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# How End-User Characteristics Affect Technostress: An Exploratory Investigation

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## **HOW END-USER CHARACTERISTICS AFFECT TECHNOSTRESS: AN EXPLORATORY INVESTIGATION**

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### **ABSTRACT**

Individuals in organizations experience stress as a result of their use of Information and Communication Technology (ICT). This is termed as technostress. Individual characteristics form an important set of factors that influence technostress, and understanding them is important for developing organizational mechanisms for effecting appropriate adjustments in managing technostress. This paper explores the relationship between three individual characteristics – confidence in using computers, computer literacy, and experience in using computers - and technostress. The results show that a higher value of these characteristics, largely leads to lower technostress.

**Key Words: Information Systems, Management of Technology, Technostress, Computer literacy, Computer experience**

### **INTRODUCTION**

Computers have become ever-present, and the pervasiveness of the nature of their support for activity in business and economic enterprise continues to increase. The explosion in the introduction and use of ICT has also resulted in some negative psychological and behavioral outcomes and reactions for users. Studies have described some of these outcomes as computer anxiety (Hudiberg, 1989; Igbaria and Chakrabarti, 1990), computerphobia (Jay 1981; Weill et al., 1990), technophobia (Rosen et al., 1987; Brosnan, 1998b).

In recent years, studies have suggested that users of ICT experience stress. This is termed as “technostress” (Weill and Rosen, 1997; Brod, 1984). Technostress has received particular attention as an individual’s cognitive reaction to computers, and as yet another aspect of the bivalent effects of ICT. It is important to examine the various factors that influence technostress, so that its effects can be better understood and managed. In this context, individual characteristics and traits form an important set of factors influencing the phenomenon of technostress. While there have been studies on the influence of some of these individual traits and characteristics on computer anxiety and computer phobia, the literature is lacking in

explanations of how individuals' or ICT users' experiences and efficacy with computers affect the technostress experienced by them.

In this paper, we explore and investigate the relationship between characteristics of ICT users and technology induced stress. In the following sections we first describe the theoretical background and develop the propositions for the study. Thereafter we describe the research methodology and present the empirical analysis. Finally we describe the results and point out their implications in terms of managing the effects of technostress on individuals.

## **THEORETICAL BACKGROUND AND RESEARCH PROPOSITIONS**

### **Computer Related Anxiety and Phobia**

Computer anxiety (Raub, 1981; Heijnsen et al., 1987) has been used to describe fear, apprehension and agitation (Gaudron and Vignoli, 2002) that individuals may experience when interacting with, or thinking about computers. Computer anxiety has been measured through assessments of self-reported panic, anxiety and avoidance when using computers (Heijnsen et al., 1987, Gardner et al., 1985, Meir, 1988). Technophobia or computer phobia (Jay, 1981; Rosen et al., 1987) happens when individuals are "scared" to use IT (Brosnan, 1998b). Technophobia can result in "computer alienation"- that is, in a socially and psychologically induced subjective state of separation and estrangement from computers (Abdul-Gader and Kozar, 1995). It may also lead to resistance towards ICT adoption.

### **The Notion of "Technostress"**

The term "Technostress" (Brod, 1984; Weill and Rosen, 1997) is used to describe the stress due to an individual's use of ICT. Technostress describes the stress experienced by individuals because of their inability to appropriately adapt to, and cope with, ICT and their use. Although research has not, by and large, described in any detail the origins and consequences of technostress, there is anecdotal evidence (Weil and Rosen, 1997; Brillhart, 2004; Brod, 1984) that technostress results in perceived work overload, demoralized and frustrated users, information fatigue, and loss of motivation and satisfaction at work.

There are a number of ways in which the use of ICT can create stress for users. For instance, the capabilities of ICT for constant connectivity result in individuals losing control over their time and space. Continual exposure to emails, cell phones and the Internet leads users to the feeling that they are never "free" of technology and that their time and space have been invaded. The attitudes of individuals and their sense of security in their jobs are negatively affected when they think that nothing they do is private anymore and that they are always under supervision or "on call" (Weil and Rosen, 1997). Further, while the use of ICT helps in multi-tasking and hence in accomplishing more work in less time, there are limits to which individuals can effectively engage in multi-tasking. The use of ICT tends to push individuals over these limits and often the result is burnout at work. Based on these arguments, Tarafdar et al (2005) have identified five dimensions or components of technostress, as described below. Each of these dimensions describes a specific situation which might cause a user of ICT to experience stress.

The first of these is “**Techno-overload**”. This dimension describes situations where ICT forces users to work faster and longer. The second dimension is “**Techno-invasion**”. This describes the invasive effect of ICT in terms of creating situations where users can potentially be reached anytime, employees feel the need to be constantly “connected”, and there is a blurring between the personal and the work-related contexts. “**Techno-complexity**” describes situations where the complexity associated with ICT makes users feel inadequate as far as their skills are concerned and forces them to spend time and effort in learning and understanding various aspects of ICT. “**Techno insecurity**” is associated with situations where users feel threatened about losing their jobs as a result of new ICT. Finally, “**Techno uncertainty**” happens because of frequent upgrades to hardware, software, networks and applications within the organization which make it difficult for users to “settle down” and work with one system.

## **Individual Characteristics That Influence Technostress**

### ***Confidence in using ICT***

In the context of ICT adoption, this idea has been illustrated through the concept of computer self efficacy. Computer self efficacy represents an individual’s perceptions about his or her ability to use computers and computer skills in the accomplishment of a task (Compeau and Higgins, 1995b). Higher self efficacy leads to lower computer related anxiety and computer phobia (Compeau and Higgins, 1995b; Betz and Hackett, 1981). Persons with greater self efficacy have a positive attitude towards ICT in general (Venkatesh and Davis, 1996) and are more likely to feel comfortable about using it (Compeau et al., 1999; Igbaria and Ilviri, 1995). Based on the above arguments, we expect that individuals with greater confidence in their ability to use ICT will, on the whole, feel less technostress. We therefore frame the following propositions for each dimension of technostress.

***Proposition 1:*** Individuals with higher confidence in using ICT, would experience lower Techno\_Overload

***Proposition 2:*** Individuals with higher confidence in using ICT, would experience lower Techno\_Invasion

***Proposition 3:*** Individuals with higher confidence in using ICT, would experience lower Techno\_Complexity

***Proposition 4:*** Individuals with higher confidence in using ICT, would experience lower Techno\_Insecurity

***Proposition 5:*** Individuals with higher confidence in using ICT, would experience lower Techno\_Uncertainty

### ***Computer Literacy***

Computer literacy is widely understood to have a positive effect on a person’s “affectation” towards computers (Beckers and Schmidt, 2001). Computer literacy also has a strong negative influence on computer anxiety. It has also been reported that individuals who are less computer literate experience greater “alienation” – a subjective state of separation and withdrawal – from computers (Abdul-Gader and Kozar, 1995). Based on the above findings, computer literacy can be expected to have a negative influence on technostress. We therefore frame the following propositions for each dimension of technostress, 6 through 10:

***Proposition 6:*** Individuals with higher literacy in ICT, would experience lower Techno\_Overload

***Proposition 7:*** Individuals with higher literacy in ICT, would experience lower Techno\_Invasion

***Proposition 8:*** Individuals with higher literacy in ICT, would experience lower Techno\_Complexity

***Proposition 9:*** Individuals with higher literacy in ICT, would experience lower Techno\_Insecurity

***Proposition 10:*** Individuals with higher literacy in ICT, would experience lower Techno\_Uncertainty

## ***Computer Experience***

Chu and Spires (1991) found that attendance of an introductory course in computers and their applications significantly reduced the computer anxiety scores of highly computer anxious graduate students. In another study of 350 primary and secondary teachers in Queensland (Russel and Bradley, 1997), it was found that more experience with computers was required to make teachers less anxious about using instructional ICT. A study by Bozioaneles (2004) suggests an inverse logarithmic relationship between computer experience and computer anxiety. Based on the above observations, it can be argued that individuals who have greater experience with ICT would experience lower technostress. We therefore frame the following propositions.

***Proposition 11:*** Individuals with greater experience in ICT, would experience lower Techno\_Overload

***Proposition 12:*** Individuals with greater experience in ICT, would experience lower Techno\_Invasion

***Proposition 13:*** Individuals with greater experience in ICT, would experience lower Techno\_Complexity

***Proposition 14:*** Individuals with greater experience in ICT, would experience lower Techno\_Insecurity

***Proposition 15:*** Individuals with greater experience in ICT, would experience lower Techno\_Uncertainty

## **RESEARCH METHODOLOGY**

Our research tested the relationship between the different aspects of technostress and three individual characteristics, namely, computer literacy, level of confidence in using computers, and experience in using computers. The first two characteristics were measured using a single question on a ten point scale. The third one was measured as the number of years for which the individual had been using computers. The aspects of technostress were measured through multiple items, based on constructs as described in (Tarafdar et al., 2005).

### **Data Collection**

Data for this research was collected from users of ICT in five organizations - two in the U.S. and three in India. Support from the organizations was solicited through the head of the IS departments, in the U.S. organizations. In the Indian organizations it was sought through senior Vice Presidents. Two of the organizations were government organizations, one was in the manufacturing sector, and the other two were in the financial services. First, emails were sent out to employees describing the nature and purpose of the study, and asking them whether they would be interested in participating. They were requested to ask for the questionnaire if they were interested, and to return the completed questionnaire in a sealed envelope. Respondents were informed that participation in the study was voluntary and that the confidentiality of their responses was assured. A total of 680 questionnaires were distributed, of which 608 were returned, representing a response rate of 89.4%. Most of the respondents were between the ages of 26 and 55, and about 80% of them had either a Bachelor's or a Master's degree. They belonged to all levels of management.

### **Data Analysis and Results**

In the first step, we measured the dimensions of technostress, using the scale for "Technostress\_Creator", as developed by Taradar et al., (2005). The scale had 23 items, forming five factors. The factors were first order constructs, with "Technostress\_Creator" being the

second order construct. On validation using Factor Analysis, the same five factor structure was identified. Factor Analysis is useful for identifying the underlying structures of factors. It provides initial unidimensionality (convergent validity) among the items in a factor and discriminant validity across factors. The five factors were Techno-Overload, Techno-Invasion, Techno-Complexity, Techno-Insecurity and Tech-Uncertainty. Next, we calculated the sample mean value of each of the individual characteristics. The sample was then divided into two sets, based on the sample mean value, so that one set had a “high” value of the particular characteristic (that is a value greater than the mean), and the other set had a “low” value (that is a value less than the mean). This was done for each of the three characteristics. Finally, T-tests were conducted to ascertain if the values of the five factors, that is, Techno-Overload, Techno-Invasion, Techno-Complexity, Techno-Insecurity and Tech-Uncertainty, differed significantly, between the two (“high” and “low”) sets of the sample, for each of the three individual characteristics. The results of the t-tests are shown in Table 1. From this table it is seen that all the propositions except 11 and 15 are supported by the results.

**Table 1: Comparison of Means**

Constructs	Group	Group Mean	Number of Observations	t-value	Significance of t-value
<b>1. Level of Confidence level in using Information Systems</b>					
<b>Overload</b>	Group 1	3.10	369	3.510	0.000
	Group 2	2.84	225		
<b>Invasion</b>	Group 1	2.28	369	2.048	0.041
	Group 2	2.14	225		
<b>Insecurity</b>	Group 1	2.50	369	3.786	0.000
	Group 2	2.67	225		
<b>Uncertainty</b>	Group 1	3.38	369	2.523	0.012
	Group 2	3.22	225		
<b>Complexity</b>	Group 1	2.89	369	7.846	0.000
	Group 2	2.41	225		
<b>2. Level of Computer Literacy</b>					
<b>Overload</b>	Group 1	3.11	406	3.607	0.000
	Group 2	2.81	189		
<b>Invasion</b>	Group 1	2.32	406	3.958	0.000
	Group 2	2.04	189		
<b>Insecurity</b>	Group 1	2.53	406	6.010	0.000
	Group 2	2.15	189		
<b>Uncertainty</b>	Group 1	3.41	406	4.162	0.000
	Group 2	3.13	189		
<b>Complexity</b>	Group 1	2.90	406	9.638	0.000
	Group 2	2.30	189		
<b>3. Number of years of experience using computers</b>					
<b>Overload</b>	Group 1	3.02	318	<b>0.655*</b>	<b>0.512</b>
	Group 2	2.97	263		
<b>Invasion</b>	Group 1	2.32	318	2.956	0.003
	Group 2	2.12	263		
<b>Insecurity</b>	Group 1	2.54	318	4.553	0.000
	Group 2	2.27	263		
<b>Uncertainty</b>	Group 1	3.32	318	<b>-.141*</b>	<b>0.888</b>
	Group 2	3.33	263		
<b>Complexity</b>	Group 1	2.79	318	3.157	0.002
	Group 2	2.59	263		



## DISCUSSIONS

The primary contribution of this paper is that it identifies individual characteristics that influence the extent to which ICT users experience technostress. Our findings here support all except two of our research propositions. They indicate that individuals who are more confident about using computers, or have higher computer literacy are less prone to experiencing technostress. And individuals with greater experience with computers have less Techno-Invasion, Techno-Insecurity and Techno-Complexity

The results have implications for organizations, for managing the effects of technostress on employees. First, task related confidence in general, can be developed through social learning processes such as training in how to perform the specific task, exposure to repeated instances in which the task is performed, accomplishment in actually performing the task (Gist, 1987). Therefore, the confidence of such ICT users with regard to the use of computers can be increased by gradually exposing them to various applications in a training environment and under controlled conditions. Second, the organizational use of ICT is likely to continue to increase, and higher computer knowledge and literacy relevant to the business context, is helpful in establishing general awareness about how ICT can be used. Organizations must therefore institute mechanisms to increase overall computer literacy amongst employees. Third, exposing users to various contexts involving ICT increases their familiarity and experience with using computers. For instance, involving them in the planning and implementation of new ICT can increase their understanding of the rationale behind their adoption, and benefits expected from it, and help them to better adapt to changing applications.

Based on the above ideas, and given the ever-increasing commonness of ICT use in organizations, we believe that it is important to continue to explore strategies that can be used to counter technostress. Future research should therefore investigate in greater detail, the effects of different organizational mechanisms for appropriately supporting and enhancing ICT related capabilities of end users. This we feel is an important aspect of managing technostress.

## CONCLUSION

Since ICT adoption results in changes in tasks and control structures, adjustments at the individual and organizational levels is required. This paper sheds light on one such adjustment – that of individual adaptation to the stressful effects of ICT. This paper shows that technostress can be reduced by enabling individuals acquire greater confidence in using IT, and by increasing their computer literacy and experience. The findings discussed herein can be used by organizations to frame appropriate organizational strategies for managing technostress, as well as by researchers for further examination of related aspects of technostress.

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