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LEARNING FROM CLIMATE RESEARCH: APPLYING THE FINITE POOL OF WORRY ON CYBER-RELATED RISKS

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Abstract

Experts in climate change and cybersecurity face a similar challenge: although most people do perceive the severity and likelihood of hazards like global warming or data theft, they rarely actively engage in a change of behaviour to decrease their risk that exposure to the hazard will lead to negative consequences. Whereas most research in Information Systems predominantly draws on cognitive, consequentialist models, climate researchers claim that negative affect can be seen as the wellspring of actions and that a lack of emotions and affects delays or defers behavioral changes. Especially, the role of worry as trigger for behavioral change has been accentuated in the last decade but remains largely overlooked in the context of cyber-related hazards. However, behavioral scientists claim that humans' capacity of emotions is limited which leads to the hypothetical mental formation of a Hierarchy of Concerns. Only risks that are perceived as probable, serious and concern-inducing will elicit personal worry which ultimately leads to action. Due to the limited capacity of emotions, climate researchers attribute inaction to the so-called Finite Pool of Worry. We thus assume that cyber-related hazards are affected similarly by these mental formations and present our experimental approach aimed at demonstrating its existence.

Keywords: Cyber-related hazards, Finite Pool of Worry, Hierarchy of Concerns, Risk Perception, Risk-as-Feelings.

1 Introduction

The consensus among scientists and experts could not be clearer: cyber-related hazards are increasingly serious and frequent – not only for companies but also for individuals. Recently released crime statistics in the UK show that 57% of all 3.3 million fraud offences were cyber-related (Office for National Statistics 2017) and news about ransomware like Locky in 2016 (Davis 2016) or Wannacry in 2017 (Hern and Gibbs 2017) are prominent real-life evidence for the increasing threat and importance of cyber-related hazards. Nevertheless, researchers continue to observe individuals engaging in risky password practices (Whitty et al. 2015) or privacy-threatening behaviour (e.g., Norberg et al. 2007; Sutanto et al. 2013) despite the individuals risk assessment and stated intention for a behavioural change. In light of these findings, reported rates of privacy concern or risk perception appear counter-intuitive. Concepts like the privacy paradox (Acquisti 2004), "(IT) Security Fatigue" (e.g., McGraw 2016; Stanton et al. 2016), or the well-known intention-behaviour gap (e.g., Sheeran and Webb 2016) have been utilized to explain aspects of this paradoxical behaviour. In a recent experiment by Sonnenschein and colleagues (2016) this paradoxical behaviour became apparent with individuals stating their threat perception and risk assessment of cybersecurity risk but not acting accordingly as evidenced by their actual preference of receiving 5 Euro in cash instead of an antivirus application worth the same amount. Similar results are consistently shown in privacy research as individuals continue to share personal details on Social Network Sites even though they state awareness for risks like privacy intrusion (Acquisti and Grossklags 2004; Krasnova et al. 2010).

Against this backdrop, we argue that the assessment of new cyber-related hazards like privacy intrusion or online data theft suffers from two shortcomings in information systems (IS) research: on the one hand, studies so far have measured these cyber-related hazards singled out and isolated from a plethora of hazards people encounter simultaneously in their everyday life (e.g., Featherman and Pavlou 2003; Krasnova et al. 2010). On the other hand, the majority of IS research continues to focus solely on cognitive aspects of risk assessment – thus, largely overlooking findings of psychological science which argue for so-called dual-processing theories of thinking (Epstein 1994). These theories and models suggest that risk is perceived and more importantly acted upon in two fundamental ways, namely risk-as-feelings and risk-as-analysis. Whereas the first refers to intuitive, emotion or affect-based reactions to hazards, the latter refers to a deliberative, analytical process of assessing risks (Slovic and Peters 2006). A large proportion of studies on privacy or IT security risks measure individuals' perceived risk but often neglect emotion-based factors but focus rather on weighing up benefits against costs or risks (e.g., Lee 2009) or draw upon the definition of risk as likelihood multiplied with potential damage (Rhee et al. 2012). However, laypeople often respond counterintuitively to beliefs held by experts regarding the probability of risks exemplified by the reported perceived high risk of terror attacks despite the rather low probability (e.g., Braithwaite 2013; Sjöberg 2004). Many studies also indicate that people employ biases and heuristics when processing probabilistic information (e.g., Kahneman et al. 1982; Simon 1976; Tversky and Kahneman 1979) and draw on a number of explanatory, predominantly cognitive, factors (Sjöberg 1998). However, these cognitive models fail to explain risk perception and its influence on coping behaviour fully, thus highlighting the often neglected yet significant role of affect and emotion (e.g., Loewenstein et al. 2001; Weber 2006). Researchers in the field of health and climate research are increasingly including measures of negative affect and emotions to account for these findings. Some extant studies in IS research, for instance IT security studies that draw on the latest incarnation of the Protection Motivation Theory (Floyd et al. 2000; Rogers and Prentice-Dunn 1997) include "fear" as an important construct in understanding protection intention. In an extensive study, Boss and colleagues (2015) demonstrated the importance of including fear and fear appeals in order to better understand the intention or desire for (precautionary) action or protective behaviour. Interestingly, their measurement of fear includes items that clearly refer to aspects of worry ("I am worried about the prospect of losing data from my computer") even though previous research concluded that worry is distinct to feelings of fear (Levy and Guttman 1985). Different disciplines, however, have pointed out the role of worry as a major predictor for intention and action (e.g., Baron et al. 2000; Peters et al. 2006; Schmiege et al. 2009) while also stating that worry is an emotionally draining process. In line with this reasoning, researchers argue that „people possess limited but renewable physiological, cognitive, and social resources for dealing with emotionally draining events" (Linville and Fischer 1991). This assumption has been successfully demonstrated in studies in a global warming context which indicate that environmental issues occupy lower ranks of priority and worry when put into perspective with issues such as health care, financial crises, or national security (Leiserowitz 2007). This so-called "finite pool of worry" was shown in an experiment with Argentinian farmers by Hansen and colleagues where increasing concern for a political hazard, attenuated concern about another hazard, namely global warming as a societal hazard (Hansen et al. 2004). In an IS context Crossler and colleagues (2013) hypothesized a similar dynamic although they attribute it to fear by stating "it is hard to imagine that the fear someone experiences when faced with threats to data or computer systems is at the same magnitude as the fear of being diagnosed with cancer" (p.93).

We thus argue that similarly to risks posed through global warming, cyber-related hazards also depend largely on the context and the presence of other hazards and are thus similarly affected by the finite pool of worry. Additionally, both hazard categories are fairly novel to most people and both likelihood and potential damage are difficult to estimate for laypeople (Slovic et al. 1980). Furthermore, both represent intangible hazards and are often regarded as "expert problems", i.e., responsibility to address these risks is shifted towards a higher entity such as the state or the management of businesses (e.g., Blythe et al. 2015; Kellstedt et al. 2008). Given these parallels in terms of novelty, delayed consequences, and responsibility between global warming hazards and cyber-related hazards such as priva-

cy intrusion or data theft along with similarities regarding individually perceived barriers for action (Lorenzoni et al. 2007), we propose to test if cyber-related hazards differ in terms of risk perception and will occupy lower ranks of risk ratings and priority when put into perspective with other hazards with the help of interviews and an experiment.

By focusing on the role of worry, we contribute to the current stream of IS literature by highlighting the role of emotions other than fear that play an important and possibly substantial role in explaining subsequent action or inaction. As a consequence, the inclusion of worry could provide more explanatory power for commonly used IS theories such as Protection-Motivation Theory or General Deterrence Theory. Thus, worry and the notion of a finite pool of worry could thus serve as a further explication for the lack of behavioral changes. Additionally, the results of the planned empirical study might be able to highlight the influence of other risks in risk perception and risk assessment as current studies continue to measure cyber-related or other hazards in the IS disciplined often isolated.

2 Theoretical Background and Hypotheses Development

One of the major difficulties in risk (perception) research is the definition and delineation of relevant terms. *Risk* itself is often utilized synonymously with terms like *hazard*, *peril*, *harm*, *threat* or *uncertainty*. Whereas laypeople continue to use these terms interchangeably, researchers have a longstanding tradition of disentangling the jargon in order to establish scientific methods to measure risk perception. According to Kaplan and Garrick, *risk* contains both "uncertainty and some kind of loss or damage that might be received" and has to be distinguished from the term *hazard* which is simply defined as "a source of danger" or an event that has the potential of negative consequences (Kaplan and Garrick 1981). Risk is thus interpreted as possibility or likelihood of a threat, i.e., circumstances or events with the potential to cause harm (like loss or injury), and the degree of probability of such a threat. This definition however leads to yet another difficulty: probability and likelihood are both abstract terms and constitute difficult concepts to comprehend and to measure objectively for most laypeople (Haimes 2009). An objective approximation of the probability is often hindered by a lack of facts and actual data which is why laypeople draw upon a number of cognitive heuristics and biases when asked for risk judgments (Kahneman et al. 1982). The predominant model which seeks to include the most important factors that influence risk perception is the Psychometric Paradigm introduced by Slovic, Fischhoff and colleagues (e.g., Fischhoff et al. 1978; Slovic et al. 1986). They identified dimensions such as "dread", "involuntariness", "knowledge (to those exposed and of experts), "controllability", and "immediacy" along with the well-known factors likelihood and catastrophic potential to account for the difference in definitions of riskiness between experts and laypeople. Despite the high influence and application, the psychometric paradigm has been scrutinized and criticised for neglecting other important social, cultural and emotional factors (Dake 1992 Loewenstein et al. 2001; Marris et al. 1995). Instead the call for a broader inclusion of cultural factors along with sociodemographic factors, heuristics and biases, and experiential processing which includes affect and emotions has echoed through several research disciplines (e.g., Crossler et al. 2013; Horst et al. 2007; Slovic et al. 2004; van der Linden 2015). Although, cognition-based theories and models include affects, Loewenstein and colleagues argue that most of these theories, for example the Theory of Reasoned Action (Ajzen and Fishbein 1980) or the Health-Belief-Model (Becker 1974) assume that feelings are triggered by the decision situation and are thus included as "anticipated emotions" (Loewenstein et al. 2001). Unlike decision researchers, researchers in social psychology and neuroscience strongly advocate the role of "anticipatory emotions" in decision-making which serve as informational input rather than output in decision processes. Studies with experiment subjects suffering from neurological abnormalities confirmed the strong influence of emotions in decision under uncertainty (Bechara et al. 1997; Damasio 1994). Other researchers could prove the rapidness and immediacy of emotional reactions which precede cognitive evaluations in decision- and judgement-making (Finucane et al. 2000; Zajonc 1980). Furthermore, Ness and Klaas (1994) showed that emotional reactions can diverge from cognitive judgements of risk severity and can have a stronger effect on subsequent behaviour. Van der Linden (2017) thus hypothesized that worry as an active emotional state can be "linked to adaptive behavioural responses aimed at reducing a particular threat" (van der Linden

2017, p. 24). However, he continues to claim that a difference between generalized concern and personal worry for an issue like climate change exists which explains the failure to adopt a more environmentally-friendly behaviour and can be depicted in a so-called "Hierarchy of Concern"-model.

According to Peters and colleagues (2006), worry is an important prerequisite that helps humans prioritize risks and prepares individuals for future actions. However, most people seem to prioritize certain issues over others, for example buying a cheap car instead of an environmentally-friendly one, i.e., prioritizing economic aspects over environmental features. Even people who claim that climate change is very likely to happen and consider it a serious issue for society will not behave in consonance with their stated concerns. According to van der Linden, this mental model of risk prioritization can be depicted and explained with a hierarchy of concerns:

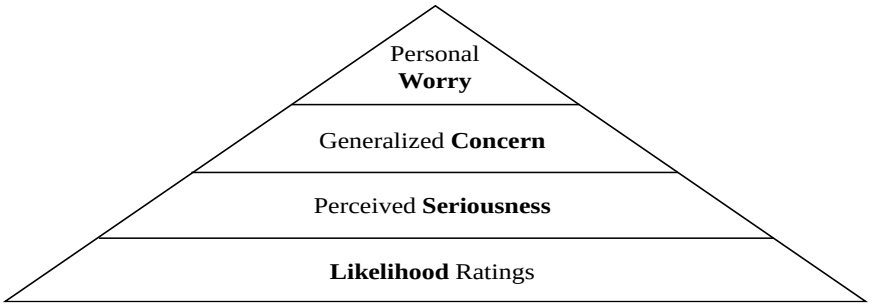

Figure 1. Hierarchy of Concern (HoC) Model according to van der Linden (2017)

Despite high likelihood ratings, an individual might not necessarily perceive an issue like climate change as a very serious risk. Similarly, individuals who do perceive climate change as both likely and serious, might not be very concerned about it – for example, due to the delayed effects or the belief in potential corrective measures and remedies. In turn, climate researchers could show that despite an expressed concern for society to be affected by climate change, people do not necessarily regard it as a personal worry and thus do not perceive it as a high personal priority (Leiserowitz 2007; Nisbet and Myers 2007). Against this backdrop, we assume that a similar reasoning is employed when perceiving new cyber risks like privacy intrusion or data theft. We thus hypothesize:

H1 ***Individuals will express high likelihood ratings and a perceived seriousness of cyber-related hazards but will express less worry about these hazards compared to other well-known hazards.***

According to lower expressed personal worry, behavioural measures will also be influenced in such way that:

H2 ***Individuals will prioritize preventive behaviour regarding other well-known risks over new cyber-related hazards.***

Additionally, we expect to see differences according to demographic characteristics, i.e., students will assess and prioritize hazards differently compared to young professionals or working parents as these are faced with further or more "existential" hazards. These hypotheses are strongly linked to another phenomenon identified in environmental risk research, namely the Finite Pool of Worry.

Based on findings of Linville and Fischer showing people's preferences for separating or combining emotionally impactful events in several domains, we can assume that individuals tend to separate two negative events following a multiple-loss-avoidance hypothesis (Linville and Fischer 1991). It appears that people can only worry about a certain amount of issues hinting at a finite capacity for worry. If a certain issue is more present, individuals will express more concern and likely worry about it, this however means other hazards will appear less worrisome (Weber 2006). In the context of climate change, an experimental study with Argentinian farmers showed that increasing concern for climate hazards like global warming, reduces the concern and worry about political hazards (Hansen et al. 2004). In two scenarios, farmers had to rate their extent of concern and worry about A. the political situation in their country, B. weather and climate, and C./D. prices of input variables and crops. Both scenarios featured identical crop selection and cultivation decision. The second scenario included sea-

sonal climate forecast for the upcoming season and led to higher stated concern about climate hazards. Simultaneously, concern about the political situation decreased although no actual change was implied in the second scenario. Additionally, Hansen and colleagues also found indication of a finite pool of worry within each scenario as farmers who worried more about one hazard would express less worry regarding the other hazards.

In line with these findings, we hypothesize that cyber-related hazards will also be rated differently when put into perspective with other risks people feel confronted with.

H3 The perception of cyber-related hazards will be affected by the finite pool of worry resulting in decreased ratings of expressed worry and perceived risks compared to other hazards.

3 Study Design, Data Collection, and Analysis Methods

3.1 Pre-Study: Selection of Hazards

In contrast with most other studies that measured the perception of risks, hazards were not chosen in advance but identified through paper-based interviews which were distributed to three homogenous samples: undergraduate students in Information Systems, young professionals in a technology company, and young working parents. These sample groups were selected to identify general differences in risk perception due to differing personal and contextual factors (employment status, age, responsibility for others) and were predominantly Europeans. Due to the potentially very sensitive responses and to ensure anonymity, respondents were asked to fill out a questionnaire which required them to indicate demographic information, to assess their propensity to worry and to list a minimum of five risks they felt confronted with. In order to avoid any biases, no examples of potential risks were given but respondents were asked to identify whether the mentioned risk was considered to be individual/personal or societal/global. The following table gives an overview of the characteristics of the sample groups:

	Students [N=24]	**Young Professionals [N=24]**	**Working Parents [N=8]**
Average age	21,8	28,6	34,1
Gender distribution	9 female, 15 male	9 female, 15 male	4 female, 4 male
Education level	high school diploma [22], bachelor degree [2]	bachelor degree [7], master degree [17]	High school diploma [1], master degree/equivalent [7]
Total number of hazards	98	91	42

Table 1. Respondents - Demographics

Due to poor data quality, we had to exclude 2 data sets in the working parents' sample. The total amount of stated hazards without duplicates was 131. These hazards were then sorted by 5 IS researchers and students who did not participate in the study. These 5 raters assigned the initial hazards to the following seven categories: technology, work/study context, financial or economic, environment, health, social, and political hazards. The identification of categories resulted from an initial descriptive coding process and subsequent pattern coding performed independently by 1 researcher and 2 students according to Saldana's (2009) recommendations. The resulting seven categories were triangulated subsequently with external documents like "The Global Risk Report" issued by the World Economic Forum (2017) and other large-scale surveys across Europe (e.g., Pew Research Center 2017) and aggregated into the aforementioned seven categories. Subsequently, all 131 hazards were assessed again and inter-rater reliability was ensured through assessing the percent absolute agreement level across all 5 raters as the number of raters and rating levels were rather small (Altman 1991; Fleiss 1971). All hazards were attributed to the respective category with an agreement level of other 80 percent. The sorting process was reiterated for ambiguous hazards until a sufficient amount of agreement was achieved. A total of 5 mentioned hazards were too ambiguous ("espionage") or too unclear ("fear") to sort into these categories and were thus excluded from further analysis. The total amount and distribution of the resulting hazard categories per sample can be extracted from the following table:

Hazard Category	Students [N=24]	Young Professionals [N=24]	Working Parents [N=8]
Technology	**15 [15,63%]**	5 [5,56%]	2 [4,76%]
Work/study	10 [10,42%]	**14 [15,56%]**	4 [9,52%]
Finance and Economics	5 [5,21%]	10 [11,11%]	**6 [14,29%]**
Environment	8 [8,33%]	10 [11,11%]	**6 [14,29%]**
Health	5 [5,21%]	8 [8,89%]	3 [7,14%]
Society	**27 [28,13%]**	**19 [21,11%]**	**9 [21,43%]**
Politics	**26 [27,08%]**	**24 [26,67%**]	**10 [23,81%]**

Table 2. Hazards and Distribution according to Hazard Categories

The share of the respective hazard category compared to total mentions is presented in brackets. Students most often specified social (e.g., "populism", "migration"), political (e.g., "war", "North Korea"), and technological (e.g., "privacy loss", "data theft") hazards. Similarly, young professionals indicated political hazards most often (e.g. "Donald Trump", "terror attacks") followed by social hazards (e.g., "isolation", "growing gaps in the society") and hazards in the job context (e.g., "failures at work", "job dissatisfaction and work-life balance"). Working parents also saw more hazards in a political (e.g., "terrorism") and social context (e.g., "migration"), but indicated a higher proportion of financial (e.g., "rising accommodation costs", "financial crises") and environmental hazards (e.g., "global warming"). Common themes across all samples were terrorism, poverty, intrusion or loss of privacy, extreme weather events due to global warming, migration crisis, and personal failure in a study or work context.

3.2 Planned Experiment: Finite Pool of Worry and Hierarchy of Concerns

Based on these patterns, we devised a questionnaire for the experiment. The experiment will be conducted mainly online due to geographical distances for the young professional and working parents sample and is thus administered via an online questionnaire. Students will be approached directly in classes and either complete a paper-based questionnaire at university or the online questionnaire. The experiment comprises the following elements:

Hazards A	Group A ("cyber" group)	Group B (control group)	Hazards B
1) Online data theft 2) Privacy intrusion 3) Cyber attack	Perception of **cyber-related hazards**	Perception of **other, infrequent hazards**	1) Lung cancer 2) Rising housing prices 3) Extreme wind
Individual Worry Propensity			
4) Terror attack 5) Interstate Conflict 6) Failure (in job/at studying) 7) Large-scale migration 8) Loss of Prosperity + **Hazards B**	Perception **of all hazards** (including cyber-related and other hazards)		4) Terror attack 5) Interstate Conflict 6) Failure (in job/at studying) 7) Large-scale migration 8) Loss of Prosperity + **Hazards A**
Priority Ranking			

Figure 2. Experiment Approach.

Figure 2 illustrates our experimental approach which is based on the identified and selected hazards of our pre-study. We randomly assign participants to group A, which are first asked to rate three cyber-related hazards, or assign participants to control group B. Group B will be asked to rate three other hazards that were mentioned less frequently but appeared in all samples. After general questions of self-assessment regarding the participants worry propensity (e.g., "I worry all the time", "I worry about a great variety of things", "One concern overshadows every other one currently", "I live a life

free of worries", "I don't have enough resources available to worry about everything"; 1 = totally disagree – 7 = totally agree), participants have to evaluate a total of eleven hazards that include cyber-related hazards, other less frequently mentioned hazards along with 5 dominating topics identified during the pre-study. Based on our theoretical development, we will measure aspects of risk-as-feelings and risk-as-analysis. The items and corresponding sources can be found in Table 3. We include items based on the psychometric paradigm, two items measuring threat on an individual and societal level to account for the diversity of risks we identified during our pre-study, items regarding emotional risk assessments and three other items. These items aim at identifying comparative optimistic biases and personal as well as governmental action:

Category	Items	Source
Risk-as-analysis **(intellectual, cognitive judgment)**	How do you evaluate the likelihood of the following risks? [0 = absolutely unlikely, 0% probability – 100 = absolutely likely, 100% probability]	Based on Slovic et al. (1986)
	To what extent do you consider yourself informed about the following risks? [1 = Very well informed/known precisely 7 = No knowledge at all/not known]	
	How much do scientists, experts know about the risks listed below? [1 = not known – 7 = much scientific knowledge/consensus]	
	To what extent can you avoid the following risks? [1 = completely unavoidable – 7 = easily avoidable]	
	If you are exposed to the risk, to what extent can you, by personal skill or diligence, avoid being harmed? [1 = uncontrollable/no personal control – 7 = full personal control]	
Threat **(individual – societal)**	How personally threatened do you feel by these risks? [1 = unthreatened – 7 = very threatened]	Based on Slovic et al. (1986); Sjöberg (1998)
	How threatened is the whole society/ your country's population by these risks? [1 = unthreatened – 7 = very threatened]	
Risk-as-feelings **(intuitive, affective reactions)**	Is this a risk that you have learned to live with and can think about reasonably calmly, or is it one that you have great dread for? [1 = no dread – 7 high dread]	Based on Slovic et al. (1986); Baron et al. (2000); Schmiege et al. (2009)
	How much do you worry about the following risks? [1 = worry-free – 7 = very worried]	
	How uneasy do you feel when thinking about the following risks? [1 = not uneasy – 7 = very uneasy]	
	How much do you think about the following risks? [1 = no thoughts – 7 = many, constant thoughts]	
other	Compared to others -comparable to you-, how likely are you affected by the following risks? [1 = considerably less likely – 7 = considerably more likely]	Based on Loske et al. (2013; Baron et al. (2000)
	How necessary do you consider state regulations and governmental remedies concerning the following risks? [1 = absolutely unnecessary – 7 = extremely necessary]	
	Imagine there was a way to completely eliminate some of these risks to you and your family. Indicate the priority you would give to eliminating each risk to you and your family. [1 = no priority – 7 = highest priority]	

Table 3. Operationalization of Risk Perception Constructs

Threat[1] has been singled out as it comprises both analytical as well as emotional components (Pessoa 2009). After assessing all risks with the aforementioned items, participants are asked to attribute 100 monetary units to the seven risk categories under the presumption of being able to insure themselves against it. Additionally, all seven categories have to be ranked according to the priority of governmental or societal countermeasures. These questions will help determining the allocation and differences regarding generalized concern, thus indicating the existence of a Hierarchy of Concerns.

[1] Threat in our study differs from the operationalization in most PMT studies as it does not result out of perceived susceptibility and perceived severity. The items for threat are based on the operationalization typically used in social sciences to ensure comparability with studies in climate research and risk perception in general.

4 Expected Results and Discussion

Whereas other research fields have begun to increasingly include affective or emotional factors and incorporated aspects of risk-as-feelings into cognitive, consequentialist theories like the Theory of Planned Behaviour, studies in Information Systems still predominantly view risk perception solely from a risk-as-analysis perspective (Kobbeltvedt and Wolff 2009; Schmiege et al. 2009). Privacy research has already tapped into the risk-as-feelings theory by incorporating concerns and other emotional factors such as joy or even worry into research models, however predominantly viewing these factors rather as anticipated than anticipatory emotions (Horst et al. 2007). Our results are expected to provide further insight into the role of worry – specifically when applied in a cyber-related hazard context. Furthermore, we expect to see decreased risk ratings for these affective and emotional items as soon as cyber-related hazards have to be rated among a plethora of other risks. A change regarding the risk assessment can be ascribed to limited available emotional resources, i.e. the finite pool of worry in particular (Linville and Fischer 1991). In order to attribute this effect to cyber-related hazards in particular, we will analyse similar effects within Group B, thus demonstrating the general existence of a finite pool of worry, whereas dissimilar effects might be a sign for differences in risk assessment depending on the category of risk and would require further statistical tests on an intra-individual level. Another expected result, is the general existence of the so-called Hierarchy of Concern. We expect to see differences regarding priorities and expressed concern and worry for risks that are deemed similarly likely and as serious or severe as other risks.

5 Conclusion, Potential Contribution, and Future Plans

The aim of our experimental study is to show the importance of a risk-as-feelings approach in technological risks, namely cyber risks such as privacy intrusion, data theft, or cyberattacks and hence, highlighting the role of worry in this context. Generally, research on risk perception can often only point to a very limited amount of influencing factors. Especially, the role of media exposure and the so-called "Social Amplification of Risk" (Kasperson et al. 1988) is an important factor in risk perception. The over-presentation of rather unlikely events like terrorist attacks (Silver et al. 2013) underlines the influence media and the social environment exert on risk perception in general. Additionally, individuals will always employ a plethora of heuristics and biases due to time and knowledge constraints, as demonstrated by bounded rationality studies (Simon 1982). Another limitation can be seen in the hypothetical nature of the finite pool of Worry, the Hierarchy of Concerns and the expected small sample size for our experimental study. However, we believe that our approach can serve as a first base for further studies that look deeper into the differences/similarities of cyber-related hazards and climate change research. Potential contributions are closely linked to the envisioned future research agenda based on our literature analysis and first results. Especially, the inclusion of worry – distinct from fear – into frameworks like Protection-Motivation Theory or General Deterrence Theory might result in increased explanatory power. Generally speaking, the phenomenon of the finite pool of worry should also be considered by either including other risks or factors capturing respondents' current state or hierarchy of concern. An individual faced with extreme financial worries might not be interested at all in actually performing preventive or protective actions regarding a cyber-related hazard. In this light, we plan to test an extended PMT-model across a rather heterogeneous sample given that existing studies highly rely on data of students or skilled knowledge worker samples while accounting for the risk-as-feelings approach. In addition, our findings provide important contributions for practitioners. Drawing again on findings from climate research, official agencies and other key players in risk communication of global warming or climate change have embraced the importance of feelings in risk perception and subsequent protective behaviour. Understanding how cyber-related hazards evoke emotions and how differently they are perceived compared to other hazards, can serve as an important first step in a prescriptive approach in cyber risk communication. In conclusion, we expect that our experimental study will be able to provide several theoretical contributions and may inspire IS research to draw on other interesting findings stemming from climate change risk research and as such follow the successful transfer of models from the health context into IS research.

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