

# COPING WITH DISCREPANT INFORMATION TECHNOLOGY EVENTS: A LITERATURE REVIEW

*Research paper*

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## Abstract

*Coping theory has been used to explain and predict the behaviors of users facing discrepant information technology (IT) events, i.e., unexpected, negative events that occur due to problems and difficulties when using such technology. However, researchers have examined coping by using a vast array of conceptualizations, discrepant IT events, coping strategies, and behaviors, which have led to considerable heterogeneity in the existing literature. Therefore, the present paper demonstrates the results of a comprehensive literature review, identifying and analyzing 27 relevant investigations. The present literature review contributes to the literature by identifying six theoretical implications: (1) coping literature can be subdivided into research streams on technostress, IT adoption and usage, and IT security, (2) the literature disagrees about the antecedents of coping strategies, (3) coping strategies are heterogeneous, (4) coping strategies show interdependences, (5) coping strategies show paradoxical effects, and (6) development of a framework of coping with discrepant IT events. In addition, the paper proposes new directions for future coping research for all three identified research streams.*

*Keywords: IT-events, Coping, Appraisal, Technostress, IT adoption and usage, IT security*

## 1 Introduction

Users of information technology (IT) often perceive discrepant IT events, which are unexpected, negative events that occur due to problems and difficulties with IT (Ortiz de Guinea and Webster, 2013). For instance, users may be confronted with IT complexity and overload (Srivastava et al., 2015) because of new and always changing IT systems (Bala and Venkatesh, 2015) or with IT threats such as viruses or malware (Liang and Xue, 2010). Coping theory is used to explain and predict the behaviors of users facing discrepant IT events (Beaudry and Pinsonneault, 2001); this reflects the increasing importance and focus on coping as it is one, fairly positive way to help manage discrepant IT events.

However, the spectrum of coping literature in information systems (IS) research has used a wide range of technologies, contexts, units of analysis, theories, and research methods. For example, the context of the research varies from technostress to IT security, and from the individual to the organizational level. Different theories and models such as the transactional theory of stress and coping (Lazarus and Folkman, 1984), technology threat avoidance theory (TTATM; Liang and Xue, 2009), the coping model of user adaptation (CMUA; Beaudry and Pinsonneault, 2005), and technology adaptation models (Bala and Venkatesh, 2015) have been utilized to investigate coping in IS research. Also, different coping strategies have been studied such as users removing themselves from the IT event (Galluch et al., 2015), changing the way they use IT (Galluch et al., 2015; Ortiz de Guinea and Webster, 2013), technology adaptation (Bala and Venkatesh, 2015), and IT adoption (Lee and Larsen, 2009).

Therefore, the present paper is a comprehensive literature review designed to obtain a holistic understanding of IS coping by identifying discrepant IT events, applied coping strategies, and their effects in the IS research field over the past more than fifteen years. Reviewing and synthesizing the existing IS literature on coping is valuable to identify currently underinvestigated research issues and select theories and coping strategies, all of which are prerequisites to rigorous future research. This will also help to identify existing research streams, to analyze their strengths and weaknesses, and reveal new directions

for future research. Hence, the following research question (RQ) is answered: *How has coping been investigated in IS literature to explain and predict the behavior of users facing discrepant IT events?*

The main IS journals (e.g., the ‘Basket of Eight’<sup>1</sup>) and conferences (e.g., AMCIS, ECIS, ICIS) regarding coping literature were analyzed. Three main research streams in the coping literature could be identified: coping and technostress, IT adoption and usage, and IT security. Based on the analyses and synthesis, the present examination reveals several general shortcomings of IS coping literature as well as proposes research questions for each research stream.

The paper is organized as follows. First, in the theoretical background section, general coping theory is explained. Following this, the research methodology is described, including the steps of the literature review. The identified literature is subsequently classified and synthesized into the three research streams noted above (i.e., technostress, IT adaptation and use, IT security). Their theoretical implications are discussed and future research directions for each research stream are developed.

## 2 Theoretical Background: Coping Theory

Coping is a function of behavioral, cognitional, and perceptual efforts to handle threatening demands (Pearlin and Schooler, 1978; Lazarus and Folkman, 1984). Coping is initiated by a specific **event** that conflicts with the goals of an individual and leads to the cognitive processes (Folkman and Moskowitz, 2004). Coping theory notes that individuals go through two cognitive processes: primary and secondary appraisal (Lazarus and Folkman, 1984).

The **primary appraisal** evaluates the event as a potential harm/loss, threat, or challenge. Individuals evaluate the potential negative consequences of being threatened by the event. It represents how dangerous an individual perceives the event to be (Lazarus and Folkman, 1984).

Then, the **secondary appraisal** is initiated, which assesses the individual’s ability to handle the perceived event. The perception of the event activates the secondary appraisal, in which individuals assess available action options and decide what they can do to cope. Secondary appraisal evaluates the ability of the individual to handle the event (Lazarus and Folkman, 1984).

Based on these two cognitive processes, the strength of the event (primary appraisal) and the individual’s ability to handle the event (secondary appraisal), each individual then selects a **coping strategy**. There are two major categories: problem-focused coping (PFC) strategies or emotion-focused coping (EFC) strategies (Lazarus and Folkman, 1984; Lazarus, 1999). PFC aims to mitigate the problem and determine the direct problem such as active coping or instrumental support. EFC aims to regulate emotions tight to the event by trying to change negative emotions felt about the event such as acceptance and positive reinterpretation (Lazarus, 1993).

Coping strategies result in different **outcomes** such as job performance and satisfaction (Salo et al., 2015; Beaudry and Pinsonneault, 2005; Bala and Venkatesh, 2015). The coping process is summarized in Figure 1.



Figure 1. Coping process (based on Beaudry and Pinsonneault, 2005)

<sup>1</sup> See <http://aisnet.org/general/custom.asp?page=SeniorScholarBasket>. Said journals are listed in the first eight rows of Table 1.

### 3 Research Methodology: Literature Review

To give a comprehensive overview of IS coping research a literature review has been conducted, structured following the five steps recommended by vom Brocke et al. (2009): (1) definition of review scope, (2) conceptualization of topic, (3) literature search, (4) literature analysis and synthesis, (5) research agenda.

The first step (1) was to define the *scope of the review* by classifying the present research into the taxonomy proposed by Cooper (1988) and shown in Figure 2. The focus of the literature review is on the research outcomes and applications of examinations focusing on coping strategies. The objective is to integrate the results of previous research on coping within IS literature to obtain a holistic understanding of coping. Each article is analyzed in view of the coping process—discrepant IT-events, appraisal, the applied coping strategies, and the outcomes (see Figure 1)—to analyze which coping strategies are applied and which discrepant IT-event faced, and to show the effects of coping strategies on the outcomes. Hence, the present paper is organized along a conceptual structure. The literature review takes a neutral perspective in representing previous results. The audience addressed by the literature review are specialized scholars interested in coping with regard to discrepant IT-events. According to the taxonomy, the coverage can be classified as representative, as it is limited to a sample of representative articles, but does not explicitly consider the entirety of the literature.

Characteristics	Categories			
Focus	research outcomes	research methods	Theories	Applications
Goal	Integration	Criticism		central issues
Organization	Historical	Conceptual		Methodological
Perspective	neutral representation		espousal of position	
Audience	specialized scholars	general scholars	practitioners/politicians	general public
Coverage	Exhaustive	exhaustive and selective	Representative	central/pivotal

Figure 2. Taxonomy of the review (based on Cooper, 1988)

The second step is (2) *conceptualization of the topic*. As shown in section two, the present literature review was based on the process of coping encompassing IT-events, appraisal, coping strategies, and outcomes (Lazarus and Folkman, 1984). The third step (3), *literature search*, considered the sources presented in Table 1. These sources are selected based on the Senior Scholars' Basket of Journals. Table 1 lists the investigated journals and conferences, the respective search fields and the coverage.

Also, hits resulting from a query using the keywords coping, problem- and emotion-focused coping, and coping strategies are presented for each journal or conference. The decision whether an identified article was analyzed in detail was made based on the title and the abstract. If the title was relevant to the focus of this review, the abstract was screened to make a final decision. A major aim of the literature analysis was to provide an overview of coping research within the IS literature. Thus all available research published between 2000 and 2017 that was based on coping theory (Lazarus and Folkman, 1984; Beaudry and Pinsonneault, 2005; Liang and Xue, 2009) and considered at least one coping strategy applied by users was included. Studies were excluded when they did not consider coping theory or when they investigated organizational working conditions or external organizational mechanisms to counteract discrepant IT events that were not experienced by the users themselves. Following this process, 24 articles were determined to be relevant. Subsequently, a backward and forward search was conducted (Webster and Watson, 2002), in which only high-ranked and current examinations were considered. This search revealed three additional articles, such that 27 articles were identified as relevant for this literature review.

Senior Scholars' Basket of Journals	Search fields	Coverage	Hits	Analyzed		
Management Information System Quarterly	Title, Abstract, Keywords	2000 - 2017	10	5		
European Journal of Information Systems			4	3		
Information Systems Journal			5	2		
Journal of Information Technology			0	0		
Information Systems Research			2	1		
Journal of Management Information Systems			3	1		
Journal of Strategic Information Systems			1	0		
Journal of Association of Information Systems			3	1		
<b>Conferences</b>						
International Conference on Information Systems			34	6		
European Conference on Information Systems			14	1		
American Conference on Information Systems			52	4		
Back and forwards search					3	
Total sum					Σ 128	Σ 27

Table 1. Number of hits and identified publications for each journal or conference

## 4 Result of Literature Analysis

The identified research articles were subdivided into different units of analysis as suggested by Webster and Watson (2002). An interpretive coding method was used to identify and analyze the objectives of each article (Myers, 2013). For example, the research objective of Galluch et al. (2015) was to analyze whether discrepant IT events lead to strain responses and whether coping strategies reduces these effects. As strain responses are mainly investigated in the technostress research stream, this paper was thus assigned to this research stream. Based on this method, the following three distinct units of analysis could be identified: coping and technostress, coping and IT adoption and usage, and coping and IT security. Each research stream is synthesized and analyzed in the following sections.

### 4.1 Coping and technostress

Coping and technostress are closely intertwined. For instance, Weinert et al. (2013) developed a conceptual model of technostress and coping. They theorized that primary and secondary appraisal lead to PFC and EFC, which in turn influences technostress. In particular, they assumed that coping moderated the relationship between discrepant IT events<sup>2</sup> and strain responses, which are psychological and physiological responses to the discrepant IT event.

Some investigations have validated these influences empirically. It is suggested that the application of coping strategies regarding method control and resource control moderate the relationship between overload and conflict and psychological and physiological strain responses. Coping had no effect on the relationship between overload and conflict and psychological responses, whereas resource control decreased the relationship between overload and physiological responses, and method control decreased the relationship between conflict and physiological responses (Galluch et al., 2015). Another investigation examined whether coping influences anxiety, stress, and depression among IT personnel. Five different coping strategies were studied: social support, active coping, cognitive avoidance coping, self-controlling coping, and accepting responsibility coping. The findings indicated that active coping had no significant effect on anxiety, stress, and depression, whereas all other coping strategies positively affected these dependent variables (Love et al., 2004).

In addition, research suggests that the effect of technostress creators (overload, invasion, complexity, insecurity, uncertainty) on job burnout, as well as on job engagement, is moderated by dominant personality traits such as openness-to-experience, neuroticism, agreeableness, conscientiousness, and extraversion. Their findings showed that extraversion reduced the effect between technostress creators and job burnout and neuroticism reduced the effect between technostress creators and job engagement. Agreeableness increased the relationship between technostress creators and job burnout, and openness enhanced the effect between technostress creators on job engagement (Srivastava et al., 2015). A recent

<sup>2</sup> The terms 'discrepant IT event' and 'IT stressors' are used interchangeably throughout.

investigation examined whether emotion-focused coping strategies such as distress, venting and distancing from IT moderates the relation between technostress creator and strain. Also, they investigated the role of IT control in this context. Results showed that distress venting reduces the effect of technostress creators on strain but only when users have low IT control. Furthermore, they revealed that distress venting has a direct positive effect on strain such that the higher distress venting the higher strain (Pirkkalainen et al., 2017).

The technostress concept has been extended to the domain of IT security. They investigated overload, complexity, and uncertainty, which creates stress in employees. It was theorized that security-related stress (SRS) influences information security policy (ISP) violations and that coping mediates this relationship. In particular, it was assumed that the EFC strategy—moral disengagement—mediates the relationship between SRS and ISP violation intention. The results showed that moral disengagement increased ISP violation intention significantly and indicated that moral disengagement plays a mediating role between SRS and ISP violation intention (D'Arcy et al., 2014). Herrington et al. (2007) identified in their qualitative study five different discrepant IT events experienced by students in their computer program, namely demanding coursework, lack of confidence, time requirements, unbalanced life, and difficult professors. Students coped with these discrepant IT events by applying avoidance, comedic displacement, planning, and realism. Based on these results, a framework was developed to indicate how students cope with discrepant IT events and stay within the computing discipline. Results of the studies reviewed within the research stream of technostress are summarized in Table 2.

Discrepant IT event	Appraisal		Coping strategy	Outcome (variables are highlighted)	Reference
	1.	2.			
Overload	-	-	Method control (PFC)	Method control increases the relationship between overload and <b>physiological strain responses (alpha-amylase)</b> .	(Galluch et al., 2015)
	-	-	Resource control (PFC)	Resource control decreases the relationship between overload and <b>physiological strain responses (alpha-amylase)</b> .	
Conflict	-	-	Method control (PFC)	Method control decreases the relationship between conflict and <b>physiological strain responses (alpha-amylase)</b> .	(Galluch et al., 2015)
	-	-	Resource control (PFC)	Resource control increases the relationship between conflict and <b>physiological strain responses (alpha-amylase)</b> .	
IT related issues	-	-	Social support (EFC)	Social support is related with high <b>anxiety</b> , high <b>stress</b> , and high <b>depression</b> .	(Love et al., 2004)
	-	-	Active coping (PFC)	Active coping has no significant relationship with <b>anxiety</b> , <b>stress</b> , and <b>depression</b> .	
	-	-	Cognitive avoidance coping (EFC)	Cognitive avoidance coping is related to high <b>anxiety</b> , high <b>stress</b> , and high <b>depression</b> .	
	-	-	Self-controlling coping (EFC)	Self-controlling coping is related with high <b>anxiety</b> , high <b>stress</b> , and high <b>depression</b> .	
	-	-	Accepting responsibility coping (EFC)	Self-controlling coping is related with high <b>anxiety</b> , high <b>stress</b> , and high <b>depression</b> .	
Technostress creators (overload, invasion, complexity, insecurity, uncertainty)	-	-	Conscientiousness (EFC)	Conscientiousness has no effect on <b>job burnout</b> or on <b>job engagement</b> .	(Srivastava et al., 2015)
	-	-	Extraversion (EFC)	Extraversion reduces the effect of technostress creators on <b>job burnout</b> .	
	-	-	Openness (EFC)	Openness increases the effect of technostress creators on <b>job engagement</b> .	
	-	-	Neuroticism (EFC)	Neuroticism increases <b>job burnout</b> and decreases <b>job engagement</b> as well as reduces the effect of technostress creators on <b>job engagement</b> .	
	-	-	Agreeableness (EFC)	Agreeableness increases <b>job engagement</b> and the relationship between technostress creators and <b>job burnout</b> .	
Security-related stress (overload, complexity, uncertainty)	-	-	Moral disengagement (EFC)	Moral disengagement increases the <b>information security policy violation intention</b> , and it mediates the relationship between security-related stress and <b>information security policy violation intention</b> .	(D'Arcy et al., 2014)
Technostress creators (overload, invasion, complexity, insecurity, uncertainty)	-	-	Distress venting (EFC)	Distress venting reduces the relation between technostress creators and <b>strain (emotional exhaustion)</b> and increases <b>strain (emotional exhaustion)</b> directly.	(Pirkkalainen et al., 2017)
	-	-	Distancing from IT (EFC)	Distancing from IT has no significant effect.	

Note: - = has not been considered; Only articles by which a discrepant IT event and a corresponding coping strategy could be identified are listed.

Table 2. Overview of the results within the research stream of technostress

## 4.2 Coping and IT adoption and usage

Coping strategies have also been investigated in the IT adoption research stream, mostly applied to increase IT usage. The well-known coping model of user adaptation (CMUA) states that the evaluation of the discrepant IT event starts with primary appraisal, in which users assess the discrepant IT event as either threat or opportunity. The assessment of the discrepant IT event follows an evaluation of the amount of control and the resources users have to estimate the coping possibilities. Coping here uses four different adaptation strategies (benefits maximizing, benefits satisfying, self-preservation, and disturbance handling), each containing different PFC and EFC strategies, which are determined by primary and secondary appraisal. Each strategy is assumed to result in three different outcomes: restoring emotional stability, minimizing the perceived threats of the technology, and improving user effectiveness and efficiency (Beaudry and Pinsonneault, 2005). However, the CMUA has been conceptually developed such that the following examination validates its statistical robustness. Their results show that the four strategies of adaptation (benefits maximizing, benefits satisfying, self-preservation, and disturbance handling) are empirically distinct from each other and the appraisal process leads to the theorized adaptation strategies (Elie-dit-Cosaque, 2007; Elie-Dit-Cosaque and Straub, 2011).

The application of the CMUA in the context of emotions shows that coping strategies such as venting, seeking social support, and distancing mediate the relationship between negative emotions (anger, anxiety) and IT use, whereas task adaptation and seeking instrumental support mediate the relationship between positive emotions (happiness, excitement) and IT use (Beaudry and Pinsonneault, 2010). The following investigation extended this study and investigated how users cope with uniform and mixed emotions and how these coping strategies are reflected in patterns of IT use; their results indicate that users cope with mixed emotions by applying combined coping strategies (Stein et al., 2015). A recent investigation is based on the CMUA to predict usage behavior in mandated situations where users have no free decision whether or not to use the IS. They concentrate on an implementation of an IS and propose, based on the appraisal process, four different user responses such as engaged, compliant, reluctant, or deviant. For example, they argue that users appraising the IS as a threat have a low-control response in a deviant way by using workarounds, whereas users appraising the IS as opportunity have a high-control response in an engaging way by experimenting with the IS (Bhattacharjee et al., 2017).

Besides the CMUA, an early study investigated whether the appraisal of a new IT determines one's coping acts and whether different coping behaviors lead to various levels of integration of IT. It was hypothesized that a new IT appraised as a threat will lead one to apply more user coping activities (e.g., learning new skills), whereas a new IT appraised as an opportunity will lead one to apply more IT-work system coping acts (e.g., modifying the IT itself). Furthermore, user coping acts are hypothesized to be associated with a higher level of integration between IT and the user, leading to a greater level of integration between IT and the working system (Beaudry and Pinsonneault, 2001).

Furthermore, research has examined how users cope with the situation when free trial software restrictions are worse than expected and how coping influences purchase decision making. The researchers focused on the coping strategies rational thinking and action coping. The results demonstrate that action coping increases willingness to pay and that rational thinking has no effect on willingness to pay but positively influences action coping (Hock-Hai and Xue, 2007). Also, coping theory has been used to develop a theoretical framework that unpacks and traces the processes by which IT comes to influence organizational actors' identity (Nach and Lejeune, 2009). Alternatively, it has been applied to understand why mobile application users do not complain about highly negative incidents. An explorative analysis revealed several PFC strategies (switching the app, fixing the app, waiting for updates, adapting to the app) and EFC strategies (downplaying the role of the app, overstating the needed effort, online/offline venting, blaming the device/oneself, empathizing with the app provider) that explain why users do not complain (Salo et al., 2015).

Also, the literature suggests that PFC redirects thoughts from the task an individual is currently working on to the discrepant IT event. Results show that discrepant IT events lead to computer-related thought and adaptation behavior (Ortiz de Guinea and Webster, 2013). Bala and Venkatesh (2015) have developed a model of technology adaptation behavior that states that adaptation behaviors are a key linking

mechanism between discrepant IT events and job outcomes such as job performance. They identified different technology adaptation behaviors (avoidance, exploration-to- innovate, exploitation, exploration-to-revert) that are performed based on the appraisal process. The results showed that exploration-to-innovate and exploration increase job performance and job satisfaction, whereas exploration-to-revert decreases job performance and job satisfaction. The results reviewed within the IT adoption and usage research stream are summarized in Table 3.

Discrepant IT event	Appraisal		Coping strategy	Outcomes (variables are highlighted)	Ref.
	1.	2.			
IT implementation	Perceived opportunity Perceived threat	Perceived controllability	Avoidance (PFC)	Avoidance has no significant effect on <b>job performance</b> and <b>job satisfaction</b> .	(Bala and Venkatesh, 2015)
			Exploration-to-innovate (PFC)	Exploration-to-innovate increases <b>job performance</b> and <b>job satisfaction</b> .	
			Exploitation (PFC)	Exploitation increases <b>job performance</b> and <b>job satisfaction</b> .	
			Exploration-to-revert (PFC)	Exploration-to-revert decreases <b>job performance</b> and <b>job satisfaction</b> .	
Negative emotions with new or changing IT	-	-	Venting (EFC)	Venting increases <b>seeking social support</b> .	(Beaudry and Pinsonneault, 2010)
	-	-	Seeking social support (EFC)	Seeking social support increases <b>IT use</b> .	
	-	-	Distancing (EFC)	Distancing decreases <b>IT use</b> .	
Positive emotions with new or changing IT	-	-	Task adaptation (PFC)	Task adaptation increases <b>IT use</b> .	(Beaudry and Pinsonneault, 2010)
	-	-	Seeking instrumental support (PFC)	Seeking instrumental support increases <b>task adaptation</b> .	
New IT appraised as threat	-	-	user coping act (PFC)	User coping act has no significant effect on <b>user integration</b> .	(Beaudry and Pinsonneault, 2001)
New IT appraised as opportunity	-	-	IT-work system coping act (PFC)	IT-work system coping act has no significant effect on <b>IT-work system integration</b> .	(Beaudry and Pinsonneault, 2001)
Negative disconfirmation on time and functional restriction	-	-	Rational thinking	Rational thinking has no significant effect on <b>willingness to pay</b> but a positive effect on <b>active coping</b> .	(Hock-Hai and Xue, 2007)
	-	-	Active coping (PFC)	Active coping increases the <b>willingness to pay</b> .	
IT system implementation	Opportunity Threat	High/low control	Engaged response Compliant response Reluctant response Deviant response		(Bhattacharjee et al., 2017)
Note: - = has not been considered; Only articles by which a discrepant IT event and a corresponding coping strategy could be identified are listed.					

Table 3. Overview of the results within the research stream of IT adoption and usage

### 4.3 Coping and IT security

The third research stream, which draws on coping theory, focuses on IT security issues. IT security research has developed the so-called technology threat avoidance theory (TTAT) and claims that users go through two cognitive processes leading up to coping behavior. During threat appraisal, users assess the potential danger in their computing environment and during coping appraisal, users seek coping mechanisms to avoid the threat. Both appraisal processes lead to the determination of coping behavior in terms of PFC and EFC (Liang and Xue, 2009).

TTAT has been used several times to better understand IT security behaviors in personal computer usage (Lee and Larsen, 2009; Liang and Xue, 2010; Herath et al., 2014). For example, one study investigated how users cope with IT threats. A research model using TTAT was developed to explain how users develop threat perceptions, evaluate safeguard measures, and engage in avoidance behavior. The results showed that perceived threat, safeguard effectiveness, and self-efficacy increased avoidance motivation, which in turn, increased avoidance behavior (Liang and Xue, 2010). The intention to adopt an email authentication service was investigated by drawing on threat-appraisal coping mechanisms. TTAT has been used to investigate the factors that influence user intentions to adopt an email authentication service to reduce email risk perception (Herath et al., 2014). In the same vein, the determinants affecting business executive adoption of anti-malware software for their organizations was investigated by drawing on TTAT (Lee and Larsen, 2009). Another study examined differences in IT security behaviors between users in the United States and China (Chen and Zahedi, 2016). It was theorized that perception of online security threats and the ways to deal with them differ between the countries. In particular, it

was assumed that coping behaviors in terms of seeking help and avoidance differ between the nations in the context of security. Results indicated significant differences between both countries.

A recent investigation concentrated on the threat of identity theft (Wang et al., 2017a). They examined the role for anticipated distress of losing personally identifiable information. They used coping theory to predict of adoption intention for identity theft protection services. The results indicated that anticipated distress influences adoption intention of identity theft protection services, and its effect is partially mediated by perceived threat of identity theft and perceived coping efficacy of the services. Another study focused on coping responses in the process of phishing email detection. (Wang et al., 2017b). They examined the antecedence (i.e., perceived phishing threat, perceived detection efficacy, and phishing anxiety) of coping adaptiveness (task-focused coping, emotion-focused coping, adaptive coping) and its consequences (detection effort and detection accuracy). The results showed that perceived detection efficacy increases coping adaptiveness, whereas phishing threat and anxiety reduce coping adaptiveness. Coping adaptiveness positively impacts the detection effort and detection accuracy.

Sonnenschein et al. (2016) focused on mobile security threats. They based their analysis on coping theory and concentrated on gender-specific differences by the cognitive appraisal process. Their results showed that female and male mobile users' problem-focused coping behaviors are based on different threat and coping appraisals. A further investigation aimed to understand when and how threat and coping appraisals influence adaptive security behaviors or trigger maladaptive security behavior (Chen, 2017). The results demonstrated that coping appraisal plays a more dominant role in promoting adaptive security behaviors, while fear elicits both adaptive and maladaptive security behaviors. The results within the IT security research stream are summarized in Table 4.

Discrepant IT events	Appraisal		Coping strategies	Outcomes (variables are highlighted)	Ref.
	1.	2.			
Email risk perception	Threat appraisal	Internal coping mechanism appraisal	Coping motivation (intention to adopt email authentication service) (PFC)	-	(Herath et al., 2014)
Malicious IT	Perceived severity Perceived susceptibility	Safeguard effectiveness Safeguard cost Self-efficacy	Avoidance motivation (PFC)	Avoidance motivation positively and significantly influences <b>IT-threat avoidance behavior</b> .	(Liang and Xue, 2010)
Internet security attacks	Perceived threat (severity, susceptibility)	Perceived coping efficacy (security response efficacy, security self-efficacy)	Seeking help (PFC)	Chinese users are significantly more disposed to <b>seek help</b> in the face of internet security attacks.	(Chen and Zahedi, 2016)
			Avoidance (PFC)	Chinese users are inclined to <b>adopt avoidance</b> as a coping behavior. U.S. users are less inclined to <b>adopt avoidance</b> as a coping strategy.	
Malware	Perceived threat (severity, susceptibility)	Perceived avoidability (effectiveness, costs, and self-efficacy)	Intention to adopt anti-malware (PFC)	Intention to adopt anti-malware increases significant the <b>adoption of anti-malware</b> by SME executives.	(Lee and Larsen, 2009)
Phishing emails	Perceived phishing threat	Phishing detection efficacy	Coping adaptiveness (task-focused coping, emotion-focused coping, avoidance coping)	Perceived phishing threat reduces, and phishing detection efficacy increases <b>coping adaptiveness</b> . Phishing anxiety reduces <b>coping adaptiveness</b> . Coping adaptiveness increases <b>detection effort</b> and <b>detection accuracy</b> .	(Wang et al., 2017b)
Anticipate distress of losing personally identifiable information	Perceived threat (severity, vulnerability)	Perceived coping efficacy (response efficacy, self-efficacy)	Adoption intention for identity theft protection services	Anticipate distress of losing personally identifiable information increases <b>perceived threat, coping efficacy, and adoption intention for identity theft protection services</b> . Perceived threat and coping efficacy increase <b>adoption intention for identity theft protection services</b> .	(Wang et al., 2017a)
General perceptions on Internet security	Threat severity Threat susceptibility	Security self-efficacy Security response efficacy	Protective action (PFC)	-	(Chen, 2017)
			Avoidance (EFC)		
			Inaction (EFC)		
Smartphone risk	Threat appraisal	Coping appraisal	Problem-focused coping behavior (PFC)	Female and male mobile users' problem-focused coping behaviors are based on different threat and coping appraisals.	(Sonnenschein et al., 2016)

Note: - = have not been considered; Only articles by which a discrepant IT-event and a corresponding coping strategy could be identified are listed.

Table 4. Overview of the results within the research stream of IT security



## 5 Discussion and Implications

IS literature on coping research uses a wide range of technologies, contexts, units of analysis, theories, and research methods. The present research presents the results of a comprehensive literature review designed to obtain a holistic understanding of coping by identifying discrepant IT events, applied coping strategies, and outcomes. In the following, the theoretical implications of the present literature research are first outlined and a proposed research agenda for each identified research stream is then developed.

### 5.1 Theoretical implications

By identifying and analyzing IS coping literature six implications for theory can be derived.

One, the present literature review makes a conceptual contribution to the literature by revealing that coping theory has been used in three different contexts (Johns, 2006): coping and technostress, coping and IT adoption and usage, and coping and IT security. The literature review shows that research objectives across the three research streams differ. In the technostress stream, the articles identify and investigate coping strategies that reduce the effect between discrepant IT events and strain responses or decrease strain responses directly. The broad objectives of the research on IT adoption and usage are to investigate whether coping strategies result in different IT usage behavior or change organizational outcomes such as job performance and job satisfaction. Within the research stream of IT security, the objectives are to examine how users cope with IT threats such as email risk or malicious IT. In line with Johns (2006), the present paper calls for a more sophisticated consideration of the different contexts by investigating and applying coping strategies.

Two, the review reveals disagreements about the antecedents of coping strategies. Several investigations indicate that coping strategies are consequences of a cognitive appraisal process (Liang and Xue, 2009; Bala and Venkatesh, 2015; Beaudry and Pinsonneault, 2005), in which coping strategies results out of a primary and secondary appraisal of the discrepant IT event. In contrast, other investigations argue that the results of the cognitive appraisal process are discrepant IT events rather than coping strategies. These investigations argue that the appraised discrepant IT events are direct antecedents of coping strategies (D'Arcy et al., 2014; Galluch et al., 2015). To shed light on the different approaches of coping, the present review calls for more precise investigations on whether one of these approaches is inappropriately used or whether there is one theoretical approach that could generally applied.

Three, a vast array of coping strategies that lead to considerable heterogeneity in the existing coping literature are also identified. Different coping strategies have been investigated, such as individual behavior (Galluch et al., 2015), IT usage itself (Bala and Venkatesh, 2015), changed IT usage patterns (Ortiz de Guinea and Webster, 2013), or intention to adapt (Lee and Larsen, 2009). This heterogeneity of coping strategies makes it difficult to generalize and compare results within and between the three research streams. To promote a greater understanding of coping in IS research the present paper calls for a development of a comprehensive structure and classification of coping strategies.

Four, the present examination reveals that coping strategies not only reduce the discrepant IT events or increase outcomes such as job performance or job satisfaction but also influence each other. For instance, the literature review discovers that venting increases seeking social support (Beaudry and Pinsonneault, 2010) and rational thinking increases active coping (Hock-Hai and Xue, 2007). Hence, a greater consideration and investigation of the dependencies between different coping strategies is called for.

Fifth, the effect of the coping strategies is not always counteracting, as coping strategies such as social support or accepting are related to high strain responses such as anxiety (Love et al., 2004) and venting increases strain (Pirkkalainen et al., 2017). Also, exploration-to-revert decreases job performance and job satisfaction (Bala and Venkatesh, 2015), and distancing decreases IT usage (Beaudry and Pinsonneault, 2010). The counter-intuitive effect of coping strategies in this context might demonstrate a paradox, as coping strategies, which are supposed to manage the situation, increase negative outcomes. Hence, the present literature review calls for a greater consideration and investigation of these paradoxical effects, which might be addressed by considering the longitudinal effects of coping strategies.

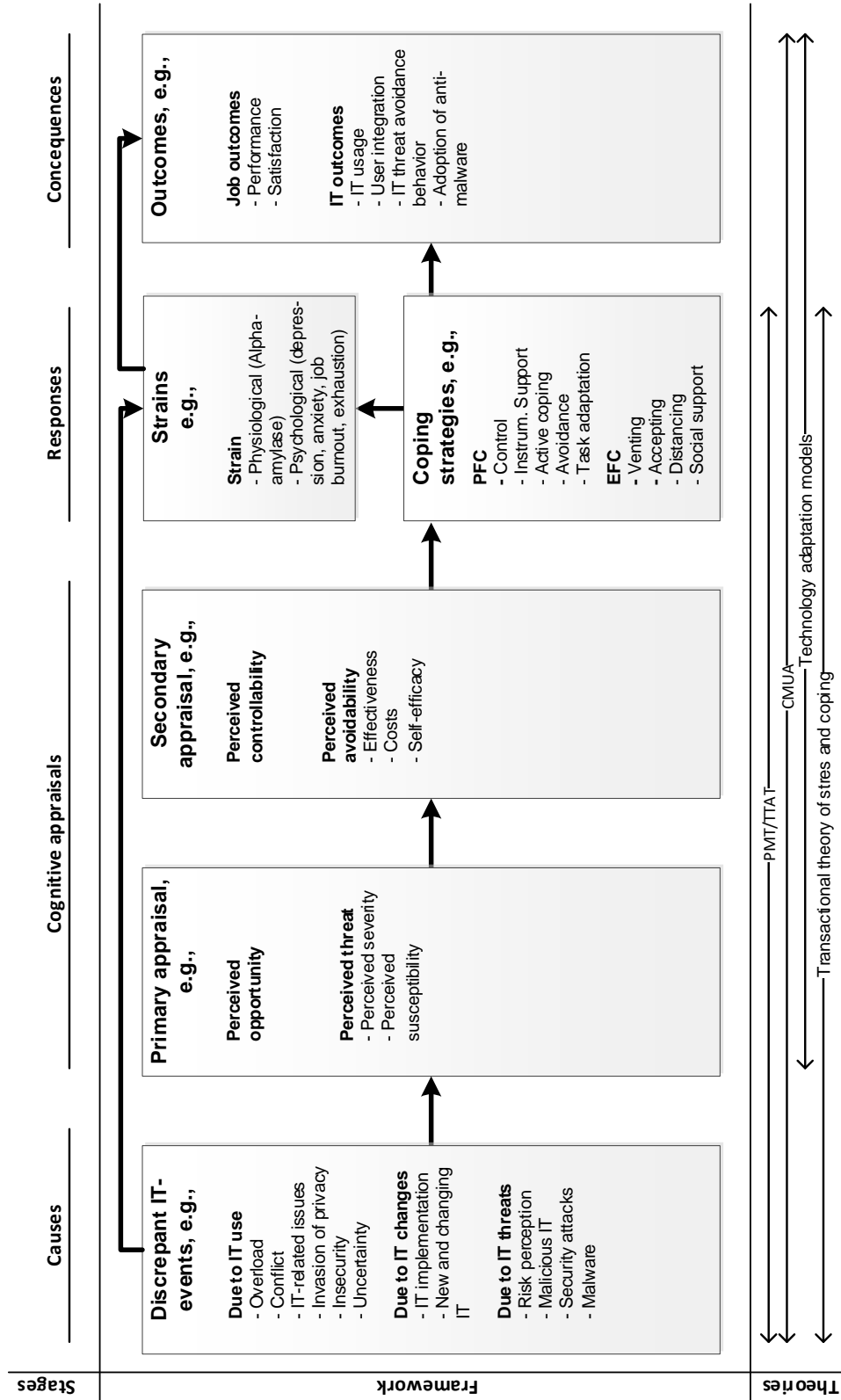


Figure 3. Framework of coping with discrepant IT events

Sixth, the three research streams are aligned and a framework of coping with discrepant IT events is proposed, as depicted in Figure 3. First, the present paper identifies three different kinds of discrepant IT events: events that occur due to IT use such as the invasion of privacy (e.g., Galluch et al., 2015; Pirkkalainen et al., 2017), events that occur due to IT changes such as new implementations of IT (e.g., Beaudry and Pinsonneault, 2010; Bala and Venkatesh, 2015), events that occur due to IT threats such as security attacks or malicious IT (e.g., Liang and Xue, 2010; Chen, 2017). Second, it identifies different types of primary and secondary appraisals. Several investigations follow the CMUA theory (Beaudry and Pinsonneault, 2005), which encompasses perceived opportunity, perceived threat, and perceived controllability. Others follow the TTAT (Liang and Xue, 2009), which focuses on perceived threat and perceived avoidability. Third, the examination identifies several PFC and EFC strategies. Coping strategies are applied to manage outcomes such as job performance, job satisfaction, or IT usage (e.g., Beaudry and Pinsonneault, 2010; Bala and Venkatesh, 2015). Fourth, research shows that discrepant IT events also lead to strain responses, which can be psychological or physiological (e.g., Galluch et al., 2015; Pirkkalainen et al., 2017). These strain responses result in different types of outcomes, such as intentions, job engagements, or IT usage (e.g., D'Arcy et al., 2014).

Next, each research stream is separately analyzed and for each a short agenda for future research is proposed.

## 5.2 Research agenda

The present paper contributes to existing knowledge by presenting a synthesis of the literature focusing on coping with discrepant IT events within the IS Basket of Journals, and the main IS conferences and providing specific directions for future research. To enable the identification of previously unexplored areas, the present paper pays attention specifically to the different IT events, appraisals, coping strategies, and outcomes. The articles are categorized regarding this structure and based on the categorization shown in Table 5, several shortcomings are identified in IS coping literature, which are described in the following.

Research streams	Discrepant IT events due to			Appraisal				Coping strategies		Outcomes		
				1.		2.						
	IT use	IT changes	IT threats	Opportunity	Threat	Controllability	Avoidability	PFC	EFC	Strain	Job outcomes	IT outcomes
<b>Coping and technostress</b>	8, 13, 14, 16	<b>RQ1</b>	5	-	<b>RQ2</b>	-	-	8, 13	7, 13, 16	7, 8, 13, 14, 16	<b>RQ3</b>	-
<b>Coping and IT adoption</b>	<b>RQ4</b>	1, 2, 3, 4, 10, 17	-	1, 4, 17	1, 4, 17	1, 4, 17	-	1, 2, 3, 10	<b>RQ5</b>	-	1, 3	2, 3, 4
<b>Coping and IT security</b>	-	-	5, 6, 9, 11, 12, 15, 18, 19	-	5, 6, 9, 11, 12, 15, 18, 19	-	5, 6, 9, 11, 12, 15, 18, 19	5, 6, 9, 11, 12, 18, 19	5, 18	7, 18	-	6, 11, 12

Note: - = have not been considered. 1 = Bala and Venkatesh (2015); 2 = Beaudry and Pinsonneault (2001); 3 = Beaudry and Pinsonneault (2010); 4 = Bhattacharjee et al. (2017); 5 = Chen (2017); 6 = Chen and Zahedi (2016); 7 = D'Arcy et al. (2014); 8 = Galluch et al. (2015); 9 = Herath et al. (2014); 10 = Hock-Hai and Xue (2007); 11 = Lee and Larsen (2009); 12 = Liang and Xue (2010); 13 = Love et al. (2004); 14 = Pirkkalainen et al. (2017); 15 = Sonnenschein et al. (2016); 16 = Srivastava et al. (2015); 17 = Stein et al. (2016); 18 = Wang et al. (2017a); 19 = Wang et al. (2017b).

Table 5. Overview of IS research on coping and uncovered research areas

### 5.2.1 Coping and technostress

Despite the close relationship between stress and coping shown in psychological literature (Lazarus and Folkman, 1984) only a few investigations have examined coping and technostress in IS research. Hence, the body of literature focused on coping and technostress should be extended to obtain greater in-depth insight how users cope with technostress. The present literature review contributes to the literature by identifying the examined discrepant IT events, the associated applied coping strategies, and outcomes within the research stream on technostress (see Table 2). As shown in Table 5, the main discrepant IT

events studied in this research stream are IT events due to IT use such as exceeding demands occurring while using the IT such as overload and complexity. By focusing on the two coping categories, it is discovered that EFC strategies are more often considered in this research stream. The aim of the different coping strategies is thereby to counteract the psychological strain responses such as anxiety, depressions, and bodily responses or outcomes such as job engagements or behavioral intentions.

Table 5 demonstrates that previous research mostly focusses on IT events due to IS use. However, as the literature suggests that strain responses such as emotional exhaustion and fatigue occur when encountering a discrepant IT event, technostress might also occur when perceiving IT events due to IT changes and IT threats. Hence, the present paper proposes investigating how IT events occur because of IT changes and because IT threats lead to strain (**RQ1**).

Also, Table 5 indicates that the cognitive appraisal process—primary and secondary appraisal—has been neglected in the research stream of technostress. However, coping theory suggests that the cognitive appraisals of the event determine the coping strategies (Lazarus and Folkman, 1984). Furthermore, psychological literature demonstrates that the appraisal process is essential to understand what the person was trying to cope with (Beehr and McGrath, 1996), because the effectiveness of a coping strategy depends on which events the user concentrates on (Lazarus and Folkman, 1987). Hence, the present literature review suggests investigating how cognitive appraisals determents the coping strategies in the context of technostress (**RQ2**).

Within the research stream of coping and technostress, IT outcomes and job outcomes are mostly neglected, as demonstrated in Table 5. Technostress literature shows that special job outcomes such as end-user performance or satisfaction are crucial in this research stream (Tarafdar et al., 2010; Tarafdar et al., 2014). However, coping literature has neglected the effects on job outcomes such as end-user performance. In addition, the effect between strain and outcomes is mainly neglected in coping and technostress research. Users who perceive strain are tired and fatigued, such that they have only a few mental resources left to perform their tasks (Ayyagari et al., 2011; Maier et al., 2015). When users do not have enough mental resources, job outcomes such as performance might decrease. Therefore, it is suggested what effects strains have on IT and job outcomes and how do coping strategies influences these effects be investigated (**RQ3**).

### 5.2.2 Coping and IT adoption and usage

This research stream contained several research articles considering coping theory. The main theory in this research stream is CMUA, developed by Beaudry and Pinsonneault (2005). By identifying the examined discrepant IT events and the associated applied coping strategies and outcomes (see Table 3), the present literature review contributes to the research stream of IT adoption and usage. The main discrepant IT events studied in the literature are IT events due to new or changing ITs. PFC strategies have been investigated more often in this research stream. Coping strategies are mainly applied to manage the new or changing IT, to increase outcomes such as job performance, job satisfaction, or IT usage. As the objective of this research stream is to increase job performance or satisfaction, IT events that occur due to IT use such as complexity might reduce these job and IT outcomes. For example, the literature indicates that IT events which occur due to IT use reduce job performance and satisfaction (Tarafdar et al., 2007; Ragu-Nathan et al., 2008; Tarafdar et al., 2010) or lead to the situation that user stops using the IT entirely (Maier et al., 2015). Therefore, the present examination suggest investigating how discrepant IT events influences job and IT outcomes and how coping strategies can reduce these effects (**RQ4**).

Research in this strand mostly focuses on PFC strategies. However, the literature suggests that users perform PFC when having high control over the situation, whereas they perform EFC when having low control (Lazarus and Folkman, 1984; Beaudry and Pinsonneault, 2005). Hence, the present paper suggests investigating how emotion-focused coping strategies lead to the protection against IT-events (**RQ5**).

### 5.2.3 Coping and IT security

In the IT security research stream, the main objectives were to examine how users cope with discrepant IT events due to IT threats such as email risk or malicious IT. The main theory in this research stream is TTAT, developed by Linag et al. (2009). The present literature review contributes to the research stream of IT security by identifying the examined discrepant IT events, and the associated applied coping strategies and outcomes (see Table 4). Research mainly investigates discrepant IT events such as malicious IT, email risk perception, and internet security attacks. Most of the studied coping strategies belong to the PFC categories. The two cognitive appraisal processes—primary and secondary appraisal—have been considered in almost every article. Different than the other two research streams, coping strategies are the main behavior of interest in the context of IT security. The consideration of outcomes in terms of job performance or IT usage has been neglected.

Analog to the research stream of coping and IT adoption and usage, in the IT security research strand, most investigations focus on PFC strategies. However, as noted above, the literature suggests that users perform PFC when having high control over the situation, whereas they perform EFC when having low control (Lazarus and Folkman, 1984; Beaudry and Pinsonneault, 2005). Therefore, it is suggested investigating how EFC strategies reduce discrepant IT events such as malicious IT (**RQ6**).

Some investigations already focus on security-related stress (e.g., D'Arcy et al., 2014; Wang et al., 2017a). The perception of IT threats such as IT risks or malicious IT might not only explain and predict the protection behavior of users but also lead to strain responses by the users. For example, Wang et al. (2017a) focused on the distress of losing personally identifiable information. Users perceiving security threats are not only performing protection behavior but might also respond in a psychological and physiological way. Therefore, the present literature review suggests investigating what role strain responses play in this research stream (**RQ7**).

## 6 Limitations and Future Research

Although a rigorous approach has been applied to identify relevant literature (Webster and Watson, 2002; vom Brocke et al., 2009), the results are limited due to the used search terms. Moreover, the list of keywords has been specified beforehand and was not inductively extended. By solely focusing on the eight journals out of the Senior Scholars' Basket and the main IS conferences, the current investigation might miss some findings, published at other conferences or in other journals. The scope of the literature review is limited such that future research might take work from related disciplines such as psychology into consideration. In addition, the present paper does not consider the different technologies of interest that have been examined or should be considered in future work. Also, future research might conduct, based on the present research, a meta-analysis to obtain statistical results.

## 7 Conclusion

The present paper provides a literature review of coping research within IS literature. The results of the literature analysis demonstrated that coping research can be subdivided into three different research streams: technostress, IT adoption and usage, and IT security. The paper identified shortcomings and proposed future directions of research for each research stream.

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