

Full Length Research paper

Technostress in the age of information communication technology: A case study of distance education

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The study assessed symptoms and manifestations of technostress among workers. The study was carried out to determine the levels of technostress among academic and administrative staff of an open and distance learning institution, ascertained the influence of age and gender on manifestations of technostress and inquired the relationship between computer hassles and stress manifestations. 101; academic (52) and administrative (49) participants, in the age range of 20-69, mean age: 35 years, were randomly selected for the study. They responded to a 22 item, likert-type, two sub-scale, technostress questionnaire designed for the study. Their responses were analyzed with mean, SD, t-test, ANOVA and correlation statistics. (i) Academic staff manifested significantly higher levels of technostress than the non-academic staff (at $t = 6.97$ (computer hassles); 6.89 (stress reaction), critical $t = 1.69$). (ii) Older respondents manifested higher levels of technostress than younger respondents. (iii) No significant differences were obtained for male and female participants on technostress manifestation. (iv) A positive correlation was observed between computer hassles and stress reaction (at obtained value $.55$, Critical $r = .195$). Improved ICT training and stress management interventions were suggested as important process for enhancing individual and professional well-being.

Keywords: Technology, stress, distance education.

INTRODUCTION

The creation of computer software and hardware, telecommunications, databases, and the Internet has affected society as a whole, by giving people new productivity options and changing the way they work (Hulbert, 1998). In the 'information age' the increasing use of information technology has become the driving force in the way people work, learn, and play (Drake, 2000). Specifically looking at the influence of technology on distance education, the idea that teaching and learning can successfully take place through electronic communication between teachers and students widely separated by space and time is a concept that has

inspired hope, dismay, excitement and fear. It is obvious that the expectation of a distance learning setting is quite different from that obtainable in the face-to-face mode. This is because faculty members are required to be in tune with computer technologies and are expected to constantly adjust to new ones in order to successfully carry out their duties. Adapting to technology is not simple. Some people tend to embrace change while others resist change (Wolski and Jackson, 1999). Thus, the rapid introduction of technology in the workplace may cause individuals in organizations to suffer from a combination of technology fatigue and aversion and this can lead to technostress.

The term technostress was coined in 1984 by a clinical psychologist, Dr. Craig Brod who conceptualized it as:

A modern disease of adaptation caused by an inability to cope with the new computer technologies

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in a healthy manner. It manifests itself in two distinct but related ways: in the struggle to accept computer technology, and in the more specialized form of over identification with computer technology (Brod, 1984, p. 16).

In addition, Shenk (1998) conceptualized technostress as any negative impact on attitudes, thoughts, behaviour or body physiology that is caused either directly or indirectly by technology. Also, in their definition of technostress, Weil and Rosen (1997) perceived it as "our reaction to technology and how we are changing due to its influence." Technostress is also seen as one form of stress which interacts with other forms of stress. Kupersmith (1992) pointed out four related but distinct components of technostress which include: Performance anxiety - the tendency of an individual to engage in negative thoughts and statements. The other include, information overload which is tension as a result of too much information which exceeds a person's apprehension capability. Also, there is the case of role conflict which is described as the friction between different functions and self-definitions and lastly, organisational factors such as colleagues, facilities, policies, culture and management.

Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007) described technostress as a problem of adaptation as a result of a person's inability to cope with or to get used to information and communication technologies (ICT). Additionally, they have identified five components of technostress, also known as technostress creators, which are: techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty. Other terms that were synonymous with technostress identified by other researchers include technophobia, computerphobia, computer anxiety, and computer stress. In addition, the term digital depression has also been used to identify the feeling of an employee when being overwhelmed by technology (Chua, Chen, and Wong, 1999; Durndell and Haag, 2002; Mustaffa, Yusof, and Saad, 2007).

Statement of the Problem

The advent of technology today has definitely brought along many wonders and makes life much easier. Many institutions today rely on the technological revolution to execute monotonous and repetitive tasks, so that boredom in the workplace could be reduced. Even though it is undeniably true that there are those who feel comfortable and really gain from the usage of technology, there are many who find it difficult to adjust. One main reason is that technology requires people to change but adapting to technology is not that easy. Inability to cope with technology could lead to technostress with its resultant physiological and psychological complications. It is therefore important to recognise the anxiety associated

with technostress in order to help the individual involved adjust well to the challenges. This will ultimately improve personal as well as professional well-being.

Objectives of Study

This study presents the following objectives:

1. To determine the levels of technostress among academic and administrative staff of an open and distance learning institution.
2. To find out the influence of age on manifestations of technostress among participants
3. To determine the influence of gender on technostress among participants.
4. To determine the relationship between computer hassles and stress manifestations

Research Hypotheses

This study presents the following hypotheses

1. There will be statistically significant differences between academic and administrative staff on manifestations of technostress
2. Older participants will exhibit significantly higher level of technostress than younger participants
3. The females will exhibit significantly higher level of technostress than the males
4. There will be significant and positive correlation between computer hassles and stress manifestations

REVIEW OF LITERATURE

Providing insight of the physiology of stress, research indicates that persons experience higher levels of adrenaline and noradrenaline during work periods with computers (Arnetz and Berg, 1993). Adrenaline and noradrenaline are catecholamines secreted by the adrenal gland. Increased excretion rates of adrenaline and noradrenaline are associated with both underload and overload (stress) stimulation and emotional arousal. Other effects of the increased catecholamines levels, as part of sympathetic nervous responses, are increased heart rate and blood pressure. Increased heart rate and blood pressure have been observed in persons performing a computer task (Muter, Furedy, Vincent, and Pelcowitz, 1993). Other research has shown that there is increased skin conductance level (SCL) while performing a computer task (Muter, et al., 1993). Skin conductance level is an indicator of increased sympathetic nervous reaction (the more you sweat the better the conductance). Another indirect indicator of being "stressed" by computer use, is an increased jaw muscle electromyograph (like clenching your teeth an index of the user's 'anger') while performing a computer task

(Emurian, 1991;1993).

According to Charlesworth and Nathan (1984), up to 75% of all visits to physicians are the result of stress-related disorders. Their study concluded that hypertension, coronary heart disease, headaches, asthma, gastrointestinal disorders, and many skin disorders are all related to stress. Cobb and Rose (1973) found a relationship between high workloads and elevated blood pressure among air-traffic controllers. House (1984) found that workload, utilization of skills, and role conflict were significantly associated with hypertension. Cobb et al., (1973) studied the relationship between job loss and elevated blood pressure. Their analysis of 150 married men over a 2-year period found men who lost their jobs or anticipated the loss of their jobs had elevated blood pressure until stabilization of employment occurred. Those individuals with no fear of potential job loss or actual job loss maintained stable blood pressure. Bloom (1985), and Creed (1985) stated that life-stress events can lead to both physical and mental illness

A survey by Masey and Stedman (1995) showed that the increase in demands for technology was among the main attributing factors to added job stress. They pointed out three ways how stress is inherent in technology: through (a) client expectation; (b) aggressive marketing schemes from software manufacturers; and (c) desire to always be on the cutting edge of technology. Massey and Stedman (1995) further conducted a survey of information-technology professionals concerning feelings about stress in their work environments. The researchers stated that 86% of surveyed technology workers indicated that their jobs were more stressful now than they were 5 years ago. They attributed the added stress to being understaffed and having additional responsibilities. The authors went on to say that employee stress was related to a "feeling of high responsibility and loss of control." They further stated that it is generally the most "conscientious workers who are inclined to develop job stress." They concluded that the nature of information technology "demands a high degree of meticulousness and attracts the type of individuals who are already prone to stress' like Type A personality individuals (Friedman and Rosenman, 1974; Agbu, 2010). It was also noted by Massey and Stedman (1995) that organizational politics, dwindling resources, hiring freezes, and a desire to be on the "cutting edge of technology places an undue burden on the availability of resources to implement and manage new technology." In addition to that, results of a 49 months study of business attitudes by Rosen and Weil (2000) revealed that over a period of three years, clerical workers, managers, and executives became more resistant and hesitant to use new technology. A vast majority (80%) of the respondent reported that technology had brought additional stress to

their lives. Some of the ways technology has made their work more stressful are system problems errors, steep learning curve, requirement for more work, and rapid change in technology. Ragu-Nathan, Tarafdar, Ragu-Nathan, and Tu (2008) agreed that it is the characteristics of information communication technologies that are creating stress in technology end-users. Shepard (1971) indicates that organizational employees can suffer from three aspects of work alienation resulting from the introduction of new technology: 1.) fear of a loss of control over the work environment, 2.) the implication that employees have been reduced to machine attendants, and 3.) fear that the technology will get the credit for a job well done.

Most persons might experience mild forms of technostress but for those who experience extreme levels of technostress there may be some dire negative effects. Extreme stress may result in health related problems, like cardiac problems, hypertension, migraine headaches, etc. A possible negative outcome is "job burnout". Job burnout has been defined as "...a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that can occur among individuals who do 'people work' of some kind" (Maslach, 1982). There are many symptoms that characterize job burnout. For example, the person may feel emotionally drained, be unable to "express a sense of humor; they might skip rest periods and food breaks, and they may report increased physical complaints". The burned out worker may begin pulling away from co-workers, and he/she might adopt an "I-don't-give-a-damn" attitude which may be associated with decreased job performance. The worker may experience increased frustration, low self-esteem, and have the "trapped" feeling. If one determines that a person or group of people are experiencing a high level of technostress, the next step would be to determine how to understand and cope with the technostress. This is the thrust of this study.

MATERIALS AND METHODOLOGY

Setting and Participants

A total of 101 participants comprising academic (52) and administrative (49) staff of the National Open University of Nigeria, Lagos, Nigeria were employed for this study. They were randomly selected from the following departments: Academic – schools of education, law and science and technology, out of the 6 schools in the university. The non-academic participants were randomly selected from the following 7 out of the 14 non-academic departments: registrar, bursary, directorate of physical planning, legal and protocol, procurement, human resources and directorate of media. The age of the

Table 1. Mean, SD and t-test of Academic and Non-Academic Participants on Technostress Scale

Measure	Academic (No: 55)		Non-academic (No:46)		t-test
	X	SD	X	SD	
Technostress Scale					
Computer Hassles	32.65	3.95	26.71	4.61	6.97*
Stress Reaction	24.05	3.59	19.57	3.91	6.87*

Note: * Significant, $P < .05$, $df = 99$, Critical $t = 1.66$

participants ranged from 20 – 69 years (mean = 35).

Instrument

A questionnaire was designed for this study. Contents of the questionnaire were extracted from Hudiburg (1995) computer hassle subscale and Omoluabi (1987) psycho-physiological symptom checklist. It is a 22 item, 4 point, likert-type questionnaire designed to assess computer hassles and corresponding stress manifestations. It is of three sections. Sections one obtained the demographic details of participants, specifically, age, gender and department. Section two assessed features of computer hassles which include: computer proficiency, key board and typing errors, adjustment to new programmes, and vulnerability to virus attack. Section three dealt with stress manifestations which include poor appetite, back ache, emotional outburst, head ache, etc.

Procedure

This survey study was carried out in two phases, namely the pilot study phase and the main study phase. At the pilot study phase, the questionnaire was administered to 20 participants (10 males, 10 females). This was carried out in order to ascertain the suitability of the questionnaire. Results obtained were positive and encouraging. Subsequently, a total number of 120 questionnaires were administered to the participant while 109 were returned, and 101 were found usable. The questionnaire was scored through direct scoring on a scale of 4 to 1. The highest score expected of computer hassle subscale was 40 with a norm score of 20. Also, the highest score expected of the stress manifestation subscale was 36 with a norm score of 18. This means that scores more than the norm scores indicate high computer hassles and stress manifestation respectively.

Data Analysis

The study employed mean, standard deviation, t-test and one way analysis of variance and correlation statistics for the data analysis. This was done with the aid of statistical package for social science (SPSS) version 15.0.

RESULT

Out of the 101 respondents, 51.49% were males while 48.51% were females. Also, academic staff made up 54.6% of the respondents while 45.54% were non-academic staff, A review of the age of the participants showed that 24.75% were between the age bracket of 20-29 years, 31.68% were between 30 to 39 years, 25.74% were between 40 to 49 years, 11.84% were between 50 to 59 years, and lastly 5.94% were between 60-69 years.

In order to examine if there are significant differences between academic and administrative staff on manifestations of technostress, the mean, standard deviation and t-test of their responses were computed. The result is presented in table 1.

The result in table 1 indicates statistically significant differences on the manifestations of technostress among academic and administrative staff. Specifically, academic staffs obtained mean scores of 32.65 and 24.05 respectively on the two subscales of technostress, while the non-academic staffs obtained mean scores of 26.71 and 19.57 respectively. The t-test revealed that the observed differences were significant at critical $t = 1.66$. This thus confirms hypothesis 1.

To ascertain the influence of age on manifestations of technostress, the mean, SD and ANOVA scores of the respondents is presented in tables 2 and 3.

Result in table 2 shows that those aged 60 years and above presented highest symptoms of technostress than others ($X = 62.33$). They were closely followed by those

Table 2. Mean and SD Scores of Age Influence on Technostress

Age Range	Technostress Scale				
	Computer Hassles		Stress Reaction		Total
	X	SD	X	SD	X
20-29 (No: 25)	28.04	4.81	19.96	3.87	48.00
30-39 (No: 32)	29.28	4.88	21.40	4.31	50.68
40-49 (No: 26)	30.88	5.01	22.34	4.66	53.22
50-59 (No: 12)	31.83	5.83	23.33	4.39	55.16
60-69 (No: 6)	35.83	4.66	26.50	4.18	62.33

Table 3. ANOVA summary Table

Measure	Between Group		Within Group		F	Sig
	SSQ	MSQ	SSQ	MSQ		
Computer hassles	376.78	94.19	2406.58	25.07	3.76	.007*
Stress Reaction	258.06	64.52	1782.73	18.57	3.47	.011*

Note: * Significant, $P < .05$, df , 4/96

Table 4. Mean, SD and t-test of Male and Female Participants on Technostress Scale

Measure	Males (No. 52)		Females (No. 49)		t-test
	X	SD	X	SD	
Technostress Scale					
Computer Hassles	29.67	5.18	30.12	5.63	.42
Stress Reactions	21.65	4.61	21.89	3.76	.29

Note: * Significant, $P < .05$, $df = 99$, Critical $t = 1.66$

Table 5. Correlation matrix of the measure

Measure	Computer Hassles	Stress Reaction
Computer Hassles	-----	
Stress Reaction	.55*	-----

Note: * = Significant, df : 100, $P < .01$, Critical $r = .195$.

aged 50-59 years ($X = 55.16$) and 40-49 years ($X = 53.22$) respectively. The lowest mean score of 48.00 was obtained for those between ages 20 – 29. To further ascertain if the observed differences in table 2 are statistically significant, the ANOVA statistics was computed and presented in table 3. Result obtained in table 3 indicates that the statistical observations were significant at $P < .05$, df , 4/96. Thus hypothesis 2 is accepted.

To identify the influence of gender on technostress, the observed result is presented in table 4. Result in table 4 showed no statistically significant differences on the male and female scores on technostress and this therefore rejects hypothesis 3.

To ascertain the relationship between the sub-measures of technostress: computer hassles and stress manifestations, the correlation statistics is presented in table 5. The result indicates that the correlation is significant at the 0.01 level (2 tailed). Hypothesis 4 is thus confirmed.

DISCUSSION AND CONCLUSION

In a bid to contribute to knowledge on technostress research, this study provided further insight on technostress, its sources, components and manifestation. Employing Nigerian sample, this study assessed

manifestations of technostress among 101 participants randomly selection from the National Open University of Nigeria. They were made up of academic and administrative staff of the institution. Demographic characteristics of the participants were: 51.49% (males); 48.51% (females); 54.46% (academic staff); 45.54% (non-academic staff); 24.75% (20-29 years); 31.68% (30 to 39 years); 25.74% (40 to 49years); 11.84% (50 to 59 years); 5.94% (60-69 years). The independent variables for the study were sex, age and department while the dependent variables were participant's responses on the technostress scale. These variables guided the research objectives and hypotheses. The study raised four hypotheses of which three were accepted.

For a test of hypothesis 1 that states that: there will statistically significant differences between academic and administrative staff on technostress, result in table 1 indicates that the academic staff manifested higher levels of technostress than the non-academic staff. Specifically, academic staff obtained mean scores of 32.65 and 24.05 respectively on the two subscales of technostress, while the non-academic staff obtained mean scores of 26.71 and 19.57 respectively. The t-test revealed that the observed differences were significant at $P < .05$, $df = 99$, Critical $t = 1.66$, obtained value = 6.97 and 6.87 respectively. This finding appeared to be in line with Kupersmith (1992) observation that technostress is only one form of stress which interacts with other forms of stress. He further asserted that other related but distinct components of technostress were information overload which is tension as a result of too much information which exceeds a person's apprehension capability and also the case of role conflict which is described as the friction between different functions and self-definitions. Thus the open and distance learning faculty member seem vulnerable because of competing roles that must to played well. First as an academic, with rigorous mental and physical exertion, he or she is expected to be up to date with current data on a particular research area as well as write and publish in reputable journals. Secondly the faculty member is expected to be a competent course coordinator or programme leader with its entire requirements. In addition to this, the faculty member is expected to be conversant with different ICT software's obtainable in the open and distance learning institution as well as be available to students for 24 hours a day. These could be very stressful indeed.

This study also discovered that older participants manifested higher levels of technostress than the younger participants. Specifically, it was observed that those aged 60 years and above presented highest symptoms of technostress than others. This group was closely followed by those aged 50-59 years and 40-49 years respectively. The ANOVA result indicates a statistically significant difference on the observed result. Observations indicate that younger people are more open to the new computer technology than older people. This

is aptly captured in Marc Prensky digital migrant and digital native dichotomy (Prensky, 2001). He identified a digital native as a person who understands the value of digital technology and uses this to seek out opportunities for implementing it. A digital migrant on the other hand was described is an individual who was born before the existence of digital technology and adopted it to some extent later in life. Alternatively, this term can describe people born in the latter 1970s or later, as the Digital Age began at that time; but in most cases the term focuses on people who grew up with 21st century modern technology (Prensky, 2001). It is however not surprising that older respondents manifested more technostress than the younger ones because of the pressure to adjust and change to the new but alien technology.

Result in table 4 showed that the females obtained higher mean scores on technostress than the males; however the t-test presented at the end of the table indicates that the observed scores were not statistically significant. This shows that males and females experience technostress equally. Also the correlation statistics showed positive correlation between the subscales of technostress: computer hassles and stress manifestations. This shows that those subjected to high level of technostress are prone to stress-related physiological and psychological complications. Such stress-related complications include: lowered immunity, backache, neck ache, tiredness and sleep problems. Others include: hypertension, headaches, dizziness, poor appetite, asthma, gastrointestinal disorders, skin rashes, blurred vision, emotional outburst and interpersonal difficulties. This is detrimental to the worker and the institution because it will greatly affect the productivity level.

CONCLUSION

The contemporary global world is a very stressful one with demands and changes to grapple with. As technology is here to stay, it is crucial we appreciate the emotional and physiological responses to technology as well as fashion out adaptable ways of adjusting to it. Technostress can reduce employee productivity and create dissonance in the work environment, costing employers time and money. Given the trend toward an increasingly faster-paced and more stressful work environment, it seems reasonable to develop effective training and wellness programs to decrease employees' stress levels and to enhance their sense of technological mastery and personal value. The study therefore recommends the following:

For the Individual

To reduce the psycho-physiological impact of

technostress, individuals should strive to get enough exercise - this is known to reduce stress. They should also learn relaxation techniques - this can help them to sleep better and relieve stress-related physical pains such as stomach pains, headaches and backaches. In addition, individual should desist from drinking too much alcohol or caffeine. Instead of helping, these stimulant increases the stress level. They should eat regular meals and a health meal, control emotional outburst through deep-breathing exercises, practice time management and make sure that the work environment is comfortable. If it is not, they should ask for help from their institutions.

For Open and Distance Learning Institutions

Generally, policy measures in ODL should strive to sustain an ever-present system of training and education using effective technologies. ODL institutions should strive to adopt user friendly hardware and software with provision for adequate training for the staff. In addition to this, ODL institutions and administrators should create a better communication channel within the work environment as well as encourage improved level of reassurance, patient and stability within the institution. This is because the practice and expectations of ODL work requires full concentration and borderless time which can be tasking on individuals emotionally and physiologically.

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