11-2005

Exploring the Impact of Technostress on Productivity

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Proceedings of the 36th Annual Meeting of the Decision Sciences Ins
Foreword

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The proceedings were made possible through the diligent work of all the individuals who wrote the r the track chairs, and many reviewers. All of the research papers in *Proceedings of the 36th Annua Decision Sciences Institute* were reviewed by at least two referees and authors were asked to ma changes to their papers. We hope that the quality shows.

The following is an example of a modified APA Style for referencing an entry in these proceedings::

EXPLORING THE IMPACT OF TECHNOSTRESS ON PRODUCTIVITY

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ABSTRACT

Based on empirical survey data, this study uses concepts from socio-technical theory to explore the effects of information and computer technology (ICT) created stress, that is, "technostress" on productivity. The paper first explains the different ways in which ICT can create stress in users, and identifies factors that create technostress. Then, it establishes relationship among technostress creators and individual productivity. Structural equation modeling is used to analyze the data and test hypotheses. The results support the hypothesized relationship and have valuable implications for management in dealing with technology related stress issues among employees.

Keywords: Technostress, Survey Study, Structural Equation Modeling

INTRODUCTION

The phenomenon known as "technostress" is caused by an inability to adapt or cope with new ICT in a healthy manner (Brod 1984, Weil and Rosen 1997). For instance, the pervasiveness of modern ICT often results in almost constant "connectivity", through email, the Internet, and the phone. Individuals feel that since they are always connected, they are "on call". This leads them to believe that they have lost control over their time and space, which creates feelings of being stressed out. To give another example, ICT users are regularly inundated with information from many different sources. Such information is frequently more than they can effectively process (Weill and Rosen 1997). This, combined with increasing levels of complexity in the ever changing ICT, creates feelings of being unable to cope, and leads to stress. Technostress therefore, is one of the fallouts of an individual's attempts and struggles to deal with constantly evolving ICT and the changing cognitive and social requirements related to their use. Its effects have become increasingly apparent over the past few years, with the rapid proliferation of ICT in the workplace.

It is important to explore various stress related effects of ICT induced changes, especially because rapid and ever changing developments in ICT in recent years have led to dramatic and irreversible changes in the workplace. Applications change frequently, and every day brings yet another new program or hardware that organizational members have to know, need to use, or must have, to do their job. And, once these are mastered, the process begins all over again as soon as the next innovation comes along, which can happen in as little as a few months. Moreover, many organizational developments and advances in terms of process redesign and cross functional integration cannot be planned or envisaged without the extensive deployment of ICT such as ERP. For the most part, therefore, the use of ICT in the workplace, in some form, is not an option.

This paper uses concepts from socio-technical theory (Trist and Bamforth 1951) to explore the effects of ICT created stress, that is, "technostress" on productivity. It first explains the different ways in which ICT can create stress in users, and identifies factors that create technostress. Then, it establishes a direct relationship between these factors and individual productivity. The study is based on a survey of 233 users of ICT in multiple organizations.

THEORETICAL FRAMWORK AND HYPOTHSIS DEVELOPEMENT

In this section we present the conceptual foundations and derive the hypothesis for this study. We first describe ways in which the use of technology in general and ICT in particular can create stress in individuals. Next, we discuss the impact of technostress on individual productivity. The research hypothesis is framed based on the discussions. The proposed research model is shown in Figure 1.

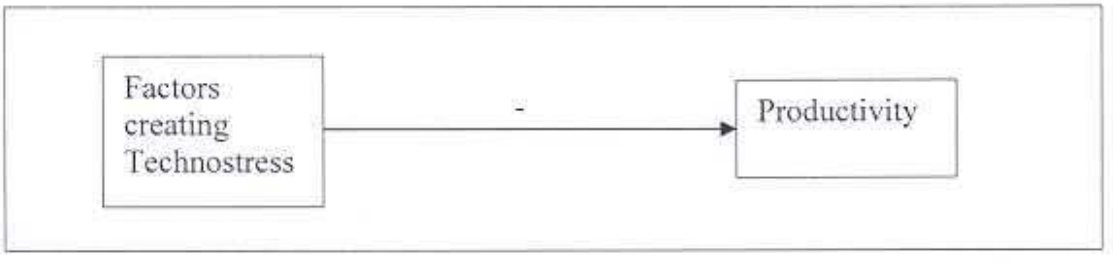

Figure 1: Research Model - The Impact of Technostress on Productivity

Stress is a cognitive response that individuals experience, when they anticipate an inability to respond adequately to the perceived demands of a given situation, accompanied by an anticipation of substantial negative consequences due to inadequate response. A situation that is perceived by an individual as presenting any sort of requirement that threatens to exceed his or her capabilities and resources, is one where stress is potentially present (McGrath 1970, 1976). The consequences of stress include psychological and behavioral effects such as low productivity, dissatisfaction at work, lack of job involvement and poor job performance (Kahn et al 1981 pg. 380, Jackson and Sculer 1985, Jex and Beehr 1991, Cooper et al 2001). Stress is also associated with a number of physiological effects such as fatigue, tension and anxiety (Fried et al 1984, Kahn et al 1981, Kahn and Byosiere 1992, Jex and Beehr 1991).

Technology is an important factor that causes stress (McGrath 1976, Cooper et al 2001). There are a number of ways in which the characteristics of modern ICT can create stress for people using them. The impact of these technologies on stress in individuals is a very important area of enquiry that has so far not been adequately addressed (Cooper et al 2001, Adkins 1997, Burke and Neslon 1997 and Cooper and Cartwright 1994). In the organizational context, technostress is caused by individuals' attempts and struggles to deal with constantly evolving ICT and the changing requirements related to their use. Although there are studies which mention some of the fallouts of technostress (Brod 1984, Brillhart 1997, Nelson et al 1990), there is almost no research that attempts to rigorously understand and validate the origins of technostress. Thus it's important to understand different ways in which technostress is created and how it affects individual performance.

The use of ICT results in information input from multiple channels such as company databases, email, the Internet and other external sources of data. Individuals are therefore exposed to more information then they can effectively handle and use (Fisher, 1999; Brod, 1984; Weil, 1999). They feel inundated with information and are forced to work faster to cope with increased processing requirements. Also, they feel compelled to acquire and process the information, simply because it is available. This may impair performance and lead to stress. The prevalence of networks, mobile and wireless computing devices, and their capabilities for ubiquitous connectivity results in individuals perceiving loss of control over their time and space. Constant exposure to emails, cell phones and the Internet leads to the feeling that they are never "free" of technology and that their space has been invaded. Employees are often forced to handle a constant stream of communication from different sources such as emails and short messages. They can be contacted anywhere and anytime (Clark, 1996, Weil and Rosen, 1997), and this means that the workday tends to extend and enter into all other areas of life.

The complexity of capabilities and terminology associated with ICT has increased significantly over the past few years. Fear and anxiety are common reactions to the ever increasing complexity of ICT (Yaverbaum, 1988;, DeMaagd, 1983). For instance, computers may crash, applications may run slow and it takes time to troubleshoot. All of this creates dissatisfaction and a feeling of being unable to cope (Brod, 1984; Fisher, 1999). The pressure to keep using the latest technology, for fear of getting left behind has also increased. Organizations often go from one cycle of ICT upgrades to the next, with very little time in between. This results in employees having to constantly learn how to work with new ICT, as their existing knowledge gets obsolete (Weil and Rosen, 1997). Although employees may initially be enthusiastic about learning how to use new applications and technologies, constant requirements for refreshing and updating can eventually lead to frustration and stress (Brod, 1984). Studies have shown that individuals report greater stress during periods of IT innovation (Nelson 1990, Johansson and Aronson 1984). ICT also help in multi-tasking and hence help accomplish more tasks at the same time. However, there are limits to which this can be effectively done by individuals, and the use of ICT often leads people to exceed these limits, resulting in exhaustion. Human beings exposed to excessive laboratory induced multi-tasking show increased tension, diminished perceived control and even experience physical discomfort such as headaches (Brillhart, 2004; Weil and Rosen, 1997). Prolonged multi-tasking aided by the use of ICT often leads to burn out.

It is clear from the above discussions that the phenomenon of technostress results in a variety of outcomes such as dissatisfaction, fatigue and anxiety. Employees are often unwilling or unable to develop the new skills required for using the ever evolving ICT in their organizations (Brod 1982). As they try to unsuccessfully apply existing solutions to the new technologies, initial errors get transmitted and magnified. All of these eventually lead to errors at work and a decrease in individual productivity (Buchanan and Boddy 1982, Nelson and Kletke 1990, Sainford 1990). Therefore, we have the following hypothesis:

Hypothesis: Factors that create "technostress" have a negative influence on individual productivity

RESEARCH METHODOLOGY

To test the hypothesized relationship between Technostress Creators on productivity, instrument to measure the Technostress Creator construct was developed. Five measures are used to ensure instrument validity in this type of study: content validity, unidimensionality, discriminant validity (Sethi and King, 1994), reliability, and predictive validity of the instrument. The measurement instrument for "Productivity" was adapted from the validated measures for the perceived impact of information technology on work (Torkzadeh and Doll, 1999).

A comprehensive literature review was completed to try to define the "technostress creator" construct and to identify an initial list of measurement items. To improve content validity, a pre-pilot study was completed that involved four end-users from business organizations and six end-users from a university. The items that were initially developed to measure technostress creators were presented to the end-users during the structured interviews. The interview results were analyzed and based on certain common patterns that emerged from the responses, the research constructs and measurement items were further revised and made ready for large-scale data collection phase. All items were measured on five point Likert scale: 1 – strongly disagree to 5 – strongly agree. A sixth option of "Not Applicable" or "I do not know" was also provided.

Data Collection

Data for this research was collected from two government organizations in the U.S. Support from the organizations was solicited through the head of the IS departments in both organizations. First, emails were sent out to employees describing the nature and purpose of the study. They were requested to ask for the questionnaire if they were interested, and to return the completed questionnaire in a sealed envelop to the sponsoring individuals. The employees were informed that participation in this study was voluntary and that the confidentiality of their responses would be assured. A total of 264 questionnaires were picked up, of which 233 were returned, representing a response rate of 88.2%.

Data Analysis

Data from the respondents were compiled and the following steps were followed in order to develop and validate the constructs:

1. Exploratory factor analysis is useful for identifying the underlying factor structure and thus providing initial unidimensionality (convergent validity) among the items in a factor and discriminant validity across factors. There were 23 items for "Technostress Creators". Exploratory factor analysis was conducted to identify the factor structure of the measurement items. A five factor structure was identified. Based on item contents, the five factors were subsequently named Techno-Overload, Techno-Invasion, Techno-Complexity, Techno-Insecurity and Tech-Uncertainty.

2. Once the factors were identified, reliability scores of these sub-dimensions were calculated. The reliability values for each factor were calculated using Cronbach's alpha, with all results above 0.77, which is well above the recommended minimum value of 0.7 (Nunnally, 1978).

3. To test the effects of technostress creators on productivity (for predictive validity), Structural Equation Modeling (SEM) package AMOS was used to model technostress as a construct made out of five sub factors. The modeling results are shown in Table 1. All the parameters were found to be significant, indicating a significant negative relationship between technostress and productivity. All model fit indices including GFI, AGFI, CFI, NFI, NNFI and RMSR meet or exceed the recommended values, indicating good model fit. Thus the hypothesis is supported by the empirical results.

DISCUSSIONS AND CONCLUSION

As can be seen from the data analysis results, the empirical data support the proposed research model very well. The hypothesis is supported, confirming that technostress creators, namely Techno-Overload, Techno-Invasion, Techno-Complexity, Techno-Insecurity and Tech-Uncertainty have significant negative impact on individual productivity. The findings from this study should have valuable implications for managers in dealing with technology related stress and productivity issues. This study can also serve as a basis for other academic research in technostress. The technostress creator instrument can be further refined by future studies. Future studies can also look into the differing impact of each of the five technostress creator factors, and some demographic variables can be introduced to make the research findings even more interesting.

Technologies are here to stay, and in most cases, they make our life easier and our work more productive. But the negative psychological and social impacts caused by the complex and uncertain nature of modern technologies should not be underestimated. More empirical studies are clearly needed to further investigate the nature and impact of the technostress phenomenon, so that appropriate technostress coping strategies can be developed and employees can fully enjoy the benefits offered by modern technologies.

Table 1: AMOS modeling results

		Standardized Estimate	Probability
Productivity	**← Technostress**	**-0.280**	***
Techno-Overload	← Technostress	0.660	***
Techno-Invasion	← Technostress	0.681	***
Techno-Complexity	← Technostress	0.677	***
Techno-Insecurity	← Technostress	0.409	***
Techno-Uncertainty	← Technostress	0.744	***
Item 1	← Productivity	0.792	***
Item 2	← Productivity	0.926	***
Item 3	← Productivity	0.884	***
Item 4	← Productivity	0.807	***

*** $p<0.01$

Model fit indices:

Chi-square (df)	60 (26)
Chi-square/df	2.31
GFI	0.945
AGFI	0.906
NFI	0.941
NNFI	0.952
CFI	0.965
RMR	0.040

Note: Detailed Technostress Creator items and complete reference list are available from the authors upon request.