

WHO IS TO BLAME? HOW TOO MUCH INFORMATION THREATENS USERS' CONTINUANCE INTENTION – AN EXPERIMENTAL ANALYSIS

Research paper

Wallbach, Sören, Technische Universität Darmstadt, Darmstadt, Germany,
wallbach@ise.tu-darmstadt.de

Haag, Steffi, Technische Universität Darmstadt, Darmstadt, Germany,
haag@ise.tu-darmstadt.de

Abstract

The rapid innovation and spread of smart phones as well as their mobile applications offer people many benefits in their everyday life. The dark side, however, is that users are constantly facing more and more information, which may result in information overload. In this paper, we argue that information overload can affect users' continuance intention of mobile applications use. The context of smart phones and mobile applications needs a special consideration because of the smaller display-size and the touch-based user interface. In addition, we contend that these effects differ according to users' attribution of the blame (themselves or mobile application) for the information overload. To explore this effect, we build on and contextualize Bhattacharjee's information system continuance model and extend it with the construct information overload. We test the model by using a scenario-based study with 120 participants that enables us to manipulate information overload as well as the locus of the attribution of blame in an isolated way. The results show that satisfaction and perceived usefulness fully mediate the negative effect from information overload on continuance intention of mobile applications. Furthermore, internal attributions of blame are associated with a higher continuance intention than external attributions.

Keywords: Information Overload, Attribution Theory, Dark Side of IT, Continuance Behaviors

1 Introduction

The rapid innovation and development in the area of information systems (IS) and especially in mobile computing leads to a ubiquitous presence of information and communications technology (ICT) in people's everyday life. Ubiquitous computing offers many opportunities for humans, like the availability of information at any time and any location (Rutkowski et al., 2013). Nowadays, this kind of information availability is common for humans and they claim this characteristic or other features for novel applications. Therefore, software providers develop more powerful applications with rich feature. The dark side, however, is that this approach also creates more complex applications and information overload (D'Arcy et al., 2014; Benlian, 2015a).

Information overload describes the cognitive conditions of a person when the existing amount of information exceeds the individual information processing capacity and leads to stress or frustration (Lu and Yang, 2011; Xu, 2016). Xu (2016) found that stress or frustration caused by complex websites in turn decrease user satisfaction and induce users to decrease their usage of the website. However, studies in consumer research building on attribution theory show that users' reactions depend on the attributed cause of product failure (Folkes, 1984). Transferring those findings, in this paper, we argue that different attributions of blame for information overload could also cause different user reactions

regarding IS use. In particular, we analyze effects of internal (attribute to themselves) and external (attribute to the mobile application) attributions of blame for information overload on users' continuance intention. We further focus on the smart phone context because the small display size and the touch-based user interface are particularly prone to information overload perceptions.

In contrast to business application usage, private application usage is self-determined by users. So, private users can easily switch to another application which fulfills the same purpose in case they are not satisfied. Furthermore, the acquisition costs for a new customer can be five times higher than the costs for maintaining one (Bhattacharjee, 2001). Therefore, for software providers it is important to avoid switching of users to another system to ensure the continuance usage and profitability of their own systems. Consequently, new insights about factors which inhibit or promote the continuance usage of a mobile application can not only lead to more sales and revenues but also strategic advantage for software providers. Thus, analyzing impacts of information overload and different attributions of blame on users' continuance intention is a crucial matter for software providers.

Prior research on information overload mainly focuses on its influences on decision quality or consumer and communication behaviors. First studies also show that information overload can cause adverse effects such as emotional consequences, which could also influence IS usage (Krishen et al., 2011; Hsu and Liao, 2014). The impact of information overload on continuance intention, especially in the context of mobile applications, however, has so far rarely been examined. However, this is important because there is a difference between the way of using mobile applications and conventional software applications (Gong and Tarasewich, 2004). For example, mobile applications differ from conventional desktop software in terms of the way how they are operated and how they are displayed (Ferreira et al., 2014).

In addition, while attribution theory rooted in psychology is increasingly being considered in other areas of research (e.g. finance Chen et al., 2016), we did not find any study answering the call of (Martinko et al., 2011) building on attribution theory to explain IS use behavior.

Therefore, the purpose of this paper is to address those gaps by answering the following research questions:

RQ (1): What is the impact of information overload on users' continuance intention to use a mobile application?

RQ (2): How do different attributions of IS failures (internal vs. external attribution) affect users' continuance intention?

To answer these questions, we conducted a scenario-based online experiment with 120 participants. The scenario-based approach allowed us to analyze the causal effect of information overload on users' continuance intention as well as different effects of various attributions of blame in an isolated manner. Hereby, we contribute to existing IS continuance research in three ways. First, we provide a possible operationalization of the construct information overload in scenario-based experiments. Second, we show that there is no direct effect, but the effect of information overload on continuance intention is fully mediated by satisfaction and perceived usefulness. Finally, third, we show that those effects vary by different attributions of blame for the information overload.

The next section provides an overview of the literature on IS continuance, information overload, and attributional theories. Afterwards, we develop seven hypotheses, which we empirically tested in an online experiment. The third part of our paper describes the experimental method. Finally, we present and discuss the results of our study.

2 Theoretical Background

2.1 Theoretical Background of IS continuance

The information systems continuance model (ISCM) (Bhattacharjee, 2001) is one of the most prominent IS continuance models. The ISCM postulates that the continuance intention is primarily based on

experiences gained from previous IS use as well as on expectations of a future advantage from the IT use. According to Bhattacharjee (2001), IS continuance intention describes “users' intention to continue using of an IS”. The main antecedents of IS continuance intention are the constructs confirmation and satisfaction from the expectation confirmation theory integrated with construct perceived usefulness (Bhattacharjee (2001). The relationships within the ISCM are based on solid theoretical grounds and have been validated in a number of follow-up studies (Limayem et al., 2007; Deng et al., 2010). As information overload might affect users' experiences with and future expectations from mobile applications use, we deem the ISCM as well suited for investigating the effects of information overload (a personal experience) on users' continuance intention in the mobile context. We further adapt the definitions of Bhattacharjee (2001) to our context and define users' satisfaction with the mobile application as “users' affect with (feelings about) prior IS use” and perceived usefulness as “users' perceptions of the expected benefits of IS use” (Bhattacharjee, 2001).

2.2 Theoretical Background of information overload

In previous research, information overload is regarded as an amount of information that individuals cannot effectively capture or process (Lu and Yang, 2011). For example, research disciplines like marketing, accounting, and consumer research have analyzed possible outcomes of information overload (Eppler and Mengis, 2004; Jones et al., 2004), such as repercussions concerning decision quality or communication behavior of individuals. They show that too much information causes stress and feelings like overwhelming which lead to suboptimal decisions. In the context of IS, Maier et al. (2015b) dissected the effects of technostress on IS discontinuance intention and operationalized technostress due to different stressors. One of these stress-emerging factors (stressor) was information overload. We could not identify any other IS study on the role of information overload for users' continuance intention.

To derive a definition of information overload, we borrow a construct from the area of cognitive psychology, namely information load which refers to a given amount of information in a fixed time period (Krishen et al., 2011). According to this, we define information load as the amount of information presented by an information system during a period. The existing definitions addresses a certain amount of information, which exceeds the individual information processing capacity. For our purpose, we build on those definitions and describe information overload occurs when the present information load of individuals exceeds their own information processing capacity. Resulting negative effects, such as a decreasing perceived performance, are outcomes of information overload.

Information overload is a strongly subjective problem depending heavily on certain situations (Krishen et al., 2011; Rutkowski et al., 2013), regardless of gender, culture or education (Jones et al., 2004; Ahuja and Thatcher, 2005; Hsu and Liao, 2014). The increasing number of publications indicates that information overload is more and more important in the context of IS research (e.g. Lee et al., 2016; Zhou and Guo, 2017). Due to the ability of information systems to produce and spread information more frequently than ever (e.g. via e-mail), information overload comes more and more into the focus (Barley et al., 2011). Furthermore, nowadays we live in a fast moving society and information overload is more salient under conditions of time pressure (Mullins and Sabherwal, 2014). Krasnova et al. states that the findings of the negative effects of the huge information consumption are alarming and they claim for further investigations of the underlying logic dynamics (Krasnova et al., 2010; Krasnova et al., 2013).

2.3 Theoretical Background of Attribution Theory

Psychology's attribution theory deals with individuals' explanations for the causes of their successes or failures (Heider, 1958). Accordingly, humans act like naive scientists and try to explain behavior on the basis of incomplete information (Heider, 1958). Different attributions of blame for an related issue do not influence the issue itself but they influence the consequences resulting from it (Weiner, 1985). Some research disciplines, like finance (Chen et al., 2016) or marketing (Camilleri, 2017), have adopted attribution theory to explain, for instance, how investors react to a different attribution of managers

negative guidance news. In the IS security research exists a related approach from Siponen and Vance (2010). They investigated in which way users' may use neutralization techniques to reduce perceived harm of their policy violations. Both, the neutralization techniques as well as the attribution theory do not change the related issue but they are different in the underlying mechanism. In case of the attribution theory, the assignment of the cause is differentiated between three dimensions: stability, controllability and locus (our focus). Stability refers to the extent to which the determined causal factors can be regarded as constant or variable. Controllability deals with the degree to which a person is presumed to be able to influence a result. The dimension locus deals with the perceived place of causality. Herby, it can be distinguished between internal (individual assign the location of causality in itself) and external places of causes (place of causality in the case of third parties or external influences). We make use of this distinction and define internal attributions of locus as assigning the cause of a related issue within oneself and external attributions of locus as assigning the cause of a related issue to the environment.

3 Research Model and Hypotheses

To investigate the relationship between information overload and IS continuance intention regarding mobile applications, we build on the ISCM model and extend it with information overload. We hypothesize relationships between information overload, perceived usefulness, satisfaction, and continuance intention. Furthermore, to analyze the role of attributions, we differentiate between two different cases: internal and external attributions of blame. We hypothesize direct and indirect relationships between information overload and users' continuance intention regarding mobile applications that are moderated by the attributional dimension locus.

In a group context, Paul und Nazareth (2010) showed a negative correlation between information overload and the perceived process satisfaction. At the individual level, Gao et al. (2012) analyzed, that a higher decision quality leads to a higher satisfaction level and vice versa. Building on this, we argue in our context that a lower decision quality caused by information overload leads to a lower user satisfaction with the mobile application. This is consistent with existing literature in research of technostress. Scholars examined a negative effect from technostress on users' satisfaction. However, it should be noted that technostress consists of various stressors, one of which is information overload.

Extending these findings to mobile applications, it is also conceivable that information overload influences user satisfaction with the mobile application (not a normal or a mobile website). Due to the small display size, it is not possible to provide many information on the screen in a normal font-size. Ordinary, mobile applications use symbols or short cuts to provide more information in small space. In this case, a back transformation of the short cut into the content by the user is necessary, which causes an additional influence on information overload. Furthermore, if the user receives a huge amount of information and wants to compare this within the mobile application, because of the small font-size, the short cuts as well as the small space on the display it is a hard task. In addition, mobile applications are less powerful than normal desktop applications. Thus, usually, it is not possible to switch the position of several information entries or to highlight multiple information entries within the mobile application. These actions are necessary to reduce the cognitive effort, but not possible. Due to the touch user interface, it is often difficult or impossible, to consolidate information in an additional document or application. Moreover, in general a huge amount of information is split on several sites in a mobile application. Satisfaction is influenced by the affection with prior IS use. Individuals are used to the handling of information by ordinary desktop applications or websites. In comparison, users tend to be less satisfied with the mobile application, when they recognize that the effort to fulfil the task is bigger or needs more time. Therefore, we hypothesize:

H1: A higher level of information overload has a negative effect on users' satisfaction with the mobile application.

Changes in individual's behavior are another reported negative outcome of information overload (Ahuja and Thatcher, 2005). Following Ahuja and Thatcher (2005), changes in individuals behavior can lead to a lower satisfaction and a lower performance. The definition of perceived usefulness refers

to individuals perception of three parts: first the effectiveness of the work, second productivity and third the relevance of the system for the job (Yang and Yoo, 2004). A decreasing perceived productivity can be equated with a lower perceived performance. Furthermore, in information overload situations scholars analyzed a declining perceived efficiency, which represents one part of perceived usefulness (Yang and Yoo, 2004; Gao et al., 2012). Hence, we presume that information overload has a negative effect on perceived usefulness.

Usually, mobile applications reduce the font-size, use symbols to display the content information, split information on different sites or present a huge amount of results in "a never ending scrolling list". For example, if the user wants to compare different information, e.g. several search results to choose a suitable restaurant, he or she must read a small font size, switch between different sites and must re-transfer or search different symbols. Compared to the search on a large screen, all of this leads to high cognitive effort. Furthermore, the touch-choice of one button is very hard if the presented information is very small. Due to the high cognitive effort, the user does not perceive the application as useful and cannot therefore expect any great benefit from its use. Therefore, we hypothesize:

H2: A higher level of information overload has a negative effect on users' perceived usefulness of a mobile application.

Next to these two postulated effects, we assume a direct negative effect between information overload and continuance intention. Weak signals for this effect are provided by Maier et al. (2015a) and Hsu and Liao (2014). Maier et al. (2015a) considered discontinuance intention instead of continuance intention. According to Turel (2015), discontinuance and continuance are two different intentions, which correlate in some cases. Following Maier et al. (2015a) discontinuance intention represents the intention about the final termination of the use of the information system (e.g. deleting the Social-Network Account). They analyzed a positive effect between technostress and discontinuance intention. The postulated effects due to Maier et al. (2015a; 2015b) would be equivalent to a negative effect between technostress and continuance intention. Moreover, the hypothesized direct effect between information overload and continuance intention is strengthened by the insights of Hsu and Liao (2014). They have shown that the use of microblogs decreases significantly when users experience information overload.

This effect is also conceivable in the use of mobile applications. If users receive a huge amount of information, they feel overwhelmed by this amount (e.g. Huang, 2003). In comparison to a large display, a huge amount of information on a small display appeals more overwhelming. This strong overwhelming feeling can lead to a lower continuance intention because in this very overwhelming situation individuals do not perceive usefulness or satisfaction. Thus, information overload will affect continuance intention also in a direct way, which leads to our third hypothesis:

H3: A higher level of information overload has a negative effect on user's continuance intention of a mobile application.

We apply the ISCM model to our mobile context. Bhattacharjee's (2001) postulated relationships are re-proofed in several studies. The following hypotheses are in line with previous research. Therefore, we relinquish on a long derivation, and hypothesize:

H4: A higher level of user's satisfaction with the mobile application causes a higher continuance intention of a mobile application.

H5: A higher user's perceived usefulness of a mobile application causes a higher continuance intention of a mobile application.

H6: A higher users' perceived usefulness of a mobile application causes a higher level of user's satisfaction with the mobile application.

Finally, we hypothesize a moderating effect of attributions of blame for the overall effect of information overload on users' continuance intention in the context of mobile applications. Oliver (1980) shows that individuals' satisfaction increases when internal causes can be attributed to an event. By contrast, external attributed causes, such as product defects, can decrease product satisfaction (Folkes, 1984). Thus, different appraisals of cause attribution can trigger a subconscious mental process, which results in more (or less) favorable valuations of the respective cause. Moreover, consumers react angri-

ly to a company when an external attributed cause is additionally attributed as controllable and thus, avoidable by the manufacturer (Folkes, 1984). Such angry reactions are also often mentioned as a consequence of technostress (Ayyagari et al., 2011). Transferred to the context of mobile applications, this means that the causal attribution of blame regarding the dimension locus (internal vs. external attribution of blame for information overload) can affect the effect strength of information overload. We expect that an external attribution of blame for information overload will lead to a lower continuance intention. If users are overwhelmed by too much information, they will attribute the information overload to either an internal or an external cause. In case of an internal cause, such as a wrong usage, users perceive that the information overload is their own responsibility and they have control over the extent of future information overload. Thus, the effect on users' intention to continue using the system will be smaller than compared to an external cause, such as a system error. An internally attributed blame might even override the negative effect of information overload on continuance intention resulting in a higher continuance intention. Further, we assume that the effects of information overload on satisfaction as well as on perceived usefulness are also moderated by the attribution of blame and thus influence users' continuance intention. As such, we predict that a different attribution of blame (i.e., particularly an internal attribution of blame) will attenuate or even wipe out the overall effect of information overload on users' continuance intention in the context of mobile applications, leading us to the following hypothesis:

H7: The attribution of the blame for information overload moderates the direct and mediated effects of information overload on continuance intention in such a way that the external (internal) attribution of the blame causes an increase (a decrease) in the total effect strengths.

Figure 1 summarizes our hypotheses and presents our research model. We do not display our seventh hypothesis, because it considers group differences of the whole research model.

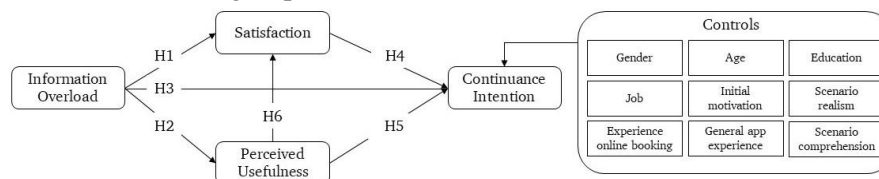


Figure 1. Research Model including hypotheses and control variables.

4 Methods

In order to test the research model (Figure 1), we conducted a scenario-based experimental study. This section first points out the experimental design. Then, we present items' operationalization as well as manipulation checks and control variables.

4.1 Experimental design and manipulations

To test our model, we used a scenario-based full-factorial study (experimental vignette methodology) with four carefully constructed vignettes (cf. Appendix 1). To avoid test fatigue, we used a between design in which each participant only presented one scenario. Scenario-based experiments are well suited for contextually related problems, such as information overload or unethical behavior (Siponen and Vance, 2010). The four textual scenarios (vignettes) have been designed in such a way that all have a high experimental realism, a high internal validity and a high variance of information overload as well as attribution of blame (Aguinis and Bradley, 2014). In doing so, we have considered the best practices for vignette studies recommended by Aguinis and Bradley (2014) as well as the recommendations by Atzmüller and Steiner (2010). To increase the scenario realism, we used fashionable pictures. Moreover, we followed the methodical approach of Vance et al. (2013) and Lowry and Moody (2015) and evaluated the scenario realism by experienced researchers before conducting the pretest.

Our first vignette contains the initial description of the fictitious person, the task as well as the technological conditions, which are influencing factors of information overload (Eppler and Mengis, 2004).

Our second vignette contains the manipulations. The manipulation of the independent variable information overload took place by a different number of the presented search results. We presented one group a search result with 12 unsorted entries, the other group received 216 unsorted entries. The manipulation of attributions of blame for the information overload took place by a hint that the fictive person think about the search site and why the person did not narrow down the search any more. In this case, the person attributes the blame to himself. The last pages were used to capture the dependent, independent and control variables. We also carried out manipulation checks (e.g. correct amount of the displayed results) as well as an attention trap on these pages. To reduce the common method bias, we followed Podsakoff et al.'s (2003) three recommendations and 1) noted that participants should answer honestly and there are no right and wrong answers, 2) guaranteed anonymity for the evaluation and 3) used different answer formats.

4.2 Measured variables and measurement validation

We used established measurement instruments to operationalize the constructs: initial motivation from Fleischmann et al. (2016); satisfaction and continuance intention from Bhattacharjee (2001); perceived usefulness from Venkatesh et al. (2012) (we used the performance expectancy which are substitutable with the perceived usefulness items (Bhattacharjee and Lin, 2015); information overload from Sasaki et al. (2015); attributions of locus (internal vs. external) from Brockner et al. (2007). The items for the measurement of the scenario realism were self-developed. In the literature are some hints that comparable items were used in other studies, but they have not been published (Vance et al., 2013).

4.3 Procedures

Before conducting our main study, we pretested the conceptualization with 26 participants. The participants reported only small typing mistakes, which we corrected. The pretest results showed sufficient indicator reliability as well as sufficient construct and discriminant validity. Therefore, no further adjustments were necessary after the pretest. The study was conducted within 21 days. The participants were acquired in social media, via mail campaigns, and the distribution of flyers at railway stations and at various universities. We chose these heterogeneous acquisitions activities, in order to achieve the greatest possible diversification of the participant with regard to regions, interests, professional activity and age to achieve a high external validity. We got 432 page impressions on our study website and 182 participants completed our study.

5 Analysis and Results

We used SPSS version 24 and Smart PLS version 3.2.7 for the evaluation of the results (Ringle et al., 2015). We cleaned up the data, converted the reverse coded variables and produce descriptive statistics with SPSS. Following Ahuja and Thatcher (2005), we chose for our analysis the variance based PLS approach because it is suitable for non-normal distributed samples and small sample sizes (Benlian, 2015b). For the investigation of our seventh hypothesis, it was necessary to split our sample. Therefore, altogether, we calculated three different models. Model 1 served for the investigation of the hypotheses one to six and contained the whole sample. Unless otherwise stated, the following evaluations refer to this model. To analyze H7, we compared model 2 containing those participants who attributed the blame to the system with model 3 containing those participants who attributed the blame to themselves.

5.1 Sample Description, Controls and Manipulation Checks

We have excluded 62 participants due to faulty manipulation checks or they had carried out the survey too quickly (Koch and Benlian, 2015). With 120 valid records our sample fulfills this requirements for exploratory factor analyzes (MacKenzie et al., 2011). The average age of our participants was 29.50 years, and 48 % were female. 69 % have a university degree as the highest education level, 19 % an A level and 12 % reported other graduations. The distribution of the current job-activities shows that

45 % of all participants were students, 44 % were employed or self-employed and 11 % reported another activity. The participants experience in dealing with mobile applications could be classified as high. 83 % of the participants reported that they use mobile applications every day. Comparable high experiences exist regarding the dealing with online travel services (4.98 on a 7 point Likert scale). The initial motivation was assessed by the participants in an average of 5.48 on 7 point Likert scale, which can be regarded as highly motivated. Furthermore, the understanding of the vignettes (6.37) and the realism of the scenario (5.80) was assessed also as very high (all items measured by a 7 point Likert scale). We also calculated these values for the models 2 and 3. Both showed comparable results.

5.2 Measurement Assessment

We assessed the measurement model based on convergence and discriminant validity. Three criteria should be examined to determine the convergence validity (Xu et al., 2012): First, the indicator reliability of all factor loadings should be above 0.65 (Falk and Miller, 1992), second the average variance extracted (AVE) of the constructs should be above 0.50 (MacKenzie et al., 2011) and third the composite reliability should be above 0.80 (Benlian et al., 2011). Furthermore, Cronbach's alpha measure is regularly reported in studies which are using structural equation modeling. The applied threshold is above 0.70. Table 2 shows that all criterions are fulfilled and convergence validity is met.

Construct	Cronbach's alpha	CR	AVE	Correlation of the constructs			
				CI	IO	PU	SAT
CI	0.931	0.956	0.880	0.938			
IO	0.814	0.877	0.642	-0.290	0.801		
PU	0.869	0.911	0.719	0.743	-0.382	0.848	
SAT	0.862	0.906	0.708	0.604	-0.394	0.642	0.841

Bold-printed = Squared root of the AVE
 IO = Information Overload; SAT = Satisfaction; PU = Perceived Usefulness; CI = Continuance Intention;
 CR = Composite Reliability; AVE = Average Variance Extracted

Table 1. Cronbach's Alpha, Composite Reliability, AVE and construct correlations.

	CI	IO	PU	SAT
CI_1	0.941	-0.287	0.704	0.586
CI_2	0.961	-0.305	0.727	0.578
CI_3	0.911	-0.222	0.660	0.533
IO_1	-0.269	0.825	-0.357	-0.346
IO_2	-0.216	0.794	-0.304	-0.282
IO_3	-0.241	0.840	-0.316	-0.344
IO_4	-0.195	0.741	-0.232	-0.282
PU_1	0.734	-0.327	0.862	0.607
PU_2	0.599	-0.337	0.866	0.524
PU_3	0.639	-0.374	0.876	0.501
PU_4	0.528	-0.252	0.784	0.541
SAT_1	0.489	-0.351	0.581	0.825
SAT_2	0.522	-0.325	0.502	0.859
SAT_3	0.523	-0.382	0.555	0.871
SAT_4	0.498	-0.262	0.521	0.809

All factor loadings are highly significant at a level of $p = 0.000$.
 IO = information overload; SAT = Satisfaction; PU = Perceived Usefulness; CI = Continuance Intention.

Table 2. Factor analysis - Item (highlighted) and cross-loadings.

For discriminant validity, two criterions must be fulfilled (Chin, 2010): first, the variance of the construct should be greater than the shared variance between this construct and all other construct in the model. Second, the Fornell-Larcker criterion must be met. As shown in Table 2, all item loadings within the corresponding construct are larger than the corresponding cross-loadings. Moreover, the Fornell-Larcker criterion was fulfilled and thus discriminant validity is met. We also investigated the convergence and discriminant validities for models 2 and 3 and found all criterions met. In addition, to

check for multicollinearity, we determined the variance inflation factor in each model. All values were below 4.2 and thus, significantly below the threshold of 10 (Field, 2018).

5.3 Results of the structural equation modeling

The predictive validity is evaluated by the variance explained in the dependent variables (R^2). To test the significances of our hypotheses, we use a bootstrapping with 5000 resamples (Krasnova et al., 2013). Figure 2 summarizes the effects of model 1 with $n=120$ participants. With exception of hypothesis 3, all hypotheses could be confirmed.

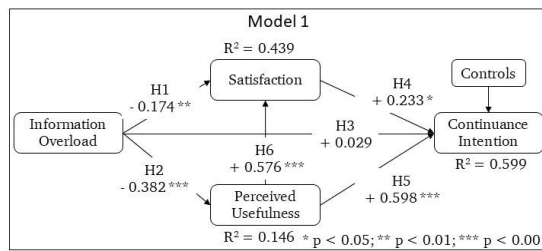


Figure 2. Results of the structural equation model 1, specification of the postulated relationships as well as the path coefficients, p-values and R square.

Figure 3 contains the evaluation of model 2 ($n=47$) and model 3 ($n=73$) to test H7. The relationship between satisfaction and continuation intention showed a significant change in the effect. The path coefficients of the relations of H2, H4 and H5 strongly differ between both models. If the blame is attributed to oneself, the path coefficient is by 0.040 lower. In addition, the p-value of the relation of H4 in model 2 was 0.026 and it changes in model 3 to 0.144, which is clearly insignificant. Moreover, the descriptive statistics in Table 3 exhibits that the continuation intention of users, which attribute the blame to the system (model 2) is lower than the continuation intention of users, which attributes the blame to themselves (model 3), as hypnotized by us. Finally, we re-tested our models including control variables and found no significant change in the effects.¹

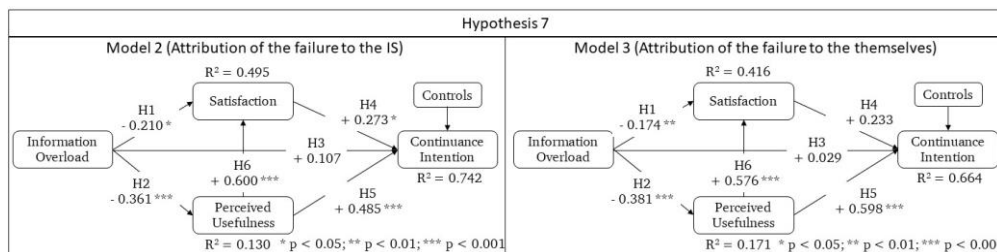


Figure 3. Results of the structural equation model 2 and 3, specification of the postulated relationships as well as the path coefficients, p-values and R square.

Construct	Model 1					Model 2					Model 3				
	N	Min	Max	Mean	σ	N	Min	Max	Mean	σ	N	Min	Max	Mean	σ
CI	120	1.00	7.00	4.061	1.613	47	1.00	7.00	3.660	1.724	73	1.00	7.00	4.320	1.493
SAT	120	1.00	6.00	3.692	1.015	47	1.00	6.00	3.457	1.112	73	1.00	6.00	3.842	0.925
PU	120	1.00	7.00	4.777	1.417	47	1.00	7.00	4.596	1.427	73	1.50	7.00	4.894	1.407
IO	120	1.25	7.00	5.385	1.365	47	1.25	7.00	5.245	1.489	73	1.50	7.00	5.476	1.281

Table 3. Descriptive statistics.

¹ Due to space limitations not included, results can be requested by the authors.

6 Discussion

The objective of the study was to identify how information overload influences users' continuance intention of mobile applications and the impact by different attributions of blame for the information overload in this context. We tested three hypotheses postulating direct and mediated effects from information overload on continuance intention to derive first insights for IS research and providers of mobile applications. Furthermore, our results regarding different attributions of blame for the information overload contribute important insights for existing research. We demonstrate that different effects exist, depending on internal and external attributions of blame. This insight can lead to the fact that studies dealing with adverse IS effects require a new consideration, because in this case, users' can also use different attributions which influence their reactions. In details:

Our first hypothesis postulates a negative effect from information overload on satisfaction. We show that information overload has a strong negative influence on users' satisfaction with the application. This finding can be placed in a coherent relation with the findings of Maier et al. (2015a) who analyze the contributions of technostress in the context of social network usage. Maier et al. (2015a) use the construct disclosure, which only covers too much information disclosed in social networks by oneself and one's virtual friends. We regard the whole amount of the presented information inside a mobile application and not only one special kind of information. Therefore, our view includes different types of information as well as different causes of information overload. Thus, our point of view is a more general one. Furthermore, a large part of technostress-studies conceptualize technostress as chronic and comprehensive stress which results from material properties of ICTs such as an unbroken ICT connectivity (Ayyagari et al., 2011; Reinke et al., 2016). We analyzed one stressor (information overload), which is different to the material properties of ICT-based communication events and examine the impact of information overload on satisfaction, perceived usefulness and continuance intention. In addition Maier et al. (2015a) argues that discontinuance intention and continuance intention are different behavior patterns, thus a differentiated analysis is necessary.

We also find support for H2 by showing a strong negative effect from information overload on perceived usefulness. Tarafdar et al. (2007) analyze the relationship between role overload and productivity and find that role overload effects productivity in a negative way. Neither the productivity as well the role overload is direct comparable with our constructs. For example, role overload deals with the role function in the job. Therefore, this finding can only be viewed as weak similarity. Our result shows that information overload effects perceived usefulness in a strong way. Perceived usefulness is a famous construct in the IS research. It is conceivable that this insight in other contexts or in other theories also serves for a new understanding or another consideration.

Moreover, it is well-researched that satisfaction and perceived usefulness are one of the main contributors for continuance intention (Bhattacharjee, 2001). In addition, we can show a negative effect from information overload on satisfaction as well as a strong negative effect of information overload on perceived usefulness. Hence, we also demonstrate that information overload strongly diminishes the continuance intention of mobile applications.

We could not find support for H3. We analyzed that the effects of information overload are fully mediated by the constructs perceived usefulness and satisfaction. Although we assumed another effect, this findings agree with the insights of Bhattacharjee's (2001) ISCM. In addition, H4-H6 serve for the replication of the relationships of the ISCM. We show that these relationships also exist in the mobile app context.

Our second objective was to analyze the effect of different attributions of blame for the information overload on users' continuance intention. Our results provide first insights that this topic area should also be investigated more closely in IS research. We find that users' continuance intention differs depending on whether the user attributes the blame for the information overload to himself or to the application. If users' attributes the blame to themselves, they have significantly higher continuance intention instead of an attribution to the application. In addition, we were able to show that different attributions cause a change in the significance level of the effect between satisfaction and users' continuance intention. A different continuance intention, caused by a different attributions of the blame of an

adverse effect (information overload), suggests that this influence also exists in other contexts. It is conceivable that the adoption as well as the continuance intention of IS can be massively influenced by attributions. For example, if the system detects an incomplete or poor input than input suggestions can use to give a hint for the necessary input parameters and demonstrate that user was responsible for the mistake. Therefore, studies dealing with adverse effects of IS could require a new consideration.

6.1 Implications for Research and Practice

We contribute to new research in the field of IS continuance. We show that information overload has a negative indirect impact on users' continuance intention to use a mobile application. We analyzed a direct effect of information overload on satisfaction as well as on perceived usefulness. The existing results in the area of technostress by Maier et al. (2015a) or Tarafdar et al. (2007) conceptualize technostress as chronic and comprehensive stress which results from material properties of ICTs (Reinke et al., 2016). In our case, we regard one single stressor and show that this stressor influences users' continuance intention in a negative way. Thus, we expanded the existing research of Maier et al. (2015a). Furthermore, we also show for the first time that the negative effect is completely mediated by the constructs satisfaction as well as perceived usefulness. Therefore, our findings contribute new insights into the existing research in the area of information overload as well as users' continuance intention to use a mobile application. It is conceivable, that these findings can adapt to other situations or applications.

We also contribute by investigating causal attributions and information overload. Both, causal attributions as well as information overload are strongly subjective and heavy situational depending. Therefore, our chosen scenario-based approach is suitable for this kind of problem. Due to carefully constructed textual scenarios we could meticulous and precisely describe details of a fictive person and a specific task. In addition, we were able to use a symbolic screenshot to increase the scenario reality. Following Eppler and Mengis (2004), these components influence the information load and can lead to information overload. Furthermore, we could manipulate isolated factors to control the different levels of information load and forms of the causal attribution. Our results constitute that the used approach is appropriate for research in the area of information overload, causal attributions as well as IS continuance. However, to validate the suitability, further studies should be done.

Further, we have demonstrated that attributions of blame for information overload affect the continuance intention of an IS. Based on our knowledge, this is the first study to consider causal attributions in the context of IS. This new insight points out a new and large research area in the IS research. It indicates that the existing research on IS Continuance, especially in the case of adverse effects such like the effects of stress on the users' continuance intention, should be reinterpreted and extended. Furthermore, the attribution theories should be examined in more detail and their effects on existing constructs should be investigated. In addition, existing IS theories should be investigated taking into account attribution theories.

From a practitioner's perspective, our study provides also important implications. The spread of smart phones and tablets has continuously increased in recent years (eMarketer, 2016) and for providers of mobile applications, the continuance use of their software is an important strategic factor for their economic success (Bhattacharjee, 2001). Due to the physical properties of smartphones and tablets, such as a smaller display, they can cause a higher information load and therefore rather information overload. We demonstrate that information overload reduces users' continuance intention. Especially in the development of mobile applications, it should be emphasized that users do not experience too high information load during the application usage. In addition, we demonstrated that the negative effect of information overload is fully mediated by satisfaction and perceived usefulness. So, these insights enable software providers to develop more specific countermeasures to increase satisfaction as well as perceived usefulness. Moreover, if users' attribute the blame for information overload to themselves, they have a higher continuance intention. This indicates, that practitioners should use hints for the user, that they attribute failure more to themselves.

6.2 Limitations, Future Research

The results of the study are subject to certain limitations. We used a scenario based research approach, in which the manipulations were carried out by means of a textual description. Although the used method was appropriate for the context of our study and a large part of the postulated hypotheses could be demonstrated empirically, some limitations of the scenario method should be explained in more detail. In our study, we asked the participants to move into the role of a fictitious person and answer some questions from the person's point of view. This is certainly advantageous to evoke perceptions regarding factors of the dark side of IT usage (Lowry et al., 2013; Vance et al., 2013). However, there may still be a difference between the real behavior of the participants and the given behavior in the role of the fictional person. Nevertheless, the control questions showed that the participants considered the scenario to be very realistic and that they placed themselves well in the role of the fictitious person. In addition, we did not control how well our participants liked to spend their holidays. The high scenario realism indicates, that the chosen story was high realistic and therefore we assume that the participants were able to identify themselves with the story. Therefore, we deem our scenarios and manipulations as realistic, but recommend to validate the results in future.

A second limitation is the distribution of the sample. Despite the heterogeneous acquisitions, the sample included many participants with a very high education level (academic degree and upper). Although information overload can occur in any human being regardless of his or her education level (Grisé and Gallupe, 1999), we suggest a follow-up study with a more balanced sample.

Appendix


<p>Philipp is 29 years old and works in a company. Due to the high order situation, Philipp is currently making many overtime work and arrives home late at night. Two years ago Philipp started to ski. To escape everyday life, he plans a skiing holiday with his two friends Christian and Max.</p> <p>Philipp was only two times skiing. Therefore, he don't knows ski resorts and is only able to ride on easy and flat slopes (the blue). To relax after the skiing day, Philipp would like to go to the sauna. Hence, a hotel with a wellness area is very important for him.</p> <p>The holiday should start in 9 days and Philipp is responsible for the booking of the resort as well as the hotel. He promised Christian and Max to book the hotel this evening at the latest. Because of the many orders at his workplace, Philipp arrives at home at 22:30 h. It is very late and Philipp wants to sleep fast, so he decides to invest a maximum of 30 minutes into the search and booking of a suitable resort and hotel.</p> <p>So far, Philipp has no idea which ski resorts are suitable for him. A work colleague Philipp told him that the App Move to Snow is very suitable for finding and booking ski tours. Move to Snow offers information about the slopes in the ski resorts as well as information about available hotels in the region. To narrow down the search, Philipp enters his criteria after starting the app and clicks "Search" (see figure)...</p>	<p>Fashionable screenshot of the app.</p> 
--	---

Table 4. Vignette 1 of our Study – Initial description.


<p>The app presents Philipp a table with his search results. The table contains 216 (Groups 1 & 2 / Groups 3 & 4 – 12 entries) unsorted entries (see figure). It is not possible to sort the entries. Each row of the table contains the name of the ski resort, the number of blue (light) slopes, the number of free hotels inside of the resort as well as a subjective review from other users. To get an overview, Philipp scrolls through the list of his search results. He studies the information very closely and built a mental a sequence of the interesting ski resorts in his head.</p> <p>After a while, he realizes that he has lose track of the situation. For him, all the names of the ski resorts sounds equal. He cannot remember which resort he likes and which ones not. He cannot built a mental a sequence of the 216 unsorted results. Furthermore, his planned 30 minutes have already expired, so Philipp is booking the next ski area. (Groups 1 & 2)</p> <p><i>Philipp finds it hard built a mental a sequence of the 12 ski resorts in his head. Finally, however, Philipp has finished the sequence in his head and decides to book one ski resort. (Groups 3&4)</i></p> <p><i>Philipp remembers the input mask of Move to Snow and thinks, "Why didn't I narrow down my search and choose Austria as my country?" (Groups 1 & 4)</i></p>	<p>Fashionable screenshot of the results (Group 1&2).</p> 
---	---

Table 5. Vignette 2 of our Study – Used manipulations.

References

- Aguinis, H. and K. J. Bradley (2014). "Best Practice Recommendations for Designing and Implementing Experimental Vignette Methodology Studies." *Organizational Research Methods* 17(4), 351-371.
- Ahuja, M. K. and J. B. Thatcher (2005). "Moving Beyond Intentions and toward the Theory of Trying: Effects of Work Environment and Gender on Post-Adoption Information Technology Use." *MIS quarterly* 29(3), 427-459.
- Atzmüller, C. and P. M. Steiner (2010). "Experimental Vignette Studies in Survey Research." *Methodology*.
- Ayyagari, R., V. Grover and R. Purvis (2011). "Technostress: Technological Antecedents and Implications." *MIS quarterly* 35(4), 831-858.
- Barley, S. R., D. E. Meyerson and S. Grodal (2011). "E-Mail as a Source and Symbol of Stress." *Organization Science* 22(4), 887-906.
- Benlian, A. (2015a). "It Feature Use over Time and Its Impact on Individual Task Performance." *Journal of the association for information systems* 16(3), 144.
- Benlian, A. (2015b). "Web Personalization Cues and Their Differential Effects on User Assessments of Website Value." *Journal of Management Information Systems* 32(1), 225-260.
- Benlian, A., M. Koufaris and T. Hess (2011). "Service Quality in Software-as-a-Service: Developing the SaaS-Qual Measure and Examining Its Role in Usage Continuance." *Journal of Management Information Systems* 28(3), 85-126.
- Bhattacharjee, A. (2001). "Understanding Information Systems Continuance: An Expectation-Confirmation Model." *MIS quarterly* 25(3), 351-370.
- Bhattacharjee, A. and C.-P. Lin (2015). "A Unified Model of It Continuance: Three Complementary Perspectives and Crossover Effects." *European Journal of Information Systems* 24(4), 364-373.
- Brockner, J., A. Y. Fishman, J. Reb, B. Goldman, S. Spiegel and C. Garden (2007). "Procedural Fairness, Outcome Favorability, and Judgments of an Authority's Responsibility." *Journal of Applied Psychology* 92(6), 1657.
- Camilleri, A. R. (2017). "The Presentation Format of Review Score Information Influences Consumer Preferences through the Attribution of Outlier Reviews." *Journal of Interactive Marketing* 39(Supplement C), 1-14.
- Chen, W., J. Han and H.-T. Tan (2016). "Investor Reactions to Management Earnings Guidance Attributions: The Effects of News Valence, Attribution Locus, and Outcome Controllability." *Accounting, Organizations and Society* 55(Supplement C), 83-95.
- Chin, W. W. (2010). How to Write up and Report Pls Analyses. In: (Eds.), *Handbook of Partial Least Squares*, p. 655-690: Springer.
- D'Arcy, J., A. Gupta, M. Tarafdar and O. Turel (2014). "Reflecting on the "Dark Side" of Information Technology Use." *Communications of the association for information systems* 35(1), 109-118.

- Deng, L., D. E. Turner, R. Gehling and B. Prince (2010). "User Experience, Satisfaction, and Continual Usage Intention of It." *European Journal of Information Systems* 19(1), 60-75.
- eMarketer (2016). *Prognose Zum Anteil Der Smartphone-Nutzer an Den Mobiltelefonnutzern Weltweit Von 2014 Bis 2020*.
<https://de.statista.com/statistik/daten/studie/556616/umfrage/prognose-zum-anteil-der-smartphone-nutzer-an-den-mobiltelefonnutzern-weltweit/> (visited on 4. Mai 2017).
- Eppler, M. J. and J. Mengis (2004). "The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, Mis, and Related Disciplines." *The information society* 20(5), 325-344.
- Falk, R. F. and N. B. Miller (1992). *A Primer for Soft Modeling*: University of Akron Press.
- Ferreira, D., J. Goncalves, V. Kostakos, L. Barkhuus and A. K. Dey (2014). "Contextual Experience Sampling of Mobile Application Micro-Usage." In: *Proceedings of the 16th international conference on Human-computer interaction with mobile devices & services*. ACM. 91-100.
- Field, A. (2018). *Discovering Statistics Using Spss*: Sage publications.
- Fleischmann, M., M. Amirpur, T. Grupp, A. Benlian and T. Hess (2016). "The Role of Software Updates in Information Systems Continuance — an Experimental Study from a User Perspective." *Decision Support Systems* 83, 83-96.
- Folkes, V. S. (1984). "Consumer Reactions to Product Failure: An Attributional Approach." *Journal of consumer research* 10(4), 398-409.
- Gao, J., C. Zhang, K. Wang and S. Ba (2012). "Understanding Online Purchase Decision Making: The Effects of Unconscious Thought, Information Quality, and Information Quantity." *Decision Support Systems* 53(4), 772-781.
- Gong, J. and P. Tarasewich (2004). "Guidelines for Handheld Mobile Device Interface Design." In: *Proceedings of DSI 2004 Annual Meeting*. 3751-3756.
- Grisé, M.-L. and R. B. Gallupe (1999). "Information Overload: Addressing the Productivity Paradox in Face-to-Face Electronic Meetings." *Journal of Management Information Systems* 16(3), 157-185.
- Hsu, C.-L. and Y.-C. Liao (2014). "Exploring the Linkages between Perceived Information Accessibility and Microblog Stickiness: The Moderating Role of a Sense of Community." *Information & Management* 51(7), 833-844.
- Huang, M.-H. (2003). "Modeling Virtual Exploratory and Shopping Dynamics: An Environmental Psychology Approach." *Information & Management* 41(1), 39-47.
- Jones, Q., G. Ravid and S. Rafaeli (2004). "Information Overload and the Message Dynamics of Online Interaction Spaces: A Theoretical Model and Empirical Exploration." *Information systems research* 15(2), 194-210.
- Koch, O. F. and A. Benlian (2015). "Promotional Tactics for Online Viral Marketing Campaigns: How Scarcity and Personalization Affect Seed Stage Referrals." *Journal of Interactive Marketing* 32, 37-52.
- Krasnova, H., S. Spiekermann, K. Koroleva and T. Hildebrand (2010). "Online Social Networks: Why We Disclose." *Journal of Information Technology* 25(2), 109-125.

- Krasnova, H., H. Wenninger, T. Widjaja and P. Buxmann (2013). "Envy on Facebook: A Hidden Threat to Users' Life Satisfaction?" *Wirtschaftsinformatik* 92, 1-16.
- Krishen, A. S., R. L. Raschke and P. Kachroo (2011). "A Feedback Control Approach to Maintain Consumer Information Load in Online Shopping Environments." *Information & Management* 48(8), 344-352.
- Lee, A. R., S.-M. Son and K. K. Kim (2016). "Information and Communication Technology Overload and Social Networking Service Fatigue: A Stress Perspective." *Computers in human behavior* 55, 51-61.
- Limayem, M., S. G. Hirt and C. M. Cheung (2007). "How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance." *MIS quarterly* 31(4), 705-737.
- Lowry, P. B. and G. D. Moody (2015). "Proposing the Control-Reactance Compliance Model (Crcm) to Explain Opposing Motivations to Comply with Organisational Information Security Policies." *Information Systems Journal* 25(5), 433-463.
- Lowry, P. B., G. D. Moody, D. F. Galletta and A. Vance (2013). "The Drivers in the Use of Online Whistle-Blowing Reporting Systems." *Journal of Management Information Systems* 30(1), 153-190.
- Lu, Y. and D. Yang (2011). "Information Exchange in Virtual Communities under Extreme Disaster Conditions." *Decision Support Systems* 50(2), 529-538.
- MacKenzie, S. B., P. M. Podsakoff and N. P. Podsakoff (2011). "Construct Measurement and Validation Procedures in Mis and Behavioral Research: Integrating New and Existing Techniques." *MIS quarterly* 35(2), 293-334.
- Maier, C., S. Laumer, A. Eckhardt and T. Weitzel (2015a). "Giving Too Much Social Support: Social Overload on Social Networking Sites." *European Journal of Information Systems* 24(5), 447-464.
- Maier, C., S. Laumer, C. Weinert and T. Weitzel (2015b). "The Effects of Technostress and Switching Stress on Discontinued Use of Social Networking Services: A Study of Facebook Use." *Information Systems Journal* 25(3), 275-308.
- Martinko, M. J., P. Harvey and M. T. Dasborough (2011). "Attribution Theory in the Organizational Sciences: A Case of Unrealized Potential." *Journal of Organizational Behavior* 32(1), 144-149.
- Mullins, J. and R. Sabherwal (2014). "How Much Information Is Too Much? Effects of Computer Anxiety and Self-Efficacy."
- Oliver, R. L. (1980). "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions." *Journal of marketing research* 17(4), 460-469.
- Paul, S. and D. L. Nazareth (2010). "Input Information Complexity, Perceived Time Pressure, and Information Processing in Gss-Based Work Groups: An Experimental Investigation Using a Decision Schema to Alleviate Information Overload Conditions." *Decision Support Systems* 49(1), 31-40.
- Podsakoff, P. M., S. B. MacKenzie, J.-Y. Lee and N. P. Podsakoff (2003). "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies." *Journal of Applied Psychology* 88(5), 879.

- Reinke, K., G. Gerlach, M. Tarafdar and R. M. Stock (2016). "Ict-Based Communication Events as Triggers of Stress: A Mixed Methods Study." In. Association for Information Systems.
- Ringle, C. M., S. Wende and J.-M. Becker (2015). "Smartpls 3." *Boenningstedt: SmartPLS GmbH*, <http://www.smartpls.com>.
- Rutkowski, A., C. Saunders, M. Wiener and R. Smeulders (2013). "Intended Usage of a Healthcare Communication Technology: Focusing on the Role of It-Related Overload."
- Sasaki, Y., D. Kawai and S. Kitamura (2015). "The Anatomy of Tweet Overload: How Number of Tweets Received, Number of Friends, and Egocentric Network Density Affect Perceived Information Overload." *Telematics and Informatics* 32(4), 853-861.
- Siponen, M. and A. Vance (2010). "Neutralization: New Insights into the Problem of Employee Information Systems Security Policy Violations." *MIS quarterly* 34(3), 487-502.
- Tarafdar, M., Q. Tu, B. S. Ragu-Nathan and T. Ragu-Nathan (2007). "The Impact of Technostress on Role Stress and Productivity." *Journal of Management Information Systems* 24(1), 301-328.
- Turel, O. (2015). "Quitting the Use of a Habituated Hedonic Information System: A Theoretical Model and Empirical Examination of Facebook Users." *European Journal of Information Systems* 24(4), 431-446.
- Vance, A., P. B. Lowry and D. Eggett (2013). "Using Accountability to Reduce Access Policy Violations in Information Systems." *Journal of Management Information Systems* 29(4), 263-290.
- Venkatesh, V., J. Y. Thong and X. Xu (2012). "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology." *MIS quarterly* 36 (1), 157-178.
- Weiner, B. (1985). "An Attributional Theory of Achievement Motivation and Emotion." *Psychological review* 92(4), 548.
- Xu, H., H.-H. Teo, B. C. Tan and R. Agarwal (2012). "Research Note—Effects of Individual Self-Protection, Industry Self-Regulation, and Government Regulation on Privacy Concerns: A Study of Location-Based Services." *Information systems research* 23(4), 1342-1363.
- Xu, J. D. (2016). "Retaining Customers by Utilizing Technology-Facilitated Chat: Mitigating Website Anxiety and Task Complexity." *Information & Management* 53(5), 554-569.
- Yang, H.-d. and Y. Yoo (2004). "It's All About Attitude: Revisiting the Technology Acceptance Model." *Decision Support Systems* 38(1), 19-31.
- Zhou, S. and B. Guo (2017). "The Order Effect on Online Review Helpfulness: A Social Influence Perspective." *Decision Support Systems* 93, 77-87.