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ABSTRACT

Emerging information and communication technologies (ICTs) make it possible for many business end-users to get connected anytime, anywhere. While the pervasive new ICTs have the potential to offer significant end-user performance gains, they also bring some negative side effects such as technostress: a cognitive reaction that an individual experiences when he or she is unable to cope with or adapt to new ICT. Given the importance of end-user satisfaction (EUS) to system success, this paper attempts to explore the impact of a set of technostress creators on EUS, and the effect of some technostress inhibiting mechanisms (e.g. end-user training, end-user help-desk and end-user involvement) on alleviating the negative impact of technostress on EUS. Empirical data were collected through questionnaire survey to help answer the research question.

Keywords

Technostress, end-user satisfaction, survey research.

INTRODUCTION

The end-user computing (EUC) environment has expanded over the past two decades from being confined to the desktops in the centralized corporate offices to now include a much larger population of end-users connected by advanced wireless technologies and mobile devices (Moore, Jackson and Wilkes, 2007). Emerging information and communication technologies (ICTs) make it possible for many business end-users to get high speed data connection while traveling around the country or working at home. Given the greatly expanded end-user base, an increasingly important issue is the end-user satisfaction (EUS) toward these new ICTs. Delone and McLean (2003) suggest that EUS is probably the most widely used indicator for system success. Thus an area of current research interest is to explore the various antecedents of EUS.

Existing literature have studied several important organizational and personal antecedent variables for EUS, including senior management support, end-user support center responsiveness and reliability, end-user involvement in system implementation, user training, end-user computer efficacy, end-user age, gender and education level, etc. (Aladwani, 2002; Torkzadeh and Dwyer, 1994; Harrison and Rainer, 1992). One of the important EUS antecedent variables that have not been extensively studied in the EUC literature is the technology related stress created by the new generation of ICTs. The pervasive nature of new ICTs such as wireless LANs and mobile phone networks make it possible for end-users to get connected anywhere, anytime. While this is desirable for improved end-user productivity, it also imposes tremendous psychological and organizational pressure on the end-users using the technology. Tarafdar, et al. (2007) empirically identified five techno-stress creators: 1) Techno-overload: the ICT pushes end-users to work faster; 2) Techno-invasion: the pervasive ICT invades personal life; 3) Techno-complexity: the complexity of new ICT makes end-users feel incompetent; 4) Techno-insecurity: the job security of end-users threatened by fast changing ICTs; and 5) Techno-uncertainty: the constant changes, upgrades and bug fixes in ICT hardware and software impose stress on the end-users.

This paper attempts to explore the impact of the above techno-stress creators on end-user satisfaction, and the effect of some technostress inhibiting mechanisms (e.g. end-user training, end-user help-desk and end-user involvement) on alleviating the

negative impact of techno-stress on end-user satisfaction. Empirical data were collected through questionnaire survey to help answer the research question.

CONCEPTUAL FOUNDATIONS

In recent years, practitioner literature (Brillhart, 2004; Brod, 1984; Sethi et al., 1987; Weil and Rosen, 1997) has termed the stress creating effects of technology in general and ICTs in particular, as "technostress". "Technostress" is a cognitive reaction that an individual experiences when he or she is unable to cope with or adapt to ICT. The effects of technostress have become increasingly apparent over the past few years, with the proliferation of ICT in the workplace. A few studies have suggested that technostress leads to reduced end-user satisfaction (Brillhart, 2004; Brod, 1984; Nelson and Kletke, 1990; Tarafdar et al., 2007). We draw from some of these studies as well as from organizational stress theories stress to develop our research model for understanding and managing the effects of technostress on end-user satisfaction.

The conceptual model for the study is depicted in Figure 1. It is expected that Technostress Creators (TSC) will have a negative impact on End-User Satisfaction (EUS), while Technostress Inhibitors (TSI) will have a positive impact on EUS. The possible moderating effect of TSI will also be examined.

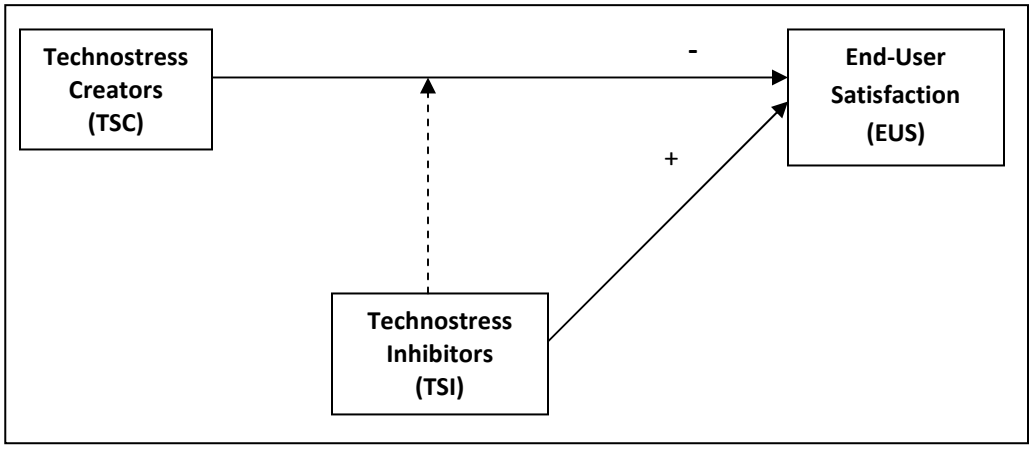

Figure 1: Conceptual Model

Technostress Creators

"Technostress Creators" represents the factors that create technostress in the organization. For understanding the aspects associated with Technostress Creators, we refer to extant literature as well as practitioner observations.

ICTs can create stress in a number of ways. First, communication overload and information overload are related fall-outs. It is routine for employees to handle a constant stream of communication from different sources such as the Internet, emails, cell phones, short messages and faxes, aided by devices such as laptops, PDA's and blackberries. They can be contacted anywhere and anytime, they feel forced to respond to different kinds of communication devices, and "not connecting" can actually become disquieting (Clark and Kalin, 1996). They feel simply inundated with information and are forced to work faster to cope with increased processing requirements. Information overload may create stress and leave users feeling frustrated and dissatisfied at work.

Second, the prevalence of ICTs and their capabilities for constant connectivity result in individuals losing control over their time and space. The attitudes of individuals and their sense of security and satisfaction 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). One of the related consequences of this has been that the work day gets extended, often by as much as two to three hours per day, these extra hours being spent in using communication devices such as email applications and blackberries, many times during odd hours (Mandel et al, 2005).

Third, even as competitive pressures to keep using the latest hardware, software and applications have increased, technical capabilities and terminology associated with ICTs have become more complex. Fear and anxiety are common reactions to this ever increasing complexity (Yaverbaum, 1988; DeMaagd, 1983), and anecdotal findings and trade surveys (Brod, 1984; Weil and Rosen, 1997) suggest that most people find the variety of applications, functions, and jargon intimidating and

difficult to understand. Also new ICT products, applications, and capabilities are created so fast that these new applications can take months to learn, and manuals can be complex. Intellectual and professional curiosity can turn into frustration and cause stress when changes in existing systems come in so rapidly that there is no chance to find meaningful patterns or develop a base of experience (Kupersmith 1992). This leads to job dissatisfaction.

Fourth, although most ICT applications are quite complex, they do not completely meet business requirements and cannot be used "as is" without major modifications. Even after these modifications have been made, the capabilities of systems may not be enough, and there may be problems such as the absence of an adequate number of terminals for users to work on (Kupersmith 1992). Moreover, computers crash, applications are slow, and it takes time to troubleshoot and get help. All of this creates dissatisfaction on the job, and a feeling of being unable to cope (Brod, 1984; Fisher and Wesolkowski, 1999).

In summary, ICTs create stress because they are complex and change frequently, involve significantly steep learning curves, require more work, and are accompanied by technical problems and errors, and hence can lead to a decrease in job satisfaction.

Technostress Inhibitors

Technostress inhibitors are technostress prevention mechanisms to negate the negative impact of technostress creators. Studies have identified certain factors and conditions that can alleviate and reduce technostress. Nelson and Kletke (1990) and Nelson (1990), for example, have identified adjustments that help decrease the consequences of the stress from technological innovation. Adequate organizational and technical support and training for end users in the context of their use of ICTs is one such factor.

Organizations often introduce new ICT systems without consulting end users. They keep workloads high while introducing ICT and do not invite employees to participate in policy-related discussions on how the system can be used (Brod, 1984). Involving end-users from the beginning enables user buy-in from the start of the implementation cycle, thus decreasing the possibility of resistance to their use (Clark and Kalin, 1996; Karasek 1979, Nelson and Kletke 1990). Prior to introducing new ICT, users should be educated about different benefits and opportunities from the use of the system. Their requirements should be solicited as far as possible and integrated into the system design. Increased user involvement in terms of knowledge of the context of the accompanying changes, and participation in implementation and planning teams, can help users to get over their ICT-related fear and anxiety.

End-User Satisfaction

One of the most important variables of research centered in the domain of end-user computing is the satisfaction of the ICT end users. End-user satisfaction (EUS) is the individual's attitude and perception towards the use of computer-based systems in the work processes that he or she performs (Rainer and Harrison 1993). The concept finds theoretical roots in the work of Cyert and March (1963), which states that a system that meets the needs of users will reinforce their satisfaction with it. End-user satisfaction includes factors such as relevance and accuracy of the information provided by an ICT-based system (Iivari and Koskela, 1987; Delone and McLean, 1992; Ives et. al., 1983), and its ease of use (Doll and Torkzadeh, 1988). It has been widely used as a surrogate for a system's overall usefulness, (Ives et. al., 1983; Rivard and Huff, 1988), overall success (Delone and McLean, 2003; Chen et. al., 2002; Bailey and Pearson, 1983; Rai et al, 2002), decision-support success (Barki and Huff, 1985), and office-automation success (Tan and Lo, 1990), as perceived by the end user. Research has argued that end-user satisfaction illustrates an attitude of the end user towards ICT (Doll and Torkzadeh, 1991; Thompson et al, 1991). It leads to greater system use and to positive performance impacts such as increased task productivity (Rivard and Huff, 1984; DeLone and McLean, 1992; Etezadi-Amoli and Farmhoomand, 1996), greater task innovation (DeLone and McLean 2003), and improved decision making (Igbaria and Tan, 1997).

The Impact of Technostress Creators on End-User Satisfaction

Stress theories assert that stressors reduce job satisfaction (Igbaria and Guimaraes, 1993; Moore 2000; Jex and Beehr, 1991). Research from the domain of EUC shows that cognitions about computers play a key role in determining the satisfaction of end users in the context of ICT mediated tasks (Bailey and Pearson, 1983; Ives et al., 1983; Rivard and Huff, 1988). Users having positive cognitions about computers show greater satisfaction with ICT. Computer anxiety (Hudiberg, 1989; Heinssen et al., 1987), for instance leads to low user satisfaction (Harrison and Rainer, 1996) and poor performance.

"Technostress Creators" (Tarafdar et al., 2007) describes stressors associated with the use of ICT. Technostress creators cause end-user dissatisfaction in a number of ways. They cause the end user to feel overloaded as a result of excess information and multitasking. They feel compelled to acquire and process information simply because it is available, and

have to consequently spend greater time and effort in information processing. At the same time they are unable to identify information that is actually useful, leading to dissatisfaction.

The use of ICT can have invasive consequences. Present organizational infrastructures, consisting of mobile communication and computing devices, intranets, virtual private networks, and wide area networks, enable constant and ubiquitous connectivity. Individuals are never "free" of technology and feel compelled to be constantly connected (Clark and Kalin, 1996). There is thus a blurring of boundaries between the home and the workplace, leading to reduced satisfaction.

ICT have become increasingly complex in their technical capabilities and terminology; users have to spend time and effort in learning how to use them, to the possible exclusion of other organizational tasks. As a result, users experience computer anxiety and dissatisfaction (Yaverbaum, 1988; DeMaagd, 1983), spend considerable time addressing associated difficulties.

Current ICT have short life cycles. Organizations are constantly upgrading and introducing new systems, often as a response to competitive pressures to keep using the latest technology (Fisher and Wesolkowski 1999). As a result, employees have to regularly learn how to work with new applications, even as their existing, quite recently acquired knowledge gets obsolete (Weil and Rosen 1997). Constant requirements for refreshing and updating eventually lead to dissatisfaction (Nelson and Kletke, 1990; Johansson and Aronson, 1984).

The organizational adoption and use of ICT is also associated with insecurity for end users. Research on stress shows that even if individuals believe that their jobs are secure, they are dissatisfied if they perceive a lack of career advancement opportunities (Jewell, 1998). End users of ICT fear the possibility of losing their jobs, in case of inability to cope with learning requirements and work process adaptations relating to new and changing ICT. Users who perceive their computer knowledge to be inadequate experience lower user satisfaction (Harrison and Rainier, 1996).

The Effect of Technostress Inhibitors on Improving End-User Satisfaction

Existing literature indicate that technostress prevention mechanisms such as user training, helpdesk support and end-user involvement in system implementation can negate the negative impact of technostress creators and improve end-user satisfaction.

One of the problems with managing technology in organizations is that although new ICTs are introduced at a rapid rate, end users are not provided with adequate training on how to use them (Weil and Rosen, 1997). Not only do end users need effective training on how to use new systems, they also need to be guided, during the early days, in the use of these systems, to help reduce their anxiety and concerns (Clark and Kalin, 1996; Kupersmith 1992). In a study of ICT users, it was found that ICT users who had "excellent to good" training had more positive reactions to new applications than those who had received "fair to terrible" training. (Yaverbaum, 1988; Zorn 2002) suggest that users should be encouraged to explore new systems, to re-tool, and to carry out face-to-face communication with the IT department personnel to resolve their ICT-related queries.

End user participation and involvement enable the organization to build and deploy ICT that are better understood by users, appropriately tailored and configured for them (Doll and Torkzadeh, 1989), more valued by them and better accepted by them (McKeen et al., 1994), thus resulting in greater user satisfaction (Doll and Torkzadeh, 1989; Kappelman and McLean, 1991; King and Lee, 1991). Mechanisms that facilitate the involvement and participation of end users in ICT implementation and reward them for doing so, are therefore expected to increase their satisfaction with ICT.

To summarize, these mechanisms and measures make it easier for end users to utilize ICTs, derive associated benefits at work, and thereby increase end-user satisfaction. We next describe the research methodology, analysis and results.

RESEARCH METHODOLOGY

The current study examines the relationships among Technostress Creators (TSC), Technostress Inhibitors (TSI), and End-User Satisfaction (EUS). Empirical data were collected through questionnaire survey method. Multiple items were used to measure each construct. The measurement items for Technostress Creators and Technostress Inhibitors were adopted from Ragu-Nathan et al. (forthcoming). The items for measuring End-User Satisfactions were adapted from Doll and Torkzadeh (1991). All items were measured on a 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 users of ICT in two public sector organizations in the United States. Support from the organizations was solicited through the head of the IS departments. First, 320 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 264 questionnaires were requested, of which 233 were returned, representing a response rate of 88.2%. The sample is highly dominated by females, 78%. It is also noteworthy that most of them are well educated. Ninety five percent of the respondents have work experience of more than 5 years and more than eight percent have worked in the particular organization for more than five years.

Data Analysis and Results

Since all measurement items in this study were adopted from previously validated scales, we did not put the items through another instrument validation process. However, we did perform careful construct reliability check. All reliability (Cronbach's alpha) scores are higher than the recommended 0.7 level (Nunnally, 1978).

Regression analysis was then performed to examine the relationships among TSC, TSI and EUS. The mean value of all items in a construct was used as input variables for the regression analysis. A total of three different regression models were run. Model 1 used EUS as the dependent variable and TSC as independent variable. Model 2 added TSI to Model 1 as the second independent variable. Model 3 add a moderator variable (TSC*TSI) to Model 2. The results for the three regression models are shown in Table 1a, 1b and 1c.

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta	B	Std. Error
1	(Constant)	4.017	.195		20.634	.000
	TSC	-.224	.075	-.194	-2.999	.003

Table 1a: Regression Model 1

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta	B	Std. Error
2	(Constant)	2.311	.253		9.144	.000
	TSC	-.093	.066	-.080	-1.404	.162
	TSI	.467	.052	.514	9.016	.000

Table 1b: Regression Model 2

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta	B	Std. Error
3	(Constant)	1.836	.572		3.207	.002
	TSC	.094	.212	.081	.442	.659
	TSI	.637	.190	.700	3.350	.001
	TSC*TSI	-.067	.073	-.224	-.927	.355

Table 1c: Regression Model 3

Model 1 shows that Technostress Creator (TSC) alone does have a significant negative relationship with End-User Satisfaction (EUS) (Table 1a). However, when Technostress Inhibitor (TSI) is introduced as the second independent variable in Model 2, the effects of TSC on ESU becomes insignificant, while TSI has a highly significant positive relationship with EUS (Table 1b). To test if TSI moderates the relationship between TSC and EUS, a moderator variable TSC*TSI is introduced in Model 3. Table 1c shows that both the TSC variable and the moderator variable TSC*TSI are not significant in Model 3, and TSI is the only highly significant variable. This means that TSI is not a moderator between TSC and EUS, but a good predictor of higher levels of end-user satisfaction.

DISCUSSIONS AND CONCLUSION

End-user satisfaction is the most widely used measure for information system success. The rapidly growing end-user population makes it critical for businesses to improve end-user satisfaction when adopting new ICTs, which in turn, may have considerable impact on employee productivity and business performance. Empirical evidences from this study shows that technostress does have significant negative impact on EUS. However, when technostress prevention mechanisms, such as better end-user support and training, and user involvement in system development and implementation are introduced, the negative impacts of TSC on EUS can be effectively negated.

For managers, this study identifies specific organizational conditions that signify the existence of technostress among end-users and relates them to end-user satisfaction, which is an important predictor of employee productivity and organizational performance. Managers can use the items developed in this study to ascertain the presence or absence of factors that create technostress. It should also be of interest to them to recognize that the organizational mechanisms described in "Technostress Inhibitors" can be effectively used to increase end-user satisfaction thus mitigate the negative outcomes of technostress.

This paper makes several contributions. First, it shows that the stress experienced by end users as a result of their use of ICT decreases their satisfaction. Our findings reinforce that the absence of adequate technostress prevention mechanisms during and after ICT implementation can lead to undesirable consequences not in line with anticipated benefits. Second, the paper suggests that there are inhibitor mechanisms that can be used to mitigate the effects of technostress, and can be used as managerial interventions for managing it. Third, the paper expands our understanding of the phenomenon of technostress by linking it to the end-user computing literature. The concepts and measurement instruments described here can be used as a strong basis for further investigation into technostress and analyze its relationship with other variables such as job performance and creativity. The constructs Technostress Creators and Technostress Inhibitors can be used by managers as diagnostic tools for assessing the extent of technostress and identifying strategies that may be required in their organizational context, for reducing its effects.

This research represents an attempt to develop a conceptual and empirical understanding of technostress and its outcomes. As this paper shows, technostress reduces end-user satisfaction, and to that extent, can offset anticipated performance benefits from the deployment of ICT. From a research point of view, the paper lays out the basis from which further inquiry on the organizational effects of technostress can be developed. From a practical point of view, the findings herein suggest a framework within which technostress can be assessed and measured, and appropriate organizational mechanisms for managing the fallouts of its effects on end-user satisfaction can be identified.

REFERENCES

1. Aladwani, A. (2002) Organizational actions, computer attitudes, and end-user satisfaction in public organizations: An empirical study, *Journal of End User Computing*, 14, 1, 42-50.
2. Bailey. J., and Pearson, S. (1983) Development of a Tool For Measuring and Analyzing Computer User Satisfaction, *Management Science*, 25, 5, 530 – 545.
3. Barki, H., and Huff, S. (1985) Change, Attitude toward Change, and Decision Support System Success, *Information and Management,* 9, 261-268.
4. Brillhart, P. E. (2004) Technostress in the workplace: Managing stress in the electronic workplace, *The Journal of American Academy of Business,* September, 302-307.
5. Brod, C. (1984) *Technostress: the human cost of the computer revolution*, Addison-Wesley.
6. Chen, L., Gillenson, M., and Sherrell, D. (2002) Enticing online consumers: an extended technology acceptance perspective, *Information and Management,* 39, 8, 705 – 719.

7. Clark, K., S. Kalin. (1996) Technostressed out? How to cope in the digital age. *Library Journal* August 30-32.
8. Cyert, R., and March, J. *A Behavioral Theory of the Firm,* Prentice-Hall, Englewood Cliffs, N.J., 1963.
9. Delone, W., and McLean, E. (1992) Information Systems Success: The Quest for the Dependent Variable, *Information Systems Research,* 3, 1, 60-95.
10. Delone, W., and McLean, E. (2003) The DeLone and McLean Model of Information Systems Success: A Ten Year Update*, Journal of Management Information Systems,* 19, 4, 9 – 30.
11. DeMaagd, G. (1983) Management Information Systems, *Management Accounting,* 65, 4, 10 - 71.
12. Doll, W., and Torkzadeh, G. (1989) A Discrepancy Model of End-User Computing Involvement, *Management Science*, 35, 10, 1151 – 1171.
13. Doll, W., and Torkzadeh, G. (1988) The Measurement of End-User Computing Satisfaction, *MIS Quarterly,* 12, 2, 259-274.
14. Doll, W., and Torkzadeh, G. (1991) The Measurement of End-User Computing Satisfaction: Theoretical and Methodological Issues, *MIS Quarterly,* 15, 1, 5 – 12.
15. Etezadi-Amoli, J., and Farhoomand, A. (1996) A Structural Model of End User Computing Satisfaction and User Performance, *Information and Management,* 30, 65 – 73.
16. Fisher, W., S. Wesolkowski (1999) Tempering technostress. *IEEE Technology and Society Magazine* Spring, 28-33.
17. Harrison, A. W. and R. K. J. Rainer (1992) The influence of individual differences on skill in end-user computing, *Journal of Management Information Systems*, 9, 1, 93-111.
18. Harrison, A., and Rainer, R. (1996) A General Measure of User Computing Satisfaction, *Computers in Human Behavior,* 12, 1, 79 – 92.
19. Heinssen, R. Jr., Glass, C., and Knight, L. (1987) Assessing Computer Anxiety: Development and Validation of the Computer Anxiety Rating Scale, *Computers in Human Behavior,* 3, 49-59.
20. Hudiburg, R. (1989) Psychology of Computer Use: XVII. The Computer Hassles Scale: Revision, Reliability, and Some Correlates, *Psychological Reports,* 65, 1387-1394.
21. Igbaria, M., and Guimaraes, T. (1993) Antecedents and Consequences of Job Satisfaction among Information Center Employees, *Journal of Management Information Systems,* 9, 4, 145-173.
22. Igbaria, M., and Tan, M. (1997) The Consequences of Information Technology Acceptance on Subsequent Individual Performance, *Information and Management,* 32, 3, 113 -121.
23. Iivari. J., and Koskela, E. (1987) The PIOCO Model for Information Systems Design, *MIS Quarterly,* 11, 3, 401-419.
24. Jewell, L. (1998) *Contemporary Industrial / Organizational Psychology.* Pacific Grove, CA: Brooks/Cole.
25. Jex, S., and Beehr. T. (1991) Emerging Theoretical and Methodological Issues in the Study of Work-Related Stress, *Research in Personnel and Human Resources Management,* 9, 311-365.
26. Johansson, G., and Aronsson, G. (1984) Stress Reactions in Computerizing Administrative Work, *Journal of Occupational Behavior,* 5, 2, 159-181.
27. Kappelman, L., and McLean, E. (1991) The Respective Roles of User Participation and User Involvement in Information System Implementation Success, *Proceedings of the International Conference on Information Syst*ems. New York, NY, 339 – 349.
28. Karasek, R. (1979) Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly,* 24, 285-308.
29. King, W., and Lee, T. (1991) The Effects of User Participation on System Success: Toward a Contingency Theory of User Satisfaction, *Proceedings of International Conference on Information System*s, New York, NY, 717 – 726.
30. Kupersmith, J. (1992). Technostress and the Reference Librarian. *Reference Services Review,* 20, Summer, 7-14.
31. Mandel, M. (2005). The real reasons you're working so hard. *Business Week*, Oct. 3, 60-67.
32. McKeen, J., Guimaraes, T., and Wetherbe, J. (1994) The Relationship between User Participation and User Satisfaction: An Investigation of Four Contingency, *MIS Quarterly,* 18, 4, 427 – 451.
33. Moore, J. (2000) One Road to Turnover: An Examination of Work Exhaustion in Technology Professionals, *MIS Quarterly,* 24, 1, 141-148.

34. Moore, R., Jackson, M. J. and Wilkes, R. B. (2007) End-User Computing Strategy: An Exampination of Its Impact on End-User Satisfaction, *Academy of Strategic Management Journal*, 6, 69-89.
35. Nelson, D. L. (1990) Individual adjustment to information-driven technologies: a critical review. *MIS Quarterly,* 79-98.
36. Nelson, D. L. and Kletke, M. G. (1990) Individual adjustment during technological innovation: a research framework, *Behavior and Information Technology,* 9, 4, 257-271.
37. Nunnally, J. C. (1978). *Psychometric Theory*. McGraw-Hill, New York, NY.
38. Ragu-Nathan, T.S., Tarafdar, M., Ragu-Nathan, B., and Tu, Q. (forthcoming) Consequence of Technostress in End Users: Conceptual Development and Empirical Validation, accepted and forthcoming in *Information Systems Research*.
39. Rai, A., Lang, S., and Welker, R. (2002) Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis, *Information Systems Research,* 13, 1, 50 – 69.
40. Rainer, R., and Harrison, A. (1993) Toward Development of the End User Computing Construct in a University Setting, *Decision Sciences,* 24, 1187 – 1202.
41. Rivard, S., and Huff, S. (1988) Factors of Success for End-User Computing, *Communications of the ACM* , 31, 5, 552 – 561.
42. Rivard, S., and Huff, S.(1984) User Developed Applications: Evaluation of Success from the DP Department Perspective, *MIS Quarterly,* 8, 1, 39-50.
43. Sethi, A. S., Caro, D. H. J. and Schuler, R. S. (1987) In Sethi, A. S., Caro, D. H. J. and Schuler, R. S. (Ed.), *Strategic Management of Technostress in an Information Society*, C. J. Hogrefe, Inc., Lewistown, NY, 1-16.
44. Tan, B., and Lo, T. (1990) Validation of a User Satisfaction Instrument for Office Automation Success, *Information Management,* 18, 203-208.
45. Tarafdar, M., Tu, Q., Ragu-Nathan, B. S. and Ragu-Nathan, T. S. (2007) The impact of technostress on role stress and productivity, *Journal of Management Information Systems,* 24, 1, 301-328.
46. Thompson, R., Higgins, C., and Howell, J. (1991) Towards a Conceptual Model of Utilization, *MIS Quarterly,* 15, 1, 125 – 143.
47. Torkzadeh, G. and D. J. Dwyer (1994) A path analytic study of determinants of information system usage, *Omega*, 22, 4, 339-348.
48. Weil, M. M. and Rosen, L. D. (1997) *TechnoStress: coping with technology @work @home @play*. John Wiley, New York.
49. Yaverbaum, G. J. (1988) Critical factors in the user environment: An experimental study of users, organizations, and tasks. *MIS Quarterly,* March, 75-88.
50. Zorn, T. E. (2002). The emotionality of information and communication technology implementation. *Journal of Communication Management,* 7, 2, 160-171.