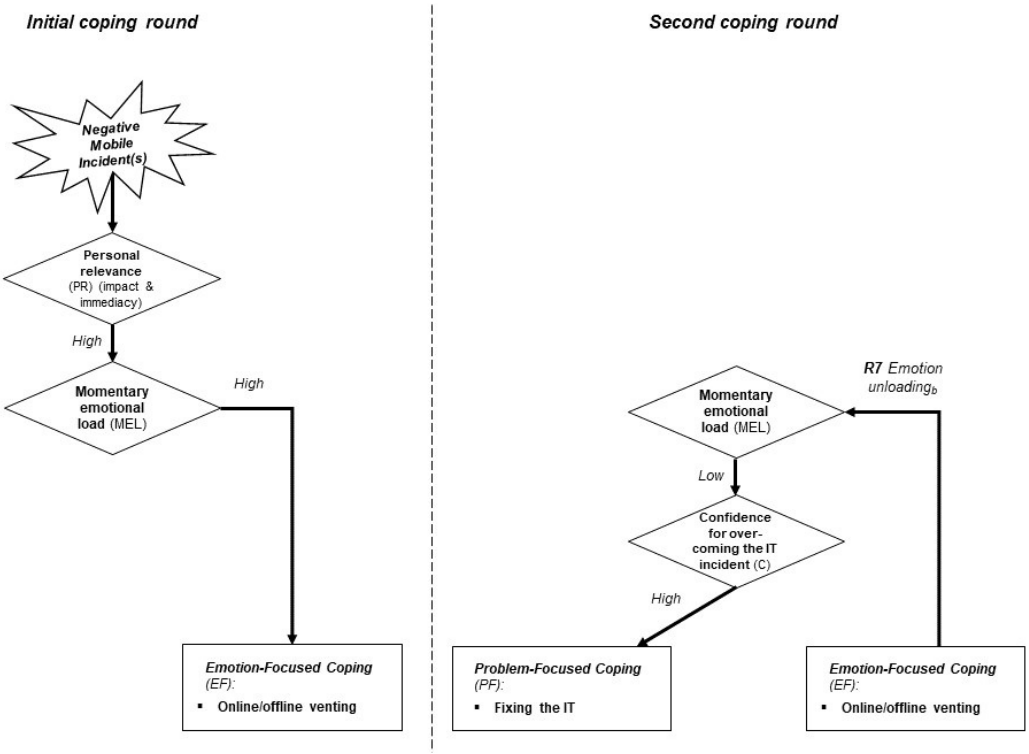


Figure 3. Illustrative Example of a Coping Sequence Including Two Coping Strategies

soothe immediate feelings and then evaluating their confidence). Finally, we observed emotional empowerment, as some users described how they employed a brute-force approach when resorting to problem-focused strategies during an overwhelming emotional load (e.g., first venting frustration and then trying to fix the IT with an impulsive, angry approach). These routes enabled a variety of different coping sequences.

We then analyzed the Phase 3 data in three steps to provide support for the emerging findings and to complement them. First, we extracted the initial appraisals and coping strategies employed immediately after the incident. These appraisals demonstrate the frequencies of how the users proceeded from the incident to their initial coping strategy (Figure 4). Second, we extracted the subsequent (re)appraisals and coping strategies. In this way, we were able to identify the routes originating from the different coping strategies (including the frequencies of how many times each route was taken). To analyze the routes, we compared whether the appraisals or coping strategies had changed from the previous round of coping. There were three general types of routes: (1) a change in appraisal (e.g., momentary emotional load had changed after the employed coping strategy from high to low), (2) no changes in appraisals but a change from an emotion-focused strategy to a problem-focused strategy or vice versa,

and (3) no changes in appraisals but the use of an emotion-focused strategy after an earlier emotion-focused strategy or a problem-focused strategy after an earlier problem-focused strategy. Furthermore, as each change in the appraisal conditions could occur in two ways (i.e., from high to low or from low to high), we include only the more frequently occurring change in our model but also list the less frequently occurring change in Appendix E as an alternative route. We highlighted the most popular routes that accounted for more than 10% of all the routes originating from problem-focused or emotion-focused strategies, respectively. Third, we extracted the users' coping sequences (i.e., the combinations of two or more consecutive coping strategies) by analyzing their initial and subsequent strategies. This procedure enabled us to examine how many strategies the users had reportedly employed, whether these included both problem-focused and emotion-focused strategies, the number of strategies after which some of the users finally achieved closure (i.e., reporting that failure was no longer relevant for them), and how many users remained without closure (i.e., reporting that failure remained relevant for them). We report the frequencies of the coping sequences in Tables 6 and 7.

Results

As a result of our data analysis, we developed a model that explains how users navigate between appraisals, problem-focused strategies, and emotion-focused strategies (summarized in Figure 4 and in Table 5). Four central constructs (personal relevance and confidence as appraisals, problem-focused strategies, and emotion-focused strategies) are derived from the theory of coping (Lazarus 1993; Lazarus and Folkman 1984). The eight IT-specific coping strategies, momentary emotional load, the routes, and the sequences are based on our data. Within our data, the users' incidents were related to applications, such as social networking, news, location-based information, sports, games, music, and photos. They were caused by failures that included poor functionality, inconvenient designs, crashes, bugs, poor content, and unexpected situations. Appendix A presents example incident descriptions.

The users' coping strategies after such incidents were influenced by appraisal conditions related to the personal relevance of the incident, momentary emotional load, and confidence for overcoming the incident. Users undertook four specific problem-focused strategies to address the problem at hand. Similarly, the users engaged in four specific emotion-focused strategies according to which they tried to address the negativity that the incident caused on an emotional level. These problem-focused and emotion-focused strategies did not necessarily lead directly to the situation's closure: We identified different routes through which the users proceeded after employing an initial coping strategy. We also found different coping sequences (i.e., employment of two or more consecutive coping strategies). Figures 2 and 3 illustrate the concepts of appraisal condition, coping route, and coping sequence. The explanations, examples, and quotations are based on the entire data of this study, while the frequencies and percentages are based on the Phase 3 dataset.

Appraisals

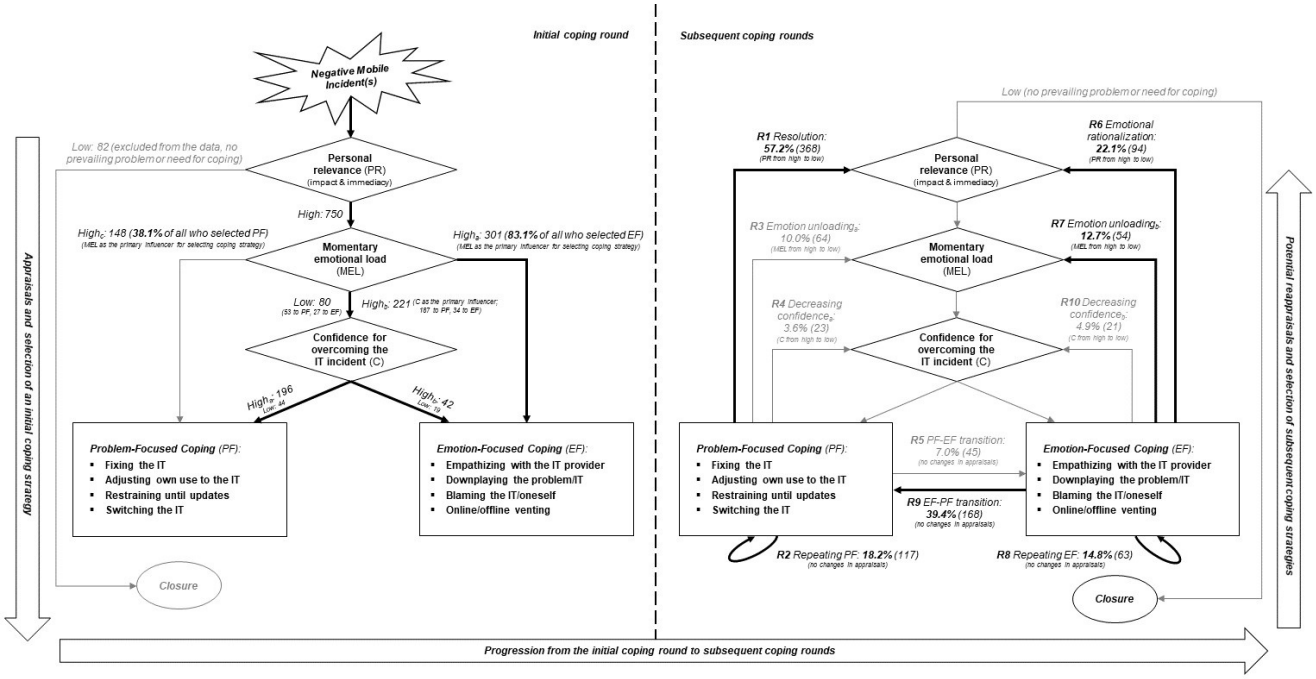
Personal Relevance. Right after the negative incident occurred, users appraised the incident's relevance to them. By personal relevance, we refer to the users' view of whether the experienced incident was important for them. When they perceived the incident's relevance to be high, they engaged with further demeanors about the situation. In cases of low relevance, the users perceived no problem, and the situation rather naturally faded toward closure.

Personal relevance manifested through the impact and immediacy of the negative incident for the user. Examples of high relevance include a user who lost an insurance benefit worth U.S. $200 because a health application could not sync content with another device (i.e., high impact) and another user who, while relying on a smartphone, got lost in an unfamiliar environment because a map application failed to function (i.e., also high immediacy):

> *I was unable to sync my [activity tracker device] with my phone's [application], missed my steps, [and]* ***lost out on insurance rebate of 200 [US dollars] for keeping healthy … I missed my insurance goal****.*

> *I was traveling [by a car] in Italy, and it came to a point where I needed a lot of quick instructions. The [map application] froze and stopped working. I would try to shut it down and restart it, but it kept getting lost ...* ***I was very frustrated because I knew that I was getting lost in a foreign country. There was nowhere around for me to stop and ask for directions. I was heavily relying on the app to get me to my destination … I don't speak the language, so getting directions became very difficult … I was very frustrated with the failure of the app.***

Momentary Emotional Load. When an incident was relevant, it had the potential to raise intense emotions. Within



Notes: Frequencies and percentages are extracted from the Phase 3 dataset. To cover the three options for proceeding from high momentary emotional load, we asked the respondents whether their choice of coping strategy was influenced more by their momentary emotional load or confidence for overcoming the IT incident (or lack thereof). R = Route. The percentages for R1–R5 are relative to all the routes originating from the problem-focused strategies. The percentages for R6–R10 are relative to all the routes originating from the emotion-focused strategies. The number after the percentage refers to the frequency with which each route was taken. The routes that accounted for more than 10% of all the routes originating from problem-focused or emotion-focused strategies, respectively, have been highlighted as popular routes. As each change in the appraisal conditions could occur in two ways (i.e., from high to low or from low to high), we present the more frequently occurring change in this figure but also list the less frequently occurring change in Appendix E.

Figure 4. The Resulting Model Explaining Coping after Negative Mobile Incidents

this study, momentary emotional load refers to the users' overwhelming negative emotions that accumulate because of the incident. The degree of emotional load appeared to pair with the subsequent coping strategies: 67.0% of the users who experienced high emotional momentary load reported it as the primary influencer for selecting their initial coping strategy.

(High) Of the users who engaged in emotion-focused coping as their first coping strategy, 83.1% experienced high momentary emotional load and reported it as the primary influencer in selecting the strategy. In comparison, the corresponding figure for problem-focused coping is 38.1%. Although a set of users reportedly also proceeded to problem-focused coping with high emotional load ($high_b$ and $high_c$ in Figure 4), more than two-thirds of the users who experienced high emotional load and reported it as the primary influencer in their coping strategy selection employed emotion-focused coping ($high_a$ in Figure 4). A high emotional load was demonstrated by such expressions as feeling *extremely frustrated, outraged, angry, agonized,* and *pissed off.* Some of the described emotional reactions were of the utmost intensity (e.g., *"I got mad at the [tablet] machine itself and threw it across the room"*). For instance, one user tried to share pictures with his friend with a mobile application. His high emotional load led him to utter curse words and vent his emotions online:

> *Me and my friend decided to try to share pictures between our smartphones via the device's own near field communication (NFC) application. It was dysfunctional.* ***[I was like] [curse word] how [curse word] this is. I vented about the dysfunctionality of this "supposed to be standardized" technology to my peers online [in internet relay chat (IRC) channels]****.*

(Low) When momentary emotional load was absent, users tended to appraise their confidence for overcoming the IT

incident. Instances of low emotional load include the following expressions: *"I had no special emotion [after the incident]," "I was mildly disappointed,"* and *"I wasn't overly gutted."* As a result, situations without high momentary load tended to move forward rather naturally, as users continued by evaluating their confidence to do something about the incident. For example, one user did not like the new update of his application but felt only mild emotions. He thought about his options for addressing the problem by adjusting his use to the demands of the application:

> *[A public transport planner application] was earlier easy to use and functioned well. Afterwards, it was updated, and the update changed the layout entirely. Since that update, it was difficult to use, at least for me. And I couldn't anymore locate the search functions easily .... **Well, I felt a bit of disappointed and, perhaps, a little bothered.** And then I thought, anyway, that if it's been updated, it should be better or fancier in some way. So that **I'll still make an effort [to use it] and won't give up immediately.***

Confidence for Overcoming the IT Incident. By confidence for overcoming the IT incident, we refer to users' beliefs about their own capabilities to handle the incident. According to our data, such confidence guided the users' choice of coping strategies:

(High) In cases of high confidence, users tended to engage in problem-focused strategies. For example, 80.2% of the users who reported confidence (or lack thereof) as their primary influencer in selecting a problem-focused strategy had high confidence. When users had a strong sense of control via confidence, they believed they were able to address the issues at hand with their own efforts and behaviors. For example, one interviewee's confidence derived from his skills and work-related IT experience directed him toward a problem-focused strategy of fixing the failures himself:

> *Let's say, for example, that there is a broken link. Something simple like that—**it's not a big effort anyway, but probably some people don't have a clue if they should add a slash or a letter "l" [to the mobile browser's navigation bar after the letters "htm"]**. I've fixed [minor problems] more than once .... At my work, I get to fix things like that.*

(Low) With low confidence, there were no apparent differences in terms of the employed coping strategies. In some cases where users were extremely unconfident, doubted their abilities, and felt there was little they could do about the problem, they thought they had no options other than to use emotion-focused strategies. For example, one user told how she lacks competence with mobile applications and thus blames herself for negative incidents and resigns herself to the situation:

> ***Due to my own uncertainty as a user, I often think** that when problems occur or the application doesn't function or anything else, it comes to my mind that **maybe it's my own fault** and not the application's .... **You can't eventually influence many things you don't properly understand**.*

Individual and Contextual Nature of the Appraisals. Personal relevance, momentary emotional load, and confidence for overcoming the IT incident were situationally constructed. Thus, one's appraisal of a given incident was influenced by individual and contextual characteristics. While our study does not focus on identifying all potential factors, we illustrate emerging individual and contextual characteristics with examples. Regarding individual characteristics, previous IT/mobile expertise tended to increase users' confidence: When the users understood the operational principles of the IT and possessed know-how, they had more leverage to overcome the incident at hand (e.g., *"I knew [clearing cache and data memory] was not going to be something difficult, plus I'm a tech guy; it was easy"*). Similarly, personal innovativeness (i.e., a willingness to experiment with new IT) promoted users' confidence because innovative users tended to envision more potential options for overcoming the incident (e.g., *"I like to experiment with all kinds of things related to these [mobile applications]—I always try to figure out the reason why that [failure] occurred"*). Innovativeness could also restrict or delay intense negative emotions as users with high innovativeness tended, at least initially, to approach problems as challenges. Naturally, short-tempered users tended to experience high emotional load by reflex (e.g., *"Well, I have quite a temper, so the frustration made me go on a cussing rant for five minutes"*). Regarding contextual characteristics, the availability of external support (i.e., help and resources from others) increased users' confidence for overcoming the IT incident. For instance, users received tips from friends about how to overcome the incident (e.g., *"I chatted online with a friend who knew another way to see the game I wanted to see, so I actually followed his advice"*). In contrast, lock-in (e.g., an application provider's attempt to tie a user to a specific application) resulted in decreased confidence by restricting certain common problem-focused strategies (e.g., switching). Lock-in made users feel like the use of a specific application is almost mandatory (e.g., "*[A popular messenger] was my primary way of communicating, so I felt very trapped—I could not hear from friends or family"*). Lock-in could also highlight emotional load in cases where the users knew they had no options for handling a particular activity other than using a particular application.

Problem-Focused Coping Strategies and Routes

We elaborate on the four problem-focused strategies and the two popular coping routes that each account for more than 10% of all the routes originating from problem-focused strategies (highlighted in Figure 4). Appendix E summarizes all routes and the frequencies with which they were taken.

Fixing the IT. With this strategy, users aim to solve the negative incidents and application failures on their own. They engage in efforts to gain information about the problem, look for potential solutions, and apply repair techniques to solve the problem. This strategy is highly active: some users may find the problems even stimulating or exciting and put themselves to work to overcome the problem. For example, one of the interviewees stated that he is a sort of *technology freak* and occasionally desires to find fixes or workarounds for application problems. He related that he might put a considerable amount of effort into defining the problem and seeking ways to overcome it:

> Answer (A): ***[I carry out] a careful detection of what might have gone wrong with [the application].***
>
> Question (Q): *What does this "careful detection" mean?*
>
> A: ***Going through the user manual and the [application] menus, and then googling. So, [I google] the name of the application and the malfunction, with different combinations of search words****. Could I find a reason from there that reflects, for example, my device, network settings, and network operator?* ***Should I adjust a setting differently from how the manual instructs, for example? And particularly, will some of the settings of my device influence it, even though it's not stated in the instructions? Usually, you can find pretty good tips for such things from other users.***

He further concluded that the fixing procedure has become routine for him, as he has resolved such application-related challenges numerous times. Consequently, the initially negative incident may even result in a positive sense of achievement.

Adjusting Own Use to the IT. Users may also react to the negative incidents by adjusting their own routines to fit the application: "*When I need the application, I will use [it] even if it was cumbersome or required extra fumbling."* They tend to adjust their behavior in situations where there are few or no alternatives, when the application is undoubtedly necessary, and when they already have considerable use history with the application (e.g., cases where a routinely used application is updated *"in a worse direction"*). Users are willing to adjust because they do not expect to get *"a perfect package"* in free or inexpensive applications. Since the monetary sacrifices are relatively low, it is easier for users to adjust to the deficiencies. For instance, one interviewee thought her incidents of unexpected smartphone battery drain were due to certain applications that consumed considerably more battery power than others. She then tackled those incidents by carrying a charger and using it during the day:

> *Certain applications drain substantially more battery .... It's actually what annoys me .... But I could carry a battery charger with me, so it wasn't like that huge problem .... I could kind of put some effort into it ....* ***For example, just like when some applications drain more battery and the battery might run out during a [school]day, I just could have the battery charger with me and recharge the battery somewhere at school… I just live with it, adjust to it****.*

Restraining until Updates. Since the update cycles for IT—and for mobile applications especially—are often frequent, users may engage in a passive problem-focused strategy by waiting for a fix via an update. Although this strategy may resemble some emotion-focused aspects, it is considered problem-focused because its main aim is to eventually solve the problem. Users may have noticed certain failures with the applications but may conclude that the providers will notice and repair them (e.g., by their testing or with the help of user feedback). They may sometimes confirm this by conducting search queries: *"I searched for information about the bug with a search engine, and others had filed complaints about the problem on the producer's online forums."* Hopes for improvements and updates are higher with applications from well-known brands with a large user base. For instance, one user thought that the forthcoming updates would take care of some deficiencies in his applications:

> *I have the experience that* ***even poor [mobile applications] will improve after waiting a couple of months*** *.... So perhaps sometimes I am optimistic [that] someone else will complain and I'll try to remember it with the next time it'll update.*

Switching the IT. Several users indicated that they address the problems caused by negative incidents simply by switching the application to a similar application or another alternative. Users emphasized how easy it is to find and

download similar substitutes from the application marketplace: *"You can always find more functional applications and leave the poor ones behind."* For instance, a malfunctioning application for a fast food chain caused one user to order food with an application for another fast food chain (i.e., switching both the application and the fast food chain, at least temporarily). Another user ended up switching a sports tracking application because it stopped working. Even though she had preferred the original application, she found new features in an alternative: *"First, [the original application] stopped working, so I had to test a new one. Then, I found various features that I liked from the new [application]… I deleted [the original application] quickly."* She emphasized that regardless of her use history with the original application, it was easy to download and test another. Furthermore, she anticipated that she could reconsider the original application when she buys a new smartphone, since it might be more compatible with a new model.

Route 1: Resolution. Resolution refers to the popular route of solving a problem that caused the incident, thus making the previously relevant incident no longer relevant. Users may reach their aims in fixing the problem, adjusting their use, enjoying an improved update, or switching the application. In such cases, resolution not only brings closure to the incident in question but can also prevent similar incidents from occurring in the future. For example, when one interviewee's music streaming application stopped functioning, she reached a resolution by switching to another similar application:

> *I had a music streaming application. And it stopped working and didn't function anymore like it used to, so* ***I switched it to [substituting music streaming application]*** *.... The original application showed me my old playlist of songs that I had created with it, but I could no longer search for new music .... So I just had to get new music for me to listen to, so then I decided to download [the other music streaming application] .... And* ***then [the substituting application] functioned just faultlessly****.*

Route 2: Repeating Problem-Focused Coping. Another popular route entailed engaging in consecutive problem-focused strategies with no changes in appraisal conditions. As such, personal relevance, momentary emotional load, and confidence for overcoming the IT incident remained unchanged. With this route, users employed either the same or a different problem-focused strategy after the earlier strategy failed to produce a resolution. For instance, a user's health application measured health information falsely. First, the user attempted to fix the IT by changing the application settings. As this did not work, the user decided to buy another device to measure health information:

> *I use almost every day [the health application] to count the number of steps I take, my workout, and the calorie intake count. I had a very good trust in this app until I realized it was failing to count my steps correctly. As an example, it was counting my steps when I was in the car driving. That messed me up because I had less step than what the app was showing .... [Description of fixing the IT:]* ***I went to the account settings to see if it was something that I can stop the step counting while I was in the car, but I couldn't find*** *.... [Description of then switching the IT:]* ***I bought [a fitness smartwatch and] count my steps with [it]****.*

Less Frequent Routes. Routes 3, 4, and 5 were taken less frequently. Route 3 (emotional unloading$_a$) refers to a change in momentary emotional load from high to low, route 4 (decreasing confidence$_a$) to a change in confidence for overcoming the IT incident from high to low, and route 5 (PF-EF transitions) to a direct transition from problem-focused coping to emotion-focused coping with no changes in appraisal conditions.

Emotion-Focused Coping Strategies and Routes

We elaborate on the four emotion-focused strategies and the four popular coping routes that each account for more than 10% of all the routes originating from emotion-focused strategies (Figure 4).

Empathizing with the IT Provider. Users could manage their emotions by compassion: for some users, negative incidents raised feelings of empathy and pity for the application providers. For instance, one interviewee had experienced an incident with a railway company's application. She had attempted to purchase a mobile ticket for herself and her friend, but the application sent both tickets to one email address. She related that *"the ticket purchase doesn't work with the application"* and that the application *"is lacking features when compared to the normal full [website] version."* However, she did not file a complaint. Instead, she thought that the application was still under development and that the railway company likely received a lot of other negative feedback from furious customers:

> *I think I've given feedback to the company about so many [other] issue, [laughs] that I wouldn't bother [complaining] about a mobile application anymore .... The winter season is coming [laughs], so* ***I bet they will get a lot of complaints about other issues … [I had] even a little sympathy [for the company]****.*

Several interviewees thought that the application providers have limited resources and already deal with many complex IT problems. Some even showed respect for the application providers:

> *I can see from [a mobile application] when it has been developed in a limited time-frame that the application developers have spotted. And then* ***I can estimate [the developer's] resources so that I can't ask for too many features to be involved [in the application] … I really consider it quite a respectable achievement when a developer has worked hard to develop a mobile application that could be used by a very large crowd of people.***

Downplaying the Problem/IT. Users also handled their frustration and negative incidents by belittling the problem or the role of the application in their life. Although users described that their incidents were momentarily relevant and influential, their post-incident descriptions included such expressions as *"small applications, small worries"* and *"at the end of the day, the application is not so necessary for me."* One interviewee described how he frequently liked to engage with the online services of a fast food chain. He noticed that the chain advertised a newly launched seasonal mobile application. He downloaded it but soon faced a highly disappointing incident:

> ***I totally broke down because [the fast food chain's application] didn't work****. It started but then it was like, when I clicked a button in a certain place, something should have happened but nothing happened.* ***I was very disappointed****, like, "What is this crap?"*

Despite these strong first reactions, he later downplayed the incident and the role of the application in his life. Although the failure had caused substantial frustration and additionally resulted in a concrete loss (a free cheeseburger), he addressed his emotions by reinterpreting and diminishing the situation:

> *I had no need to [complain] .... Maybe partly because of the redundancy of the application. I did not find it necessary there;* ***if I lose one cheeseburger, it is not crucial for me .... Some [applications] are just kind of bonus for me, like [the fast food chain's application]. It's really only a sort of cream on top of everything else****. If it doesn't work, it doesn't bother me.*

Blaming the IT/Oneself. A segment of the users directed their emotions toward their devices, applications, or themselves by blaming them for the failure. Concerning the devices, users may fault mobile devices in general or the particular device they possess. For example, one user doubted her device, since she was not sure *"if the failure lies in [her] own mobile device or its compatibility with the particular application."* As an example of blaming oneself, one interviewee had an incident where he tried to find an optimal route via a public transport application. Even though he was disappointed that he could not find the much-needed route, he blamed his own actions and capabilities:

> *It was confusing. I managed to come up with a route [within the application], but it appeared to be a weird detour route… I don't know.* ***I probably didn't know how to use it correctly*** *.... It proposed that I use many different vehicles. Although I could've traveled [the same trip] much more directly, it showed me a more difficult option… I ended up going the difficult route ....* ***I didn't know if I had just missed something about [using the application]. Like I didn't understand it properly****.*

IT and self-blame are sometimes intertwined, as the following quotation demonstrates: *"So if some problems occur, I immediately think that it's just a result of [my] overly old phone, that I should buy a new one if I want the application to function."*

Online/Offline Venting. Users also expressed their frustration through online or offline venting. Venting efforts were often routine and included strong curse words. Typical online channels for venting included application marketplaces, social networking sites, instant messengers, and discussion forums. For example, one interviewee described how he had become highly frustrated about applications asking for permission to access personal information, such as photos stored on his mobile device. Instead of bottling up his frustration about such incidents, he expressed it on the internet:

> *If [a TV streaming mobile application] asked me for permission to access all of my photos, I'm not sure whether I'd install it. But, at least,* ***I'd write many grumbling blog posts about it*** *after I'd have or haven't given the access for the application ....* ***If I got a bad feeling, I could vent it****.*

Offline, many users shared their negative incidents with friends and family. Venting may also occur when alone. One of the interviewed users described his experience as follows:

> Q: *Have you approached the service provider? Have you thought about complaining?*
>
> A: *No,* ***I just cursed and opened a beer… I just curse how stupid it is that [a specific feature of the***

> ***application] doesn't apparently work***. *[The feature] works with the corresponding desktop PC application but apparently doesn't work with [the mobile application].*

Route 6: Emotional Rationalization. Emotional rationalization refers to the popular route of users' defensive efforts in processing emotions to reappraise the negative incident and lessen its relevance. With such efforts, users go over what has happened and develop a seemingly plausible explanation about its unimportance. These explanations appear to protect users from further negativity by confirming that the incident seems, after some consideration, to be relatively unimportant for them. As a result, users perceive an incident they previously felt was highly relevant with much lower relevancy and are able to experience at least a temporary closure to the situation. For example, this route was eventually taken by a user who had initially faced a highly significant problem, then invested considerable effort to self-fix the problem, but finally failed to fix it:

> [After describing strong frustration:] Q: *Have you thought about complaining after those [unsuccessful self-fix] situations?*
>
> A: *No, because* ***I'm not used to being awfully dependent on any of such mobile applications****. It's like* ***people have managed to get along [without mobile applications]*** *formerly, back in the good old days and in history. Even though I don't know too much about those days, they say people have been able to get along [without such applications].*

Route 7: Emotional Unloading$_b$. Emotional unloading refers to users' efforts to release or soothe their emotional load raised by the negative incident. As emotional rationalization aimed at finding closure, emotional unloading tries to relieve momentary emotional load to carry on with the coping process (e.g., *"I needed to clear my head, so I let out all my negative feelings so that I could think clearly"*). While users could employ several strategies for emotional unloading (e.g., soothing intense emotions by empathizing with the IT provider), online/offline venting was a recurrent way for them to decrease their momentary emotional load by *"blowing off steam."* Two examples illustrate how venting could reduce the duration of high frustration and help to restore emotional stability:

> *At least* ***the feeling of being pissed off*** *[because of an unpleasant incident with a mobile application]* ***lasts shorter when I air a couple of [virtual] grimaces and [phrasings with a curse word]*** *out somewhere online.*
>
> *I was so angry, anxious, and frustrated* ***I needed to feel better and get my emotions under control before doing anything else!***

Route 8: Repeating Emotion-Focused Coping. Users also employed repeated emotion-focused strategies to cope with the incident. This route did not include changes in personal relevance, momentary emotional load, or confidence. For example, one user was very frustrated with an inoperative dating app—an app that she considered the only choice for online dating in her area. She first expressed her emotions by venting and cursing and then, without any changes in appraisal, she downplayed the problem by calming down and considering positive things:

> *Overall, it was a very negative experience for me, very disappointing .... [A dating application] crashed upon opening most of the time. When it decided to work, the location was always very off, and I kept seeing people from hundreds of thousands of miles away from me and the same 20–30 people's profiles kept showing up, which was very frustrating. Also, I could never engage in conversations with anyone because the app always crashed when I opened up the messages .... [Description of online/offline venting:]* ***Cursing to myself was my natural response to a popular app performing so badly*** *.... [Description of then downplaying the problem/IT:]* ***I tried to calm myself after the app kept refusing to work, telling myself positive things****.*

Route 9: EF-PF Transition. This popular route reflects transitions from emotion-focused strategies to problem-focused strategies without any changes in appraisals. Of the users who followed this route, the vast majority experienced high momentary emotional load (152 with high emotional load and only 16 with low emotional load). As such, they tended to engage in emotional empowerment, referring to situations when users gather the negative emotions raised by the incident and use them as a boost to take up arms against their problem. Such reaction can trigger problem-focused efforts in an impulsive manner. Emotional empowerment can also compensate for low confidence for overcoming the IT incident by enabling problem-focused strategies via a brute-force approach. For example, a user was aggravated because a video chat application kept getting stuck at the loading screen during the startup. The user then downplayed the role of the application and vented to summon the anger and courage needed to address the problem by switching the application to a desktop version:

> *When I opened [the video chat mobile application], it started to update my old messages bit by bit,*

starting from the oldest message! And I had a six-year history [of chat logs] with [that application]! It's like, I never got to the point of reaching even two-year-old messages. ***I just didn't have the nerve to wait****. So* ***I thought that I don't give [a curse word]! So be it! … I can use my desktop computer to take care of what I need [from the application]****.*

Q: *Do you mean that you switched the device?*

A: *Yes. At least [with this application] I did.*

Less Frequent Route. Route 10 (decreasing confidence$_b$) was taken less frequently than the previous routes originating from emotion-focused strategies. It refers to situations where confidence for overcoming the IT incident changed from high to low after employing an emotion-focused strategy.

Table 6 summarizes the number of coping strategies applied by users in each coping round.

Coping Sequences

Our data revealed different sequences for coping. Based on our findings, we propose a grouping of four distinct sequence types: dual coping sequence with closure, maladaptive dual coping sequence (without closure), prolonged coping sequence with closure, and maladaptive prolonged coping sequence (without closure). Table 7 presents the frequencies of these sequences based on the Phase 3 dataset. By **dual coping sequences with closure (18.0% of the users)**, we refer to situations where a user successfully employs a combination of two coping strategies to overcome a negative incident (i.e., the failure is no longer relevant after employing the strategies). By **maladaptive dual coping sequences (without closure) (14.0%)**, we refer to sequences otherwise similar except that no closure is reached (i.e., the failure remains relevant after the strategies are employed). Most of the dual coping sequences (with or without closure) involved both a problem-focused and an emotion-focused strategy. An example of a dual coping sequence with closure is a situation where a user felt frustrated after a mobile banking application failed to deposit a check; he vented his emotions by cursing at the application and solved the problem by switching to another application with a different bank account.

By **prolonged coping sequences with closure (10.1%)**, we refer to situations that involve three or more consecutive coping strategies that eventually lead to closure. Finally, **maladaptive prolonged coping sequences (without closure) (11.1%)** refer to situations involving three or more strategies without reaching closure in regard to the negative incident. For example, a user had remained in a vicious cycle of not finding a proper video application that would work with subtitles (Appendix D). The user portrayed the incident's relevance by emphasizing his need for an application that would work. He estimated that he could easily find an alternative, and he switched to an alternative application that displayed subtitles but failed to work otherwise due to crashes and freezes. He then anticipated updates that never emerged. He regained hope by finding another prospective application that was set to release on his smartphone's operating system but was never released. He invested further effort in searching even more for alternative applications but was disappointed by their poor quality. As such, he repeated multiple cycles of problem-focused attempts without successful closure.

Discussion

With this study, we have attempted to push IS research on coping forward and to assist IT providers in better supporting their users in terms of coping with negative incidents. Particularly, our novel findings have implications for IS researchers who use the theory of coping in explaining post-adoptive IT use. The research contributions and practical implications are presented below.

Contributions to Research

This study makes three contributions to research. First, IS researchers have provided invaluable insights into the selection of coping strategies in IT use contexts, but they have not detailed how coping potentially continues after a user employs a coping strategy. Thus, our findings shed light on this previously uncovered area by explaining the various ways IT users can navigate between problem-focused strategies, emotion-focused strategies, and appraisals. In contrast to what many of the prior studies' models and simplified diagrams imply, our discovery of the different routes and coping sequences shows that coping is not a straightforward process of first evaluating an incident and then using just one strategy. Instead, we found that coping relates to many routes and often occurs in sequences that subsequently involve a mix of problem-focused and emotion-focused strategies. Our findings thus advance knowledge on the complexity of coping in real-life situations, narrowing the gap between IT use theories and the detailed and sometimes messy ways in which IT is actually used in practice (Burton-Jones et al. 2017; Ortiz de Guinea and Webster 2013). This view is supported by psychology researchers (e.g., Folkman 2011; Lazarus 1993; Litt et al. 2011) who have stated that coping is multi-directional, many individuals use more than a single strategy

Table 6. Coping Strategies Applied by Users in Different Rounds

Coping Strategy	% and Number of Users Who Applied the Strategy at Least Once (N=750)	Users per Coping Round #							Total Times Applied
		1	2	3	4	5	6	7	
Fixing the IT	28.9% (217)	138	68	20	7	1	0	0	234
Adjusting own use to the IT	15.5% (116)	43	44	21	9	3	0	0	120
Restraining until updates	24.5% (184)	77	78	39	5	1	1	0	201
Switching the IT	35.2% (264)	130	88	41	11	2	0	0	272
Empathizing with the IT provider	3.5% (26)	10	6	9	1	0	0	0	26
Downplaying the problem/IT	5.3% (40)	22	14	4	0	0	0	0	40
Blaming the IT/oneself	19.1% (143)	73	58	12	4	1	0	1	149
Online/offline venting	41.6% (312)	257	43	13	2	0	0	0	315
Total number of users per round		750	399	159	39	8	1	1	

Table 7. The Frequencies of Employed Coping Sequences

Sequence	PF	EF	PF & EF	Total
No sequence (single coping strategy with closure)	184	67	-	251 (33.5%)
No sequence (single coping strategy without closure)	56	44	-	100 (13.3%)
Dual coping sequence with closure	44	9	82	135 (18.0%)
Maladaptive dual coping sequence (without closure)	27	20	58	105 (14.0%)
Prolonged coping sequence with closure	5	-	71	76 (10.1%)
Maladaptive prolonged coping sequence (without closure)	13	-	70	83 (11.1%)

Notes: PF = Use of only a problem-focused strategy (or strategies); EF = Use of only an emotion-focused strategy (or strategies); PF & EF = Use of both problem-focused and emotion-focused strategies. Frequencies and percentages are extracted from the Phase 3 dataset.

when responding to a negative incident, and individuals' responses can reflect complex mixes of strategies and appraisals. Accordingly, we believe that this view and the complexity of employing multiple coping strategies should be applied in IT use and coping research. Moreover, our model offers leverage for exploring the linkages between users' coping and IT-related stress (i.e., technostress) (Tarafdar et al. 2019).

Our findings provide input for distinguishing effective and desired routes in terms of coping. While resolution by problem-focused strategies can evidently be an effective route, emotional rationalization can also be regarded as a useful route for recasting an initially relevant and impactful incident as no longer relevant and impactful. Emotional rationalization seems to be particularly suitable in the context of mobile application incidents, which often trigger instant frustration due to users' impatient use, the incidents' time-criticality, and their on-the-go nature. Furthermore, we found that many users transition from emotion-focused strategies to problem-focused strategies with intense emotions. While high emotional load did pair with emotion-focused strategies, the finding that emotional load continues to be high for so many users when they shift to problem-focused strategies can be considered rather unexpected. However, not being able to soothe emotions before taking action can be problematic—for instance, restorative activities such as fixing the IT may not be optimally conducted when experiencing overwhelming negative emotions (Folkman and Moskowitz 2004). In such cases, it could be beneficial to have users unload their emotional load instead of employing problem-focused strategies with high frustration or anger. Our study also provides insights into the dynamic and changing nature of appraisals, a previously unmapped territory in IT coping and use research. Indeed, while most prior studies have anchored their investigations on static and stable appraisals of IT incidents, our study presents novel findings about how each incident can reflect more than one state of the same appraisal in a relatively short time, how the appraisals can change, and the types of routes through which the changes occur. To complement the methods used in prior IT coping studies, we also introduce a CIT-based technique for collecting sequential data about users' coping processes.

As the second contribution, our study indicates that momentary emotional load is central to coping in the IT use context. Our findings extend prior IS research, which has proposed that users decide between potential coping strategies based on their evaluation of threat and confidence (or self-efficacy/control) in a given situation. Simultaneously, many prior studies have emphasized the role of emotions **while** employing the strategies (e.g., by emotion-focused strategies) but overlooked the crucial role of emotions **before** selecting a coping strategy. While emotions and their emergence have been identified as central aspects of coping (e.g., Berger 2011; Boekaerts 2002), our study examines the role of intensive emotions in both the initial selection of a coping strategy and the recursive interplay between coping strategies and (re)appraisals. As an implication, researchers can refine their theoretical models by acknowledging the role of emotional load prior to engaging (and re-engaging) in coping strategies.

While a few studies have included some analysis of the emotions related to the selection of coping strategies, they have focused only on specific types of emotions, such as anger versus anxiety (Beaudry and Pinsonneault 2010) or loss, deterrence, achievement, and mixed emotions (Stein et al. 2015). In contrast, our findings indicate that the intensity of emotions can be just as important—or even more important—regarding coping strategy selection. As such, researchers could ask the crucial question, *how intense is the user's emotional load*, instead of (or in addition to) asking questions such as *what types of emotions does the user feel*? Our study provides complementary and somewhat differing findings compared to prior IT coping studies: In many cases, right after the users' highly frustrating IT incidents, intense momentary emotional load appeared to blur the users' thinking process and led them directly to emotion-focused strategies. In those cases, it was rather about the intensity of emotional load than about a certain type of emotion. This finding also offers a possible explanation for the contradictory findings related to confidence (or self-efficacy/control) and coping strategy selection, as researchers have debated whether a sense of high confidence to handle the situation leads to problem-focused strategies and low confidence to emotion-focused strategies (Folkman and Moskowitz 2004). While high confidence paired with problem-focused strategies in our data, the selection of emotion-focused strategies reflected a mix of high and low confidence. Indeed, even users with high confidence (e.g., backed up by expert-level IT skills) engaged in emotion-focused coping. Our data indicate that emotional load was the reason for this in many of these cases. These new insights we discovered open possibilities for IS researchers to continue "unpacking [the] complexity" of post-adoptive IT use in their future research endeavors (Burton-Jones et al. 2017).

As the third contribution, our study uncovers IT- and mobile-specific characteristics related to coping. Coping with IT incidents partially resembles coping with daily stressors (e.g., traffic jams and interpersonal disputes) but differs from coping with major life events (e.g., divorce, death, and unemployment). In line with research on daily stressors, our knowledge on mobile application users' detailed coping efforts transcends the studies of major life events that focus on the overall picture of how people overcome major tragedies (Almeida 2005; Neupert et al. 2016). While both IT incidents and daily stressors tend to reflect intense momentary emotions when daily routines are disturbed, there are certain IT-related characteristics that distinguish coping with IT from many other contexts. First, users can often modify their IT (e.g., mobile applications/devices and related features) and thereby have options for a variety of problem-focused strategies. For example, detailed settings and personalization options provide unique possibilities for fixing the IT. As another example, restraining until software updates is not possible in non-technological contexts. In addition, the IT context often offers immediate and easy options for switching (e.g., via application marketplaces). Second, the technically complicated nature of IT can make users with low confidence engage in self-blame. Simultaneously, the complicated nature of IT can inspire some users with high confidence to be absorbed in the problem and fix it themselves. Third, mobile applications often provide ways to respond to the immediate, real-time demands related to users' daily activities on-the-go. As such, mobile application incidents tend to be short-lived and sudden, which often generates intense emotions (e.g., anger) in cases of setbacks. Table 8 presents the main IT and mobile-specific characteristics related to the different coping strategies.

Additionally, our findings suggest a dualistic role for IT in coping: while IT use is typically seen as the trigger for negative incidents, it can also function as a remedial base for overcoming the incidents. Regarding switching the IT, an alternative IT can function as an aid to resolve a coping situation, especially in the overcrowded and competitive mobile application market. Prior literature on switching echoes this by highlighting that the user-related switching costs (e.g., search, evaluation, and transfer efforts) are low or moderate in such markets (Bhattacherjee et al. 2012; Ray et al. 2012). Regarding restraining until updates, the very same IT causing the incidents can function as a self-correcting tool for eliminating the problem. Nonetheless, users can also experience further disappointment in cases where a hoped-for update does not occur. These insights resonate with previous research emphasizing that dynamic software updates are influential in terms of post-adoptive use (Fleischmann et al. 2016).

Table 8. The Main IT-Specific Characteristics of Each Coping Strategy

Coping Strategy	Main Findings Regarding IT- and Mobile-Specific Characteristics
Fixing the IT	The covert operational principles of IT fascinate and inspire some users to self-fix the problem.
Adjusting own use to the IT	Some users believe that the IT products and services are typically designed to serve large masses rather than to consider the unique needs of a single user.
Restraining until updates	Users are, at times, accustomed to the rapid update cycles of the applications.
Switching the IT	The search engines and related listings in application marketplaces offer easy ways to find, compare, and download numerous alternatives for low or no cost.
Empathizing with the IT provider	Users believe that the application providers already have enough troubles in the complex world of IT products and services.
Downplaying the problem/IT	IT failures may evoke users' desires to become more independent from the IT.
Blaming the IT/oneself	With IT, it is often difficult to tell whether the failure is caused by the application, the device, the provider, or the user.
Online/offline venting	Users are accustomed to venting about IT, and online channels are efficient for airing out emotions.

Regarding fixing the IT, the IT itself can provide a platform for finding a solution to the problem. In this way, fixing and workarounds can occur as reactively applied solutions to technological trigger incidents that obstruct daily routines (Nevo et al. 2016). However, it is not rare that the complexity of the IT or its settings thwarts such remedy potential for fixing the IT.

Implications for Practice

As the main practical contribution, this study's findings promote the chances of IT providers reaching a successful recovery after negative incidents. Traditionally, the literature on product or service recovery has concentrated on the active role of the providers in reacting to failures. However, coping can offer users an alternative way to recovery. In fact, from the providers' perspective, this can often be seen as a preferable way—if successful, users are typically able to solve the problems in an autonomous manner, without active participation from the providers' side.

The eight identified coping strategies can result in different consequences: Some strategies have positive consequences for both the providers and the users, whereas others may also have negative consequences for one or even both of them. Table 9 presents our evaluation of the consequences regarding each strategy. Of the four problem-focused strategies, fixing the IT and adjusting one's own use to the IT are strategies that can have positive consequences for both the providers and the users. In contrast, switching the IT has negative consequences for IT providers, as it typically results in customer churn. For the users, its valence depends on if they can find a better alternative. Restraining until updates appears to be complicated, as it can result in either a solution to the problem or a never-ending wait for an update that will never come. Of the four emotion-focused strategies, empathizing with the IT provider has mainly positive consequences: The providers are forgiven for some faults, and the users do not expect perfection. Downplaying the problem/IT can increase users' detachment from the IT in a healthy way, but it tends to result in a decreased commitment from the providers' perspective. Finally, while blaming and venting may temporarily ease frustration, those strategies can be considered to have mainly negative consequences when they turn into rumination.

IT providers may use our findings to influence their users' selection of coping strategies by making some of them more easy or difficult to employ in comparison to others. The problem-focused strategies are often straightforward for providers to support. For example, providers may aim to promote users' self-fixing activities by making the information and the tools needed for developing the fixes more easily available as well as by establishing online communities in which users can discuss the fixes with their peers and/or developers. In contrast, the emotion-focused strategies are typically somewhat more difficult for providers to support due to their more personal nature, but ways to do this can be found. For example, providers may aim to make themselves easier to empathize with by creating more in-depth and interpersonal relationships with their users. This goal can be achieved through social media or other channels that are able to promote transparency and allow users to communicate more directly with the providers' personnel. Another example

Table 9. Point-of-View Evaluation of the Coping Strategies

	IT Provider	User
Problem-focused strategies		
Fixing the IT	+	+
Adjusting own use to the IT	+	+ / –
Restraining until updates	+ / –	+ / –
Switching the IT	–	+ / –
Emotion-focused strategies		
Empathizing with the IT provider	+	+
Downplaying the problem/IT	–	+ / –
Blaming the IT/oneself	–	–
Online/offline venting	–	–

Notes: In our evaluation, "+" refers to the tendency for potential positive consequences related to a coping strategy, while "–" refers to the tendency for potential negative consequences related to a coping strategy.

concerns online or offline venting, which can present serious business risks for providers, as it has the potential to escalate into negative word-of-mouth. One way to manage this risk is to offer users dedicated venting forums in which the providers are able to address users' outbursts, instead of stories being shared through social media without control or feedback from the providers. Such addressing may mitigate the outbursts or even result in positive word-of-mouth, if users are able to see that providers are taking their worries seriously.

Limitations and Future Topics

There are some limitations and boundary conditions related to this study. First, our approach to collecting data after the negative experiences occurred may be subject to some recall issues (Folkman and Moskowitz 2004). To overcome this, we anchored our questions in incidents that actually happened, instructed the participants to take the time to properly remember the past events, and collected a large amount of data. We also considered that the selected approach was more suitable for this study than two alternative approaches: Using a hypothetical scenario of a negative incident could suffer from the mismatch of what people say they would do in a certain situation and what they would actually do (van der Heijden 2012). Using a laboratory experiment is associated with limitations related to external monitoring, artificial settings, and lack of anonymity. As users tend to behave impulsively with mobile applications (Appdynamics 2017), these limitations could have resulted in less impulsive reactions. Second, it may be impossible to identify exclusive paths that perfectly determine human behavior. Although we were able to identify central appraisal conditions, routes, and coping sequences, there may be more. Third, using yes/no answer options for evaluating appraisals is parsimonious and thus results in certain limitations. Therefore, researchers could consider more detailed answer options/scales from the perspective of their research aims. Fourth, while the model and its key concepts (i.e., momentary emotional load, routes, and coping sequences) can also be applied in other IT contexts, there are aspects that should be carefully evaluated when interpreting the detailed findings that may not be fully generalizable. For example, the mobile application context highlights intense emotions, rapid updates, and availability of alternatives, which may play a less significant role with other types of IT. Similarly, our findings reflect voluntarily used IT and may not be fully applicable to mandatory use (e.g., organizational systems). For instance, the use of such IT that has no alternatives may reflect even longer coping sequences. Fifth, our study focused on highly negative incidents instead of ordinary incidents, which is a typical limitation of CIT (Gremler 2004). Sixth, our findings reflect U.S. and Finnish mobile application users. There may be cultural differences regarding coping behaviors. Finally, our study is subject to certain boundary conditions deriving from the theory of coping and related literature (e.g., Lazarus 1993): The findings assume that coping is initially shaped by appraisals (but may afterward proceed between the appraisals and coping strategies in various orders) and that users' responses are not necessarily rational.

Our findings open up possibilities for future research. First, our data imply that users also engage in coping efforts beforehand to prevent potential negative incidents in the future. Thus, the concept of anticipatory coping (see Harrison and Beatty 2011; Neupert et al. 2016; Newby-Clark 2004) is an interesting area for future studies on IT use. Second, using other methodological approaches could add to the insights found in this study. One potential approach is the experience sampling method, which is a way to request that participants report their immediate or very recent experiences repeatedly during a time period (Fisher and To 2012). The method is

useful for focusing on real-time experiences and minimizing recall bias (D'Arcy and Lowry 2019). Also, while artificial settings may hinder the elicitation of natural emotional responses, researchers could use laboratory experiments to manipulate specific incidents and then observe users' coping efforts in real time. Third, we provided initial findings about individual and contextual characteristics in relation to IT coping. Future research could acquire more details about how coping is influenced by individual habits and characteristics (e.g., personality and stress tolerance) and situational context (e.g., use environment, ongoing activity, and social context). For instance, it would be valuable to understand whether users can override previous coping habits with new ones (e.g., learning a new, potentially better coping strategy). Fourth, to extend research on technostress (e.g., Ayyagari et al. 2011; Pirkkalainen et al. 2019; Ragu-Nathan et al. 2008; Salo et al. 2019), researchers could investigate how single negative incidents with IT may become repetitive and create continuous stress for their users.

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Appendix A

Exemplar Negative Incidents from Our Data

Application Type	Quotation from the Data
Online auction application	So, I was bidding on a vintage video game for my significant other. I had an alarm set on my phone, because I wanted to babysit the final minutes/seconds of the auction. I really wanted to get this for him, and while I did put in a "max" bid, I was willing to go higher depending on what the other bids looked like. I wasn't home, so, I logged into the app on my phone. The app froze. It completely and totally froze. To the point where, I had to complete reset my cell phone to get it off the screen. I was frantic. By the time I logged back in, the auction was over and I lost the item. I still haven't tracked down another one like it .... I started to curse, profusely, because that's just who I am. I express frustration/disbelieve by swearing. That's what happened first .... [Then] I just started blaming the stupid app for crapping out on me. I then blamed myself for not just setting a higher ending bid to be safe. I felt stupid for assuming the technology wouldn't let me down .... [I experienced] total frustration, disappointment, and some sadness. I was super nervous, too, trying to get it done and trying make it work. It really did suck.
Map application	I got lost in some back woods area, turned on [a map application], and not only did it load so slowly, it was killing my battery. I mean everything minute or less I was losing a percent of my battery. Phone started to overheat, I was lost in these woods for over an hour because the app was trying to murder my phone .... I [also] wasted gas and time because of the dang app .... It was irritating.
Messenger application	I had [the light version of a popular messenger application] and decided to switch back to the regular full app because I wanted more access to filters and videos. When I installed the full app it would not let me sign in. I became annoyed that it wasn't working and I thought it was because I had uninstalled/reinstalled. I went back to the [light version of the application] and it also was not working. I could not hear from friends or family and I could not talk to them either. This app is my primary way of communicating so I felt very trapped .... I felt very anxious and worried that it wouldn't ever work again. That I would have to change a major aspect of the way I communicate in order to fix the issue.
Travel agency application	I was looking to book a flight. I was using the app and all of a sudden it froze and would not let me proceed. When I finally got back in to where I left off the flight was booked. I was really upset because it really killed my plans .... I swore out loud .... I had to change my departure times and look for a new flight, which drastically altered my plans .... It was very frustrating, aggravating and stressful. I was angry about the situation.

Appendix B

Additional Details Related to the Data Collection and Analysis

Part of the Study	Additional Details
Data Collection	
Phase 1	Altogether, the questionnaire was opened 970 times and totaled 619 responses. Of the respondents, 605 provided valid responses including a sufficient description of a critical incident (516 positive incidents and 89 negative incidents). A likely reason why positive incidents outnumbered negative incidents could be that mobile applications are often related to enjoyment and entertainment. In this study, we only examined the negative incidents. For negative critical incidents, each respondent rated how much dissatisfaction the incident caused on a five-point scale (1 = "not at all" to 5 = "extremely much"). The mean rating was 3.65, indicating that the incidents were indeed causing substantial dissatisfaction. We categorized the primary sources of the negative incidents as follows: not performing expected functionality (43), complex and difficult design (19), unusually slow (11), crashes (7), lack of content or poor content (7), and user's own inabilities (2).
Phase 2	The total length of the interviews was approximately 23 hours (45 minutes on average per interview), resulting in approximately 630 pages of text (21 pages on average per interview). The interviews were conducted in Finnish (the quotations from the interviews in the Findings section are translations).
Phase 3	As suggested by Lowry, D'Arcy et al. (2016), we used requirements and other actions to ensure the quality of the data: We included only respondents residing in the United States, required that the respondents' approval rate of all their previous tasks was at least 96%, required that they had completed at least 50 tasks successfully within the platform, ensured that the data included only one response from the each Mechanical Turk ID, highlighted that the responses would be analyzed anonymously, explained the scientific importance of the study, asked the respondents to think carefully, and used open questions as attention check questions (e.g., description of the incident). The compensation for the respondents was set above the level of the U.S. minimum wage.
Data Analysis	
Development of the subcategories for appraisals	We noticed that the users made interpretations about the incidents based on three appraisals: personal relevance, momentary emotional load, and confidence for overcoming the IT incident. We observed the appraisal of **personal relevance** because the users employed words such as "significant for me," "important for me," and "very relevant to me" to describe the incidents they had experienced. **Momentary emotional load** was evident because of the users' phrasings such as "I totally broke down," "it was nerve-racking," and "fu#k how much I was pissed off." We identified **confidence for overcoming the IT incident** because of the users' wordings, such as "I thought I could solve it," "I can handle issues like this," and "I'm not good with these kinds of problems." Our findings related to personal relevance and confidence for overcoming the IT incident are in line with the coping literature that recognizes them as essential appraisals (Folkman and Moskowitz 2004; Lazarus 1993; Lazarus and Folkman 1984), while the findings related to momentary emotional load are less discussed in the prior literature on coping and can be considered new. We also noted that the appraisals were influenced by individual and contextual characteristics (e.g., IT/mobile expertise and application lock-in) and, thus, extracted examples of them for illustration.
Development of the subcategories for problem-focused and emotion-focused strategies	Regarding problem-focused strategies, we found several ways in which the users addressed (or tried to address) the problem at hand. For instance, the users' own techniques and workarounds to overcome the problems were categorized as fixing the IT, while their efforts in tackling the problem by migrating to another application or device were labeled as switching the IT. For emotion-focused strategies, the users described ways to manage their emotional reactions. Examples of these include the users' efforts to air out their emerging negative feelings about the incidents (categorized as online/offline venting) and diminishing the importance of the incident and the related IT within their life (categorized as downplaying the problem/IT). In total, we found four subcategories for problem-focused strategies and four subcategories for emotion-focused strategies.
Authors' roles in the data analysis	The first author was the primary analyst. However, we followed the suggestion by Berg (2004) to include more than one researcher in the analysis. Thus, the second author was involved in the analysis in three iterations by (1) going through the initial codings to ensure their fit with the data and suggesting potential refinements to the emerging subcategories and their names, (2) confirming that the sorting of the subcategories under the overarching categories (i.e., appraisal, problem-focused strategies, emotion-focused strategies) was appropriate, and (3) ensuring that the emerging coding scheme was coherent and that nothing essential from his perspective had been left out. We resolved discrepancies by mutual agreement after discussion.

Phases 1 and 2: A Summary of Evidence for the Findings		
	Phase 2: Interviews (N = 30) (Evidence for each category)	**Phase 1: Preliminary CIT Questionnaire (N = 89) (Evidence for each category)**
Negative incident(s)	Descriptions from all interviewees	All respondents
Personal relevance	Descriptions from all interviewees	All respondents
Momentary emotional load	Descriptions from 13 interviewees	42 respondents
Confidence for overcoming the IT incident	Descriptions from all interviewees	All respondents
Fixing the IT	Descriptions from 15 interviewees	8 respondents
Adjusting own use to the IT	Descriptions from 14 interviewees	4 respondents
Restraining until updates	Descriptions from 12 interviewees	4 respondents
Switching the IT	Descriptions from 23 interviewees	10 respondents
Empathizing with the IT provider	Descriptions from 9 interviewees	1 respondent
Downplaying the problem/IT	Descriptions from 17 interviewees	6 respondents
Blaming the IT/oneself	Descriptions from 19 interviewees	19 respondents
Online/offline venting	Descriptions from 10 interviewees	8 respondents

Interviewee, Gender, Age	Fixing the IT	Adjusting Own Use to the IT	Restraining until Updates	Switching the IT	Empathizing with the IT Provider	Down-playing the Problem or the IT	Blaming the IT/Oneself	Online/ Offline Venting
I1, Male, 22	×		×	×	×	×		
I2, Female, 30		×	×	×	×	×		×
I3, Male, 26	×		×			×	×	×
I4, Female, 53			×	×		×		×
I5, Male, 36	×	×		×	×		×	×
I6, Female, 36	×						×	
I7, Female, 21		×	×	×	×	×	×	
I8, Male, 45	×	×	×	×	×	×	×	
I9, Male, 26	×		×		×	×		×
I10, Female, 16	×	×				×	×	
I11, Male, 37		×		×		×		×
I12, Female, 48		×		×			×	
I13, Male, 36				×		×		×
I14, Male, 29	×	×		×			×	
I15, Female, 30				×		×	×	
I16, Male, 18			×	×	×			
I17, Female, 28	×						×	×
I18, Male, 25	×	×	×	×				
I19, Female, 17		×	×	×				
I20, Male, 40		×	×	×	×		×	×
I21, Female, 21	×			×		×		
I22, Male, 27				×		×	×	
I23, Male, 14		×					×	
I24, Female, 20	×			×		×	×	
I25, Male, 23				×	×	×	×	
I26, Male, 17		×		×			×	
I27, Female, 51	×			×		×	×	
I28, Male, 44	×		×				×	
I29, Male, 22		×		×		×		×
I30, Female, 22	×			×			×	

Appendix C

Phase 3: Questionnaire Questions Related to a Critical Incident, Appraisals, and Coping Strategies [With the Authors' Additional Notes]

Critical incident questions:

Think of a specific time when you had **an outstandingly negative experience caused by a mobile application failure**. You can take a few minutes to recall a specific failure experience (we have included this time into our estimate of 5–15 minutes for completing the survey).

- By "mobile," we are referring to smartphones and tablets.
- By "failures," we are referring to application freezes, crashes, bugs, network issues, unusually slow functioning, unusually heavy battery usage, and updates with lost features.

In which mobile application did the failure occur?
[Open question]

In what type of mobile device did the failure occur?

- Smartphone
- Tablet
- Other (please specify)

Please briefly describe the failure experience in your own words.
[Open question]

[Initial appraisal questions:]

In that particular moment, was the failure relevant to you (i.e., was it impactful or immediate)?

- Yes
- No

Right after the failure, did you feel intense negative emotions (i.e., frustration, anger, anxiety, worry, or something similar)?

- Yes
- No

[If answered "Yes" to the previous question:]

Which of the following words best describes the emotions that you felt?
[In randomized order:]

- Anger
- Anxiety
- Frustration
- Worry
- Other (please specify)

Right after the failure, were you confident that you could overcome the failure?

- Yes
- No

[Initial coping strategy questions:]

Please check **all the activities** that you did (or tried to do) as a result of the failure. Take your time and think carefully.
[In randomized order:]

- Switching to an alternative application or another alternative
- Waiting for an update that will help to overcome the failure
- Fixing the failure by changing the settings, through a workaround or otherwise
- Downplaying the failure or the role of the application
- Airing out feelings, grumbling or cursing (alone or with others)
- Empathizing with the application provider and accepting the failure
- Blaming yourself or the technology for the failure
- Adjusting your use routines in order to adapt to the failure

[Questions about second round of appraisals and coping strategies:]

On the previous page, you informed that you did (or tried to do) the following activities as a result of the failure:
[Exemplar scenario:]

- Airing out feelings, grumbling or cursing (alone or with others)
- Fixing the failure by changing the settings, through a workaround or otherwise
- Downplaying the failure or the role of the application

Which of the aforementioned activities did you do (or try to do) first?
[Exemplar scenario:]

- Airing out feelings, grumbling or cursing
- Fixing the failure by changing the settings, through a workaround or otherwise
- Downplaying the failure or the role of the application
- I did not do (or try to do) any further activities *[Available from the second round on]*

[Questionnaire continues until the respondent chooses the option "I did not do (or try to do) any further activities" or reports that the incident was no longer relevant.]

[Phrasing is dependent on the selected strategy in the previous question:]

Please briefly describe why you did (or tried to do) this activity (i.e., airing out feelings, grumbling or cursing).
[Open question]

[Phrasing is dependent on the selected strategy and responses on the previous page:]

My choice of doing (or trying to do) this activity (i.e., airing out feelings, grumbling or cursing) …

- was influenced more by my intense negative emotions (i.e., frustration, anger, anxiety, worry, or something similar).
- was influenced more by my confidence that I could overcome the failure.

[Phrasing is dependent on the selected strategy and the responses on the previous page:]

Right after this activity (i.e., airing out feelings, grumbling or cursing) …

- the failure remained relevant to me (i.e., impactful or immediate).
- the failure was not anymore relevant to me (i.e., neither impactful nor immediate).

[Phrasing is dependent on the selected strategy:]

Right after this activity (i.e., airing out feelings, grumbling or cursing) …

- I felt intense negative emotions (i.e., frustration, anger, anxiety, worry, or something similar).
- I did not feel intense negative emotions (i.e., frustration, anger, anxiety, worry, or something similar).

[Phrasing is dependent on the selected strategy and the responses on the previous page:]

Right after this activity (i.e., airing out feelings, grumbling or cursing) …

- I remained confident that I could overcome the failure.
- I was not anymore confident that I could overcome the failure.

[If answered "I did not do (or try to do) any further activities" or reported that the incident was no longer relevant:]

Please briefly describe your final thoughts and feelings about the failure experience.
[Open question]

Appendix D

Exemplar Chain of Evidence (Maladaptive Prolonged Coping Sequence)

Interviewee and Negative Incident(s)	Appraisal	First Round Coping Strategy and Route	Second Round Coping Strategy and Route	Third Round Coping Strategy and Route	Fourth Round Coping Strategy
Interviewee #18 - Watching videos with a mobile application that leads to failures: "Subtitles of videos coupled with [the default application of a certain smartphone model], it's a 'no-go' since no subtitles work with [the application]."	**Personal relevance (high):** "I had the need to watch, oh, TV series and movies." [Watching videos remained a priority throughout the narrative.] ***Momentary emotional load**: [No references to emotional load.*]* ***Confidence for overcoming the IT incident (high)***: "I think I'm more than average [into IT and applications]. Due to my hobbies, background, and my work circles. More than average I'd say." [This view remained throughout the narrative.]	**Switching the IT**: "So I had the need to make [the subtitles] work with some application. For some time, I was browsing possible alternative applications, and I found this [particular application]." **Route 2 – Repeating problem-focused coping:** "The subtitles were indeed working, but [the alternative application] was every so often really slow and prone to crashes. And it couldn't play large files. So, in practice, viewing videos didn't work with [the alternative application] either."	**Restraining until updates:** "[With the alternative application] I first thought to figure out whether there were some tips for resolving the crashes… There was some [online] discussion about expectations that the application would be updated and rectified at some point." **Route 2 – Repeating problem-focused coping**: "But no, it didn't seem [to be updated]."	**Switching the IT**: "Then I was looking for [yet another] alternative and found [a certain application]. It was made by an open-source foundation… They had this [crowdfunding campaign] so that they also planned to convert the application to [my smartphone's operating system], and I kept waiting for it. It was supposed to be released by the new year." **Route 2 – Repeating problem-focused coping**: "But it hasn't been released to date [long after the supposed release date]."	**Switching the IT**: "Then I was browsing those [other alternative] applications, but there were just plenty of those, uh, cheap copies that promise a certain functionality." **[Remaining without closure:]** "I could already see from the [marketplace's] reviews that the [applications] were just tools for cashing in on people… So that fairly efficiently put a stop to my will to look for alternative applications anymore… [Question:] Have you found a substitute application yet? [Answer:] No, I haven't found one."

*However, we cannot rule out possible emotional load or emotion-focused strategies that would have made this coping sequence even longer.

Appendix E

Phase 3: All Routes

The Frequencies of Employed Coping Routes	
	Relative Frequency
Routes from Emotion Problem-Focused Coping Strategies	
R1 Resolution (PF ➔ PR from high to low)	57.2% (368)
R2 Repeating PF (PF ➔ PF, no changes in appraisals)	18.2% (117)
R3 Emotion unloading (PF ➔ MEL from high to low)	10.0% (64)
Alternative R3 Emotion loading (PF ➔ MEL from low to high)	1.6% (10)
R4 Decreasing confidence (PF ➔ C from high to low)	3.6% (23)
Alternative R4 Increasing confidence (PF ➔ C from low to high)	2.5% (16)
R5 PF-EF transition (PF ➔ EF, no changes in appraisals)	7.0% (45)
Routes from Emotion-Focused Coping Strategies	
R6 Emotional rationalization (EF ➔ PR from high to low)	22.1% (94)
R7 Emotion unloading (EF ➔ MEL from high to low)	12.7% (54)
Alternative R7 Emotion loading (EF ➔ MEL from low to high)	1.6% (7)
R8 Repeating EF (EF ➔ EF, no changes in appraisals)	14.8% (63)
R9 EF-PF transition (EF ➔ PF, no changes in appraisals)	39.4% (168)
R10 Decreasing confidence (EF ➔ C from high to low)	4.9% (21)
Alternative R10 Increasing confidence (EF ➔ C from low to high)	4.5% (19)

Notes: PF = Problem-focused strategy; EF = Emotion-focused strategy; PR = Personal relevance; MEL = Momentary emotional load; C = Confidence for overcoming the IT incident. Frequencies and percentages are extracted from the Phase 3 dataset.