Intended Usage of a Healthcare Communication Technology: Focusing on the Role of IT-Related Overload

Completed Research Paper

Introduction

We are living in a world where we are deluged with information that is mainly delivered over the Information and Communication Technologies (ICT). The popular press frequently discusses the challenges that individuals face in trying to assimilate this information and make decisions based upon it. The articles claim that information overload, is a serious problem. Most academic researchers suggest that too much data/information causes overload (e.g., Chervany and Dickson 1974; Galbraith 1974; Griffeth et al. 1988; O'Reilly 1980; Payne 1976; Schroder et al. 1967; Speier et al. 1999; Tushman and Nadler 1978). This paper looks at overload in a new way. In particular, it reports a study which finds that overload can be created when individuals are asked to respond to requests to use too many new technologies.

This new type of overload , also referred as IT-related overload, can be used to explain the recent slow sales of Microsoft Corp.'s radical new version of Windows, Windows 8. In the past, the newer versions of Microsoft's operating system typically were adopted by businesses shortly after their introduction to the marketplace. However, the latest, much-ballyhooed operating system is not being adopted at the same pace. Claims are that Windows 8 "requires a relearning process, a leap that many consumers and corporate buyers aren't ready to take" (Liedtke and Svennson 2013). These claims suggest that consumers are so overloaded with requests to use new applications that they don't want to take the time to figure out if Microsoft 8 offers enough functionality to overcome the cognitive processing required to use it. Only geeks update their technical skills simply because they find it fun to do so (Tsai et al, 2007). For most mortals, constantly changing interfaces, frequent introductions of new versions, and increasing requests to adopt new digital technologies or online services are typically not welcomed (references not included to preserve anonymity).

There are a number of factors that are considered in the adoption of a new technology. A large number of studies validated in a range of settings suggests that utility (e.g. perceived usefulness, relative advantage, enhanced productivity) is the strongest predictor of adoption (e.g., Davis, 1989; Taylor and Todd, 1995; Venkatesh and Brown, 2001; Venkatesh and Davis, 1996, 2000). Another important predictor has proved to be hedonism/enjoyment (e.g., Bergvik et al., 2006; van der Heijden, 2004;Venkatesh and Brown, 2001). However, in this paper we employ a different perspective for viewing the evaluation to use a new technology by incorporating a factor that plays a more nuanced role in the decision: Emotional and Cognitive Overload (ECO). To understand the role of ECO on the adoption and use of a new technology, we develop an Input-Process-Output model which opens up the black box related to the processes leading to overload. In particular, the model distinguishes mental processes from overload's emotional and cognitive consequences. We test the research model using the results of a large survey (N=2037) that was underwritten by a large Dutch bank that was interested in delivering healthcare information online through the use of a video contact technology (VCT). The findings of the study are significant and our hypotheses are supported. We report the findings and discuss their implications.

Emotional-Cognitive Model of Overload

The Emotional-Cognitive Overload Model (ECOM) in Figure 1 unlocks a black box to help us understand how individuals become overloaded when they are not able to cognitively process the inputs that they receive. We define *Emotional-Cognitive Overload (ECO)* as the negative emotional and cognitive manifestations resulting from the inability to adequately process pertinent input and handle the associated mental load. We define *mental load* as the cognitive effort required to evaluate and process inputs using an individual's cognitive capabilities and stored memories.

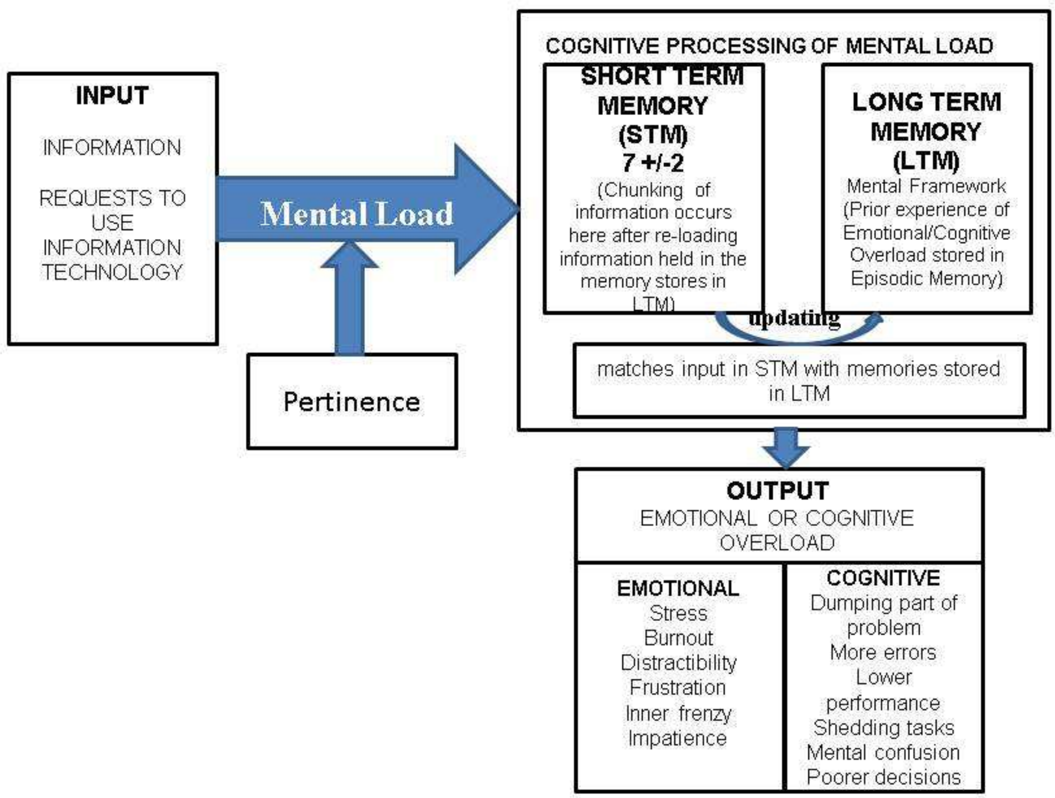

Figure 1. The Emotional-Cognitive Overload Model (ECOM)

A widely held assumption in the popular and academic press is that overload is created when people receive too much information. This myth sees information as pouring in. Little is said about processing the information. If one assumes that the problem that people are dealing with is too much information, the solution is to find ways of filtering out extraneous and only allowing needed information into the mind for processing. This is what has happened to the extent that suggestions are made to use technology to act as a filter or to propose new ways of handling email and so on. In this scenario no one is attempting to improve the processing.

Input

Our model reflects a markedly different assumption: Individuals do not process all information that they receive. A widely prevalent view portrays today's individuals as being swamped with so much information that a bottleneck is created when they try to process it. Suggested solutions focus on unclogging the bottleneck. In contrast, we argue that alleviating bottlenecks created by too much information should not be the focus of overload research. Rather, we think it is time to look at the mental processes that individuals use to deal with the deluge of information and other inputs. These processes are complex: When individuals receive an input, it is moved to their memory, which is the "data base" of the self. Each individual's memory stores past emotions and experiences in an organized manner by the "Executing Self". In particular, the Executing Self supervises the construction of specific memories, determines how they will be accessed, codes incoming events and experiences as memories, consolidates the memories into mental models so they can be appropriately associated with one another, and encapsulates personality traits (Conway 2005[1]).

At this point, it is important to realize that the input can either be information items or requests to use new technologies. Input items are compared to what is stored in memory by each individual's Executing Self in a unique way. Only the pertinent items (i.e., information or requests) then undergo cognitive processing. By p*ertinence* we mean the relevance of a new input based on a match by the Executing Self with mental models stored in memory**.** The memory uses pertinence to accept or reject all input signals, and therefore controls the mental load in the cognitive system. In other words, pertinent information makes sense because it fits cognitively with the mental models stored in the individual's memory system. Consequently, incoming information is processed selectively.

Most current views of overload are based on the premise that all information must be processed serially and completely one item at a time until an individual can process nothing more (Broadbent 1958). The Executing Self then starts processing the next input. A bottleneck is created because not enough pertinent information can get through the funnel. Our more nuanced view of the filter suggests that the inputs undergo parallel processing: preliminary information processing for selection at the filter and more elaborate information processing after the input passes through the filter. In this more nuanced view, individuals can selectively choose what they will process and, consequently, information overload is less likely to occur. Rather the bottleneck created from incoming information can be avoided by cognitively assessing whether additional processing is needed (Deutsch and Deutsch 1963). The model in Figure 1 indicates that inputs are filtered through parallel processing and many are rejected before they are ever subjected to a deeper level of processing. The idea that not all information is processed is very different from that promulgated in much of the literature on overload. Our model is about improving information processing and not about blaming the dizzying amount of information that is received.

Processing and Individual Differences

Input processing varies across individuals because of differences in their memory systems, mental resources, emotions, and storage capacity. Information is processed by the Executing Self on the basis of its pertinence and stored in the more permanent part of the memory system called the Long Term Memory (LTM). In particular, the Short Term Memory which receives new inputs, acts as an intermediary and temporary storage for about 30 seconds. The Executing Self processes these inputs based on older information held in the LTM as the individual's mental models. Each individual's mental model is saved in LTM as *cognitive schemata* which are mental representations that evolve as the individuals attempt to make sense of their own world. The mental model reflects individual differences in cognitive abilities and the organization of prior experiences in LTM. LTM has two storage architecture areas: *Semantic Memory* acts as a conceptual mental thesaurus that requires multiple exposures to information to identify and encode it while *Episodic Memory* stores personal experiences (Tulving, 1972). The Executing Self uses the individual's mental model to help him or her make sense of this input. It is the Executing Self that recovers the input in Short Term Memory and matches it with each individual's unique memories stored in the mental models in LTM. The stored memories in their mental models evolve as individuals attempt to make sense of their own world.

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[1] Most of the discussion of the Executing Self is based on Conway (2005).

Processing incoming inputs involves a certain level of mental effort, or resources. Resources reduce an individual's mental load by making the processing more efficient. Processing also can be affected by a number of other factors including emotions and storage capacity. Emotions can either help or hinder processing of the mental load (Bower, 1981). For example, people have been found to remember their emotional reactions to financial information better than the actual numbers (Rose et al. 2004) and they recall threatening material better than non-threatening material (Bower (1981). Positively-viewed inputs are processed more readily than those that are viewed negatively. Each emotion is encoded with a tag called a valence. A *valence* may be positive or negative and is attached to events (i.e., Episodic Memory) and concepts (i.e., Semantic Memory) that are activated in association with the experience of the related emotion in the past. The valence of an input is matched with a related item stored in LTM. If the two valences do not match, the processing becomes less efficient and challenges the individual's cognitive resources.

Not having enough storage can hamper processing. The brain can only hold seven, plus or minus two, items at a time (Miller 1956). Individuals become overloaded when they have to deal with more input items than they can handle. In response, they focus their attention and handle input efficiently. Miller (1956) suggests that the only way to efficiently process and recall the input and to extend the amount of information that can be processed is by chunking. *Chunking* occurs when the individual items are combined into blocks of items called chunks. In addition to information and other inputs, chunking can also involve converting a sequence of actions into an automatic routine. Construction of an increasing number of interrelated complex chunks increases expertise and therefore speeds processing and decreases overload by more efficiently dealing with attention constraints (Atkinson and Shiffrin 1968; Paas et al. 2004).

Output: Types of Overload

Overload is associated with the individual's ability to cognitively process the mental load. Typically overload is described in general terms rather than being specifically associated with emotions and with cognition. We divide overload into two types: (1) Cognitive overload which is associated with the cognitive processing of the mental load and is manifested by economizing the mental effort, by adapting the load to make it more manageable, cognitive weariness (Shirom et al., 2006), or even by a sense of professional non-accomplishment (Friedman, 2007); and (2) Emotional overload which is associated with stress, with short-term emotional consequences such as frustration (Wickens 1992), emotional exhaustion (Malasch et al., 1986; Friedman, 2007; Shirom et al., 2006), technostress (Tarafdar et al. 2007), distractibility, inner frenzy, and impatience representing the emotional side of the cognitively-overwhelming effort (Hallowell 2005), and with long-term chronic stress (Schlotz et al. 2004) similar to burnout symptoms (Maslach and Jackson 1981).

Both emotional and cognitive overload result from mental strain and exhausted resources. This may occur when an individual has insufficient resources or expertise and, consequently, faces too great a mental load to cognitively process. To cognitively process the mental load, individuals may choose strategies that have a direct impact on the output side of the equation. One such strategy is to economize mental effort by dumping part or the entire problem (Kellogg, 1990), shedding tasks, deferring choice (Dahr, 1996), chunking more effectively, or reverting to previously learned conventions. Another strategy involves accepting lower levels of performance by living with an increased number of errors, reduced information integration, and impaired decision making (Shiv and Fedorikhin 1999; Bettman et al. 1990).

When a person experiences overload, there is a secondary consequence. The Executing Self stores the experience in the individual's mental model. If the person was able to deal effectively with a particular type of overload, the experience will be tagged with a positive valence. If the person was not able to deal with the overload, it will be tagged with a negative valence. That means that the overload experience will be remembered and will impact how the person responds when a similar situation occurs in the future.

Up to this point we have spent a lot of time talking about overload. There are, however, many occasions when a person does not experience overload. It could be that the person did not have much to process and the mental load was relatively slight. It could also be that the mental load was great, but the person was able to handle it successfully. This is often the case with experts. In such cases, there is no recording of an overload experience in the mental model in memory.

Research Model and Hypotheses

In this research we focus on only a small part of the ECOM (see Figure 1). We want to explore the extent to which ECO impacts the intention to use a new healthcare communication technology, namely, a video contact technology (VCT). While other factors such as the new technology's utility or enjoyment clearly impact the intention to use a new technology, we argue that overload also plays a role. We recognize that this is not the typical way of looking at the decision to use a new technology. We know of no other research beyond ours (Rutkowski and Saunders, 2010; Rutkowski et al., 2013) that tests the role of overload on decisions about using new technology. Hence, we are testing a very parsimonious research model that only looks at overload constructs and their relation to the intention to use VCT designed to communicate healthcare information. We control for other factors such as utility and enjoyment that may impact the intention to use the healthcare VCT. If the overload constructs prove to have a significant impact on the intention to use the technology, then we will explore other aspects of ECOM in future research.

The research model in Figure 2 highlights the interrelationships of past memories of emotional and cognitive overload with the anticipation of overload from using the VCT. ECOM is unique in that it proposes a role for the memory of past experiences of overload. Further, it distinguishes cognitive and emotional overload consequences. If in the past an individual was confused when using new technology, or delivered poorer quality work because she or he was unable to adequately deal with such technology in the past, it is likely that a memory of those undesirable cognitive consequences will be encoded in the individual's mental model. For example, assessments of the objective difficulty of test problems are often based on one's subjective experience with the problems or test that have been altered by specific prior experience (Kelley, 1999). Memories of undesirable past cognitive overload are likely to be positively related to perceived cognitive overload when subjects are asked to use the new technology, the healthcare VCT. That is:

> *Hypothesis 1: Past cognitive overload will be positively related to perceived cognitive overload with the healthcare VCT.*

Similarly if the individual felt frustrated or stressed after using a similar technology in the past, these memories of undesirable emotional consequences are stored in the individual's mental model. A request to use a new technology will likely lead to perceptions that the individual will be overloaded with the information delivered by the new system. Thus we hypothesize:

> *Hypothesis 2: Past emotional overload will be positively related to perceived cognitive overload with the healthcare VCT.*

Lastly, we suggest that individuals consider the impact on themselves of using the new technology. In our case, they make an assessment as to whether they will have the cognitive resources capable of processing the information that they will receive from the healthcare VCT. If they do not think that they can process the information they will anticipate a situation of cognitive overload related to the technology which will negatively impact their intent to use it. Hence we propose:

> *Hypothesis 3: Perceived cognitive overload with the healthcare VCT will be negatively related to the intention to use this technology.*

Our model further suggests that the relationships between the intention to use the healthcare VCT and past cognitive and past emotional overload are fully mediated by IT-related overload, in this case perceived cognitive overload with the healthcare VCT. This is because of the way that past memories are activated when processing the mental load. The Executing Self evaluates inputs for their pertinence based upon what is stored in the individual's mental model stored in Long Term Memory. Hence, we predict that there will be "no influence" of past emotional and cognitive overload on VCT intention to use (see Figure 2 below).

We control for a number of relevant constructs likely to be used in the evaluation of the new technology including enjoyment (communication enjoyment) and utility (communication flow, emotional communication and information quality). The resulting research model is presented in Figure 2.

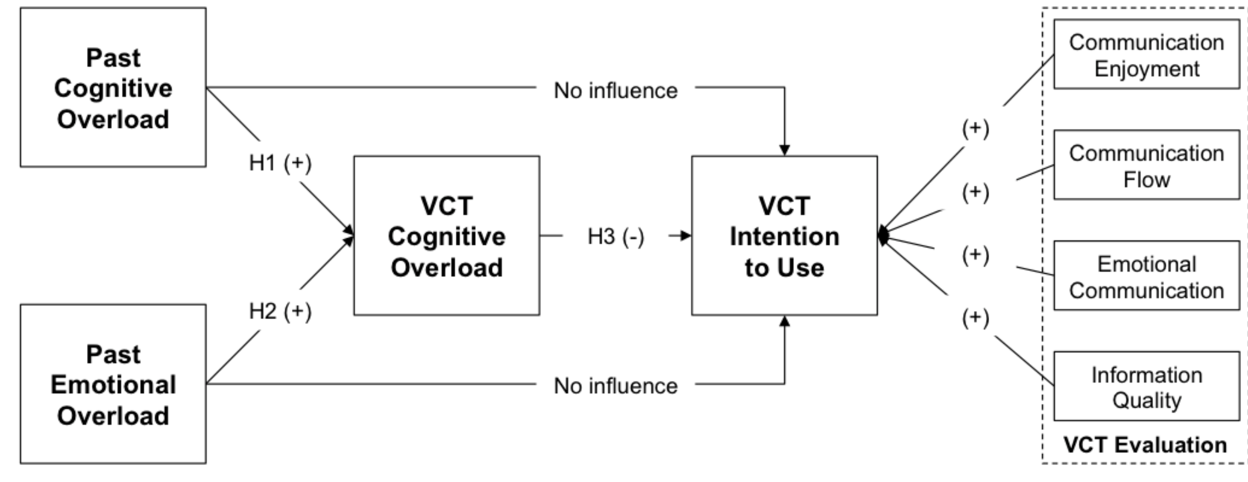

Figure 2. Research Model

Research Methodology

Instrument Development

The dependent (VCT Intentions to Use), the independent variables (Past Cognitive Overload, Past Emotional Overload) and the mediating variable (VCT Cognitive Overload) were obtained from a previous study with a sample size of approximately 1800 (Rutkowski et al., 2013). The items were developed based on literature reviews and subjected to Q-sort method using two doctoral students. The survey was pre-tested with three professionals with expertise in the banking and/or health care areas. A pilot test was conducted on 110 subjects and its psychometric properties were analyzed. The final survey was pilot tested by an additional 50 respondents. The psychometric properties of the scales are strong (Rutkowski et al., 2013).

Data Collection

An online survey was conducted in summer of 2011. Members of 2,689 households were invited to participate in a study about their intentions to use a new healthcare VCT that would promote communications between themselves and their healthcare providers. In all, 2037 respondents completed the survey for a response rate of 75.8%. The sample consists of 53.7% males and 46.3% females. The age of the survey participants ranged from 16 to 90 years, with a median age of 56 years. The median number of members per household is 2 and the median monthly gross household income is 3,672 €.

To test for common method variance, we performed Harman's single-factor test (Podsakoff et al. 2003). Factor analyses produced neither a single factor nor one general factor that accounted for the majority of the variance, indicating a low risk of common method bias. T-tests on all main constructs comparing early (first 100) and late (last 100) respondents showed no significant differences, suggesting against non-response bias (Armstrong and Overton 1977).

Data Analysis and Results

We transformed the research model into a structural equation model using the software *SmartPLS 2.0* (Ringle et al. 2005). Partial least squares (PLS) path modeling is an appropriate choice in settings where the focus is on predicting key target constructs (Hair et al. 2011). PLS tests the psychometric properties of the scales used to measure the latent variables, and analyzes the strengths and directions of the specified relationships (Barclay et al. 1995). As suggested by Chin (1998) and Hulland (1999), our data analysis followed a two-stage process: First, we assessed the reliability and validity of the (outer) measurement model. Second, we tested the (inner) structural model. Finally, we tested for muti-collinearity and lateral collinearity

Assessing the Measurement Model

PLS path-weighting scheme was used to determine the adequacy of the measurement model. Four criteria need to be examined to assess the reliability and validity of the model:

(1) *Item reliability* is assessed by examining the loadings of the items with their respective constructs. A generally accepted rule of thumb is that item loadings should be greater than 0.70, which suggests that there exists more shared variance between an item and the underlying construct than error variance (Barclay et al. 1995). If item loadings are lower than 0.40, the item should be eliminated (Hulland 1999). One item for past emotional overload (PEO4—see Table 3 in the appendix) was below the 0.40 threshold. This item was removed from the model. All other items loaded above 0.70 (see Table 4 in the appendix).

(2) *Construct reliability* indicates how well a construct is measured by its items. It can be assessed with the composite reliability measure developed by Fornell and Larcker (1981). This measure is similar to Cronbach's alpha (Barclay et al. 1995), and can be similarly interpreted (Ko et al 2005). As shown in Table 1, all constructs exceed the recommended threshold of 0.60 (Fornell and Larcker 1981), and are thus reliable.

(3) *Convergent validity* concerns the variance shared between a construct and its items. The boldface diagonal cells in Table 1 represent the square root of the average variance extracted (AVE). Each construct has an AVE greater than 0.5, establishing convergent validity for all scales (Fornell and Larcker 1981).

(4) A necessary condition for *discriminant validity* is that a latent variable shares more variance with its assigned items than with any other latent variable (Fornell and Larcker 1981). The off-diagonal values in Table 1 show the correlations between the constructs. The diagonal values are significantly greater than the off-diagonal values in the corresponding rows and columns, indicating discriminant validity for all constructs (Hulland 1999). Additionally, each within-construct item loads highly on the construct it is supposed to measure, and cross-loadings are lower than within-construct item loadings (see Table 4).

Table 1. Construct Correlations								
	PCO	PEO	CO	ITU	CE	CF	EC	IQ
Past cognitive overload (PCO)	**0.839**							
Past emotional overload (PEO)	0.608	**0.950**						
VCT cognitive overload (CO)	0.342	0.338	**0.952**					
VCT intent to use (ITU)	-0.199	-0.180	-0.609	**0.909**				
Communication enjoyment (CE)	-0.192	-0.169	-0.611	0.746	**0.851**			
Communication flow (CF)	-0.178	-0.173	-0.598	0.703	0.728	**0.776**		
Emotional communication (EC)	-0.143	-0.134	-0.541	0.711	0.727	0.751	**0.872**	
Information quality (IQ)	-0.222	-0.241	-0.705	0.765	0.710	0.730	0.742	**0.816**
Mean	3.556	2.867	3.941	3.594	3.478	3.777	3.588	4.060
Standard deviation	1.424	1.593	1.529	1.590	1.265	1.183	1.340	1.253
Composite reliability	0.704	0.903	0.906	0.827	0.723	0.602	0.761	0.666
AVE	0.904	0.966	0.967	0.966	0.913	0.858	0.927	0.909

Assessing the Structural Model

The assessment of the structural model involves estimating the path coefficients and the R^2-values. Path coefficients specify the strengths of the relationships between the independent and dependent variables, while the R^2-value is a measure of the predictive power of a model for the dependent variables (Ko et al. 2005). A bootstrap resampling method (500 samples) was used to determine the significance of the paths within the structural model. The analysis results are shown in Table 2. All hypotheses were supported at the .05 level of significance or better. (See Figure 3.) The control factors, as expected, were all positive and significant. As anticipated, the relationships between VCT intention to use and both past cognitive overload (ß=-0.023, ns) and past emotional overload (ß=0.020, ns) were non-significant. Given these results, it appears that VCT cognitive overload is a mediating variable.

Table 2. PLS Analysis Results				
Dep. Variable	VCT cognitive overload		VCT intent to use	
Indep. Variable	Path coefficient	t-value	Path coefficient	t-value
Past cognitive overload	**0.217**	**7.556*** **	-0.023	1.239
Past emotional overload	**0.206**	**7.212*** **	0.020	1.131
VCT cognitive overload			**-0.049**	**2.243* **
Communication enjoyment			**0.298**	**10.775*** **
Communication flow			**0.104**	**4.092*** **
Emotional communication			**0.136**	**5.144*** **
Information quality			**0.343**	**12.262*** **
R^2 (in percent)	14.37		68.47	
Notes: N = 2,037. Significant effects in boldface. * p < 0.05, ** p < 0.01, *** p < 0.001 (two-tailed test).				

Assessing Vertical and Lateral Collinearity

Correlation is a bivariate phenomenon, whereas collinearity is a multivariate phenomenon. If two or more variables measure the same attribute of a construct, they are said to be collinear (Kock and Lynn 2012). While vertical collinearity refers to collinearity among latent variable predictors, lateral collinearity refers to predictor-criterion collinearity. To test for both vertical and lateral collinearity, we conducted a "full" collinearity test as recommended by Kock and Lynn (2012). SmartPLS does not report VIF (variance inflation factor) values. We therefore used the software WarpPLS 2.0 (Kock 2011) to test for collinearity. The test results showed that the VIF values for all latent variables were far below 10, which is a common VIF threshold (Hair et al. 2009). Except for one control variable (information quality; VIF = 5.588), all VIF values were also well under the threshold of 5 proposed by Kline (1998).

Discussion and Implications

This study is important because it is the first to clearly demonstrate that people can become overloaded not only with information, but also with requests to use new technologies. In other words, it is not just information that can create overload. Requests to use new technologies can also create overload conditions. Further, an individual can experience overload not only when being asked to use too many technologies, but also when failing to unlearn what has already been learned. The old technologies with which we are familiar may be very similar to new ones, but different enough to be confusing. Overload is created when individuals try to match the new functionalities of the software or services with the technology they already know. If there is a mismatch, they must unlearn how they used to interface with the technology. The process of unlearning is cognitively taxing and may contribute to burnout and the rejection of new technologies.

This study also suggests a completely new aspect of overload: Individuals are affected by past memories of overload. Their past memories of overload clearly impact how they perceive the possibility of future overload. Thus, the negative consequences of using a new technology or application may persist long after someone has stopped using the technology. The nature of those memories can be either cognitive and emotional. In fact, the emotional overload may have a longer lasting impact than cognitive overload (Rose et al. 2004). To date the overload literature has not explicitly considered how emotion affects the processing of information in overload situations[2].

[2] Studies of burnout by Friedman (2006) and Shirom et al. (2007) have related overload to dimensions of burnout such as emotional exhaustion, cognitive weariness, and a sense of professional nonaccomplishment. These studies were not designed to study information processing in overload situations.

Research Implications

We purposefully tested only a small subset of the ECOM. This makes it easier to interpret the findings. The results provide support for our hypotheses that cognitive overload does, in fact, significantly impact the intention to use new technology (see Figure 3 below). Future studies should address greater portions of the model. In particular, future studies should consider the impact of varying individual cognitive resources and personality traits such as need for cognition and ability to chunk on the processing of mental load and consequences of inability to do so. Further, studying the extent to which experts experience overload should also be addressed since providing situations which create overload for them may hurt their self-efficacy.

As was the case in Brown et al. (2011) we found a complex interaction between expectations and experiences. They found that the TAM-like construct, usefulness, explained approximately 70% of the variance in their model. Though they focused on actual use, they noted that previous studies using intention accounted for 50% of the variance. Thus, we did not anticipate a large path coefficient or high R^2 for intention to use in our study.

A limitation of this study could be that we did not test all of the factors that influence the intent to use a new technology. However, we did not intend to include all factors. Rather we wanted to isolate overload related to the request to use a technology, as well as two antecedents based on past memories, to determine if further study is warranted. Future research should include more influencing factors as control variables and should pay more attention to factors other than technology design itself.

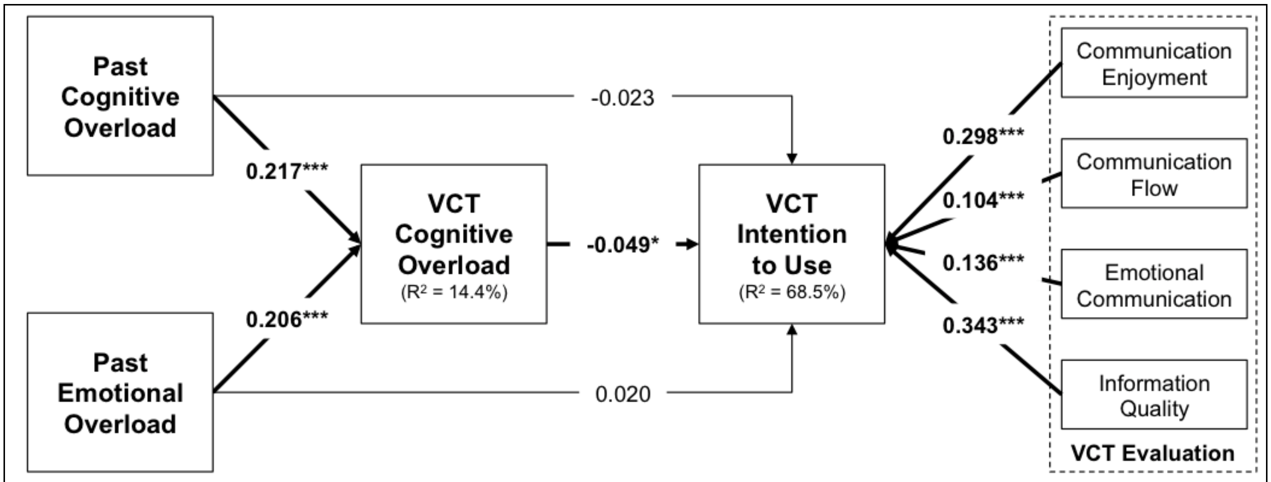

Figure 3. Research Model Results

Another limitation of this research is that we used questionnaire items to measure the dependent and independent variables. Future research should attempt to measure using alternative approaches to measuring overload, especially the emotional overload. A particularly intriguing approach is the use of thermal imagery to measure overload (Pluyter et al., 2012; Puri et al., 2005) .

Managerial Implications

The most immediate implication of this study is that managers should not adopt the newest and greatest technology just for the sake of being on the leading edge. Leading edge technologies may not be adequately developed and when implemented, they may create frustrating challenges for customers and employees. These challenges will not only hamper the productivity of individuals using that technology, but also create memories with negative valences that will inhibit their willingness to adopt technologies in the future.

The findings of this study apply not only to requests to use new technologies, but also to information inputs. Further, the findings could be extended to the workplace. In particular, managers armed with the knowledge that overload is based on the ability of individuals to process information and not on the amount of information that individuals receive can develop strategies to support their employees to develop expertise in handling information that is important for their job performance. First and foremost managers need to recognize that individuals vary in their mental resources and experience. Consequently, individuals experience overload differentially, if experienced at all.

Finally, managers may wish to structure the work setting so that their employees can receive the pertinent information that they need to complete their assigned tasks, while at the same time limiting superfluous information. The organizational structure can be designed to reflect the necessary flow of information. Liaison and other lateral positions can be used to span different departments and judiciously disseminate information. Further, social norms can be established within the organization to discourage the use of PDA in meetings (to limit distractions that interfere with information processing).

Conclusions

Progress has been made by researchers in understanding overload. Most importantly we found that overload can be induced not only from information, but also from too many requests to use new technologies. Further, we found that past memories of cognitive and emotional overload can indirectly impact the intention to use new technologies. The significant findings suggest that further tests of our model are warranted and we hope that other researchers undertake such tests. We also hope that managers will become aware of the implications of the model and seek to reduce the negative consequences of overload.

Appendices

Table 3. Construct Operationalization

Construct	Label	Item
Past cognitive overload (PCO)	PCO1	You cannot process the number of requests you receive to use new information and communication technology (ICT)
	PCO2	You cannot handle the number of requests you receive to use new ICT
	PCO3	You can cope well with the number of requests you receive to use new ICT ^{R}
	PCO4	You are overwhelmed by the effort it takes to handle the number of requests you receive to use new ICT
Past emotional overload (PEO)	PEO1	You feel emotionally pressured by the number of requests you receive to use new ICT
	PEO2	You feel confused by the number of requests you receive to use new ICT
	PEO3	You feel frustrated by the number of requests you receive to use new ICT
	PEO4	You feel happy about the number of requests you receive to use new ICT ^{R*}
VCT cognitive overload (CO)	CO1	You are concerned that the amount of information received using the video contact technology (VCT) will prevent you from assimilating the useful/meaningful information
	CO2	You are concerned that the amount of information received using the VCT will lead you to make mistakes in your treatment
	CO3	You are concerned that the amount of information received

		using the VCT will confuse you during the interaction with your medical practitioner
VCT intent to use (ITU)	ITU1	Using the VCT is appropriate to interact with your medical practitioner
	ITU2	You will use the VCT to interact with your medical practitioner
	ITU3	You plan to use the VCT to interact with your medical practitioner
	ITU4	In your opinion it is desirable to use the VCT to interact with a medical practitioner
	ITU5	You will not consider using the VCT to interact with your medical practitioner [R]
	ITU6	You would welcome a request to use VCT because you see advantages to using this technology
Communication enjoyment (CE)	CE1	When using the VCT it will be hard to communicate effectively with your medical practitioner [R]
	CE2	When using the VCT it will be hard to communicate efficiently with your medical practitioner [R]
	CE3	When using the VCT you will enjoy communicating with your medical practitioner
	CE4	When using the VCT you will have fun communicating with your medical practitioner
Communication flow (CF)	CF1	When using the VCT you will easily assess your medical practitioner's reactions to what you say
	CF2	When using the VCT it will be difficult to tell when your medical practitioner is paying attention to what you say [R]
	CF3	When using the VCT it will be difficult to keep track of the conversation with your medical practitioner [R]
	CF4	When using the VCT over time you will get to know your medical practitioner better
Emotional communication (EC)	EC1	The VCT will allow your medical practitioner and you to communicate emotional overtones during your interaction
	EC2	The VCT will allow your medical practitioner and you to communicate emotional attitudes during your interaction
	EC3	The VCT will allow your medical practitioner and you to communicate your feelings during your interaction
	EC4	You will feel comfortable communicating emotional issues with your medical practitioner when using the VCT
Information quality (IQ)	IQ1	The VCT will allow your medical practitioner and you to give and receive timely feedback
	IQ2	The VCT will allow your medical practitioner and you to tailor your messages to your own personal need
	IQ3	You are concerned that the information received using the VCT will be of poorer quality than the information received in a face-to-face conversation [R]
	IQ4	You are concerned that you will receive less information using the VCT as compared to a face-to-face conversation [R]
	IQ5	You think that you will receive as rich information using the VCT

		as you receive in a face-to-face conversation

Notes: All items are based on 7-point Likert scales, using "strongly agree" and "strongly disagree" anchors.
R Reverse-coded item.
* Based on the instrument validation process, this item was removed.

Table 4. Construct Cross-Loadings

Item	PCO	PEO	CO	ITU	CE	CF	EC	IQ
PCO1	**0,919**	0,566	0,291	-0,156	-0,163	-0,143	-0,111	-0,187
PCO2	**0,934**	0,583	0,320	-0,187	-0,188	-0,169	-0,134	-0,209
PCO3	**0,707**	0,345	0,264	-0,197	-0,181	-0,163	-0,147	-0,205
PCO4	**0,774**	0,538	0,266	-0,118	-0,103	-0,115	-0,081	-0,136
PEO1	0,540	**0,943**	0,313	-0,169	-0,160	-0,166	-0,128	-0,228
PEO2	0,620	**0,959**	0,332	-0,170	-0,157	-0,162	-0,128	-0,231
PEO3	0,571	**0,949**	0,318	-0,173	-0,164	-0,166	-0,126	-0,228
CO1	0,328	0,304	**0,941**	-0,574	-0,583	-0,565	-0,509	-0,656
CO2	0,309	0,317	**0,959**	-0,588	-0,586	-0,577	-0,530	-0,684
CO3	0,339	0,343	**0,955**	-0,578	-0,576	-0,564	-0,504	-0,673
ITU1	-0,196	-0,183	-0,581	**0,886**	0,692	0,677	0,678	0,733
ITU2	-0,149	-0,156	-0,529	**0,937**	0,672	0,626	0,647	0,685
ITU3	-0,160	-0,153	-0,546	**0,948**	0,688	0,642	0,662	0,694
ITU4	-0,146	-0,137	-0,505	**0,911**	0,667	0,622	0,645	0,672
ITU5	-0,211	-0,171	-0,569	**0,856**	0,645	0,601	0,580	0,666
ITU6	-0,220	-0,178	-0,591	**0,915**	0,701	0,660	0,663	0,719
CE1	-0,215	-0,210	-0,609	0,666	**0,859**	0,665	0,626	0,671
CE2	-0,242	-0,234	-0,630	0,664	**0,856**	0,678	0,628	0,673
CE3	-0,088	-0,055	-0,407	0,591	**0,839**	0,550	0,598	0,521
CE4	-0,095	-0,059	-0,413	0,612	**0,849**	0,574	0,619	0,535
CF1	-0,104	-0,123	-0,431	0,563	0,575	**0,782**	0,674	0,597
CF2	-0,162	-0,157	-0,497	0,510	0,546	**0,800**	0,519	0,528
CF3	-0,221	-0,207	-0,584	0,558	0,594	**0,798**	0,529	0,584
CF4	-0,065	-0,051	-0,341	0,544	0,540	**0,719**	0,600	0,551
EC1	-0,116	-0,103	-0,459	0,601	0,613	0,671	**0,904**	0,653
EC2	-0,094	-0,098	-0,435	0,555	0,581	0,624	**0,871**	0,605
EC3	-0,141	-0,125	-0,485	0,631	0,645	0,681	**0,914**	0,680
EC4	-0,141	-0,136	-0,494	0,674	0,676	0,633	**0,795**	0,639
IQ1	-0,170	-0,177	-0,495	0,613	0,531	0,578	0,604	**0,786**
IQ2	-0,144	-0,135	-0,509	0,655	0,586	0,649	0,706	**0,812**
IQ3	-0,208	-0,249	-0,689	0,613	0,593	0,579	0,556	**0,836**
IQ4	-0,216	-0,243	-0,678	0,606	0,583	0,574	0,556	**0,846**
IQ5	-0,173	-0,183	-0,512	0,631	0,600	0,595	0,598	**0,800**

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