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Technostress and Its Determinants: A Psycho–Physiological Complications Among Workforce In Nigeria

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Abstract
The goal of Information and Communication Technology (ICT) was to make our lives easier (i.e., by providing faster communications around the globe, efficacy in work processes, and so on). If modern technology was designed to empower us, to set us free, and to leave us satisfied, why do we often feel (techno-) stressed due to the use of this technology? This paper unravels a modern disease caused by inability to cope with computer technology in a healthy manner called Technostress. Technostress scale, a twenty – two item Likert-type, two sub-scale questionnaires designed for the study was administered on two hundred and one samples drawn from five faculties in National Open University of Nigeria (NOUN) and five Commercial banks in Port Harcourt metropolis, Nigeria. The data were analyzed using t-test, Correlation and ANOVA statistics. The results revealed that academic staff manifested higher levels of technostress than the employees from the banking sector, a positive correlation was observed between computer hassles and stress reaction. In conclusion, ICT training and stress management were highlighted as solutions for technostress in the two human industries.

Keywords: Techno-overload, Techno-complexity, Techno-insecurity, Techno-uncertainty, Technostress

1.0 Introduction

The world continues to be an information-driven arena where efficiency and competition are measured by the fast pace of information accessibility via Information and Communication Technology (ICT). With the innovations of new features in technologies and its capabilities to provide various services and transactions, many organisations now compete for efficiency and improved productivity. Thus, the rapid advances and changes in new technology have caused institutions and organisations to continuously introduce employees to updated technology and software packages to stay technologically current, and many a times abreast in their area of focus. However, the rapid introduction of technology in the workplace may cause individuals in organizations to suffer from a combination of technology fatigue and aversion. Thus, the presence of Information Communication Technology contributing to workload efficiency, effectiveness and good performance has created a new phenomenon called technostress; which is defined as a modern maladaptation resulting from the failure to cope with ICT and changing requirements related to the use of ICT [1, 2]. The main aim of this study is, therefore, to

investigate the impact which the incidence of technostress has among education administrators and those in the banking sector where computer technology has been deployed as the main tool for their daily work. This is with the belief that the population under study could be more vulnerable to information overload and fatigue caused by IT.

1.1 *Technostress and its Components*

Brod [1] defined technostress as a modern disease of adaptation caused by inability to cope with the new computer technologies in a healthy manner. According to him, it manifests itself in two distinct but related ways; that is in the struggle to accept computer technology, and in the more specialised form of over-identification with computer technology. He identified the symptoms of technostress to include irritability, headaches, nightmares, resistance to learning about the computer or the outright rejection of the technology while Tarafdar, Tu, Ragu-Nathan and Ragu-Nathan [3] identified five components of technostress to be:

- ***Techno-overload*:** A situation where ICT users are forced to work fasterand longer
- ***Techno-invasion**:* A situation where ICT users feel that they can be reached anytime or constantly "connected" which caused a blurring between work-related and personal contexts

- ***Techno-complexity:*** A situation where ICT users feel that their skills are inadequate due to the complexity related to ICT. Consequently, they are forced to spend time and effort to learn and understand the various aspects of ICT
- ***Techno-insecurity*:** A situation where ICT users feel threatened that they who are better in ICT compared to them
- ***Techno-uncertainty:*** A situation where ICT users feel uncertain and unsettled since ICT is continuously changing and need upgrading.

Kupersmith [4] aver that technostress has only one form of stress which interacts with other forms of stress. He pointed out five related but distinct components of technostress:

- Performance anxiety, which refers to the tendency of an individual to engage in negative thoughts and statements.
- Information overload, which is tension as a result of too much information which exceeds a person's apprehension capability.
- Role conflict which describe the friction between different functions.
- Self-definitions
- Organisational factors such as colleagues, facilities, policies, culture and management.

Tams *et al*. [5] demonstrated the strengths of a multi – method approach in technostress research. In the author's experiment, participants performed a computer – based task (a memory game) while instant messages frequently interrupted them. Messaging the resulting stress on a psychological level (using self- report measures) and a physiological level (using measures of stress hormone excretion), the authors explained a higher degree of the variance in task performance than with each method alone.

With the advent of ICT in virtually every work setting, workers are all saddled with one form of psycho-physiological complications or another due to constant adjustment to different facets of ICT. It is thus worrisome that such complications are most times overlooked and de-emphasised. The contemporary worker is gradually going blind because of poor computer screen; he or she is continually saddled with overwhelming helplessness associated with massive loss of data due to computer break down. The physiological effect of resultant stress reaction is gradually reducing the quality of life of an average worker today who must depend on ICT for daily result. Since it is almost impossible to shy away from the ICT revolution and its gains, it is very important to recognise the anxiety associated with technostress in order to help the individual involved adjust well to the challenges. It is on this premise that this study is investigating the influence of technostress on the workforce of both the educational and the banking sectors in Nigeria.

1.2 *Objectives of the Study*

The objectives of this study include:

1. To determine the levels of technostress between faculty members and bank officials.
2. To determine gender differences in the manifestation of technostress.
3. To find out the influence of age in manifestations of technostress among participants.
4. To determine the relationship between computer hassles and stress manifestations.

1.3 *Research Hypotheses*

The hypotheses tested in the study are:

1. There is a statistically significant difference between faculty members and bank officials in manifestations of technostress.
2. There is a statistically significant that males will exhibit significantly higher level of technostress than the females.
3. There is a statistically significant the older participants will exhibit significantly higher level of technostress than younger participants.
4. There is a significant and positive correlation between computer hassles and stress manifestations.

2.0 *Literature Review*

Providing insight into the physiology of stress, Arnetz and Berg [6] through their research observed that individuals are most likely to experience higher levels of adrenaline and nor adrenaline during work periods with computers. Adrenaline and nor adrenaline are catecholamines secreted by the adrenal gland. The increased excretion rates of adrenaline and noradrenaline are associated with both under load and overload (stress) stimulation and emotional arousal. Other effects of the increased catecholamine levels, as part of sympathetic nervous responses, are increased heart rate and blood pressure. Increased heart rate and blood pressure have been

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observed in persons performing a computer task [7]. Other research has shown that there is increased skin conductance level (SCL) while performing a computer task [7]. 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 electromyography (like clenching your teeth, an index of the user's 'anger') while performing a computer task [8]. In a related study, Charlesworth and Nathan [9], remarked that 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. Same token, same analogy, many factors have been identified to be the causes of technostress. Clute [10] cited the top three reasons that cause technostress as, inexperience with computers, performance anxiety and lack of training/insufficient staffing. As a matter of fact, many other studies also claimed lack of training as one of the main reasons for technostress [11]. Common organisational factors found by Clute [10] to be the sources of technostress include lack of participatory management styles, lack of communication, and lack of involvement. In fact, most studies revealed that those who suffered from technostress were mostly angry because they were forced to accept the technology without being consulted before the implementation of the technology [12] A survey by Masey and Stedman [13] showed that the increase in demands for technology was among the main attributing factors adding to job stress. They pointed out three ways on how stress is inherent in technology as 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 [13] further conducted a survey of information-technology users concerning feelings about stress in their work environments. The researchers stated that 86% of surveyed workers indicated that their jobs were more stressful now than they were five years ago. They attributed the added stress to being understaffed and having additional responsibilities. 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 [14].Ragu-Nathan *et al*. [15] agreed that it is the characteristics of information communication technologies that are creating stress in technology end-users.

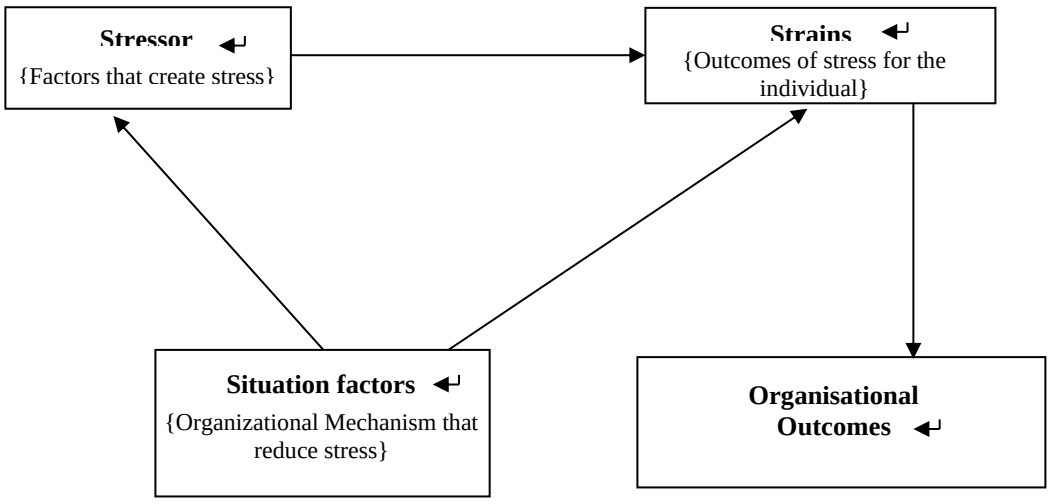

Figure 1: Transactional – based Model of Stress [15]

Figure 1 show the stress construct, which was utilized based on organizational behaviour literature.

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This provides the theoretical background for understanding stress in the organizational environment.

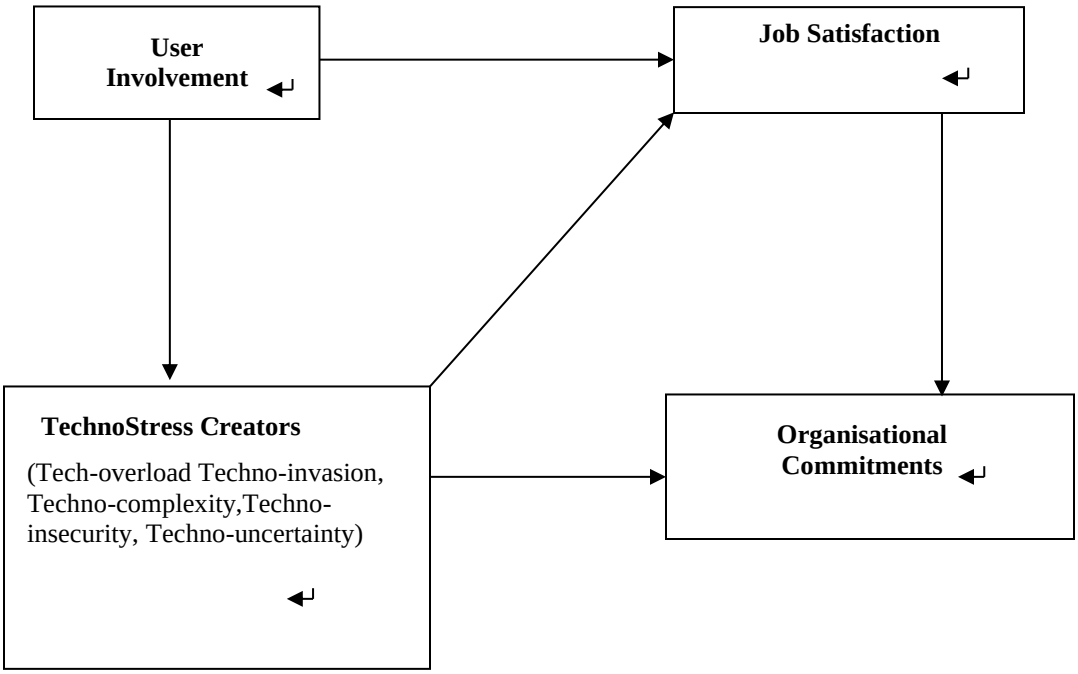

Figure 2: Conceptual Model of Technostress [15]

The general model of stress was further developed to link the theoretical concept of organizational stress of ICT usage in the organization; and explain how the use of ICTs can potentially create stress and this negatively impact individual job satisfaction and organizational commitment [15]. Studies reviewed traced to psycho-physiological impact of stress and more specifically, the influence of technostress of job satisfaction and emotional stability. The present study therefore continues this interesting and insightful debate.

3.0 *Methodology*

The research design employed for this study is survey design and specifically, the statistical method used for the analysis is a 2X2X5 ANOVA design. The independent variables are gender (male, female), place of work (university/bank) and age (20 - 29; 30 - 39; 40 - 49; 50 - 59; 60 - 69), while the dependent variables are participants' responses on the technostress scale. The independent variables were tested with mean, SD, t-test, One Way ANOVA and Correlation analysis. The results obtained were linked to the specified hypotheses.

3.1 *Population and Sample*

The population for the study was made up of National Open University of Nigeria (NOUN) where academic seminars and Inaugural lectures delivery system is majorly IT-based and staff of five banks whose services are driven with high level technology within Port Harcourt metropolis. The banks are Zenith bank, First bank, Union Bank, Unity Bank and GT bank. The actual samples for the study are 102 randomly selected respondents among the academics from NOUN and 99 randomly selected respondents among the bank staff from the five purposefully selected banks mentioned above.

3.2 *Data Collection Procedure*

Data for the study were collected using questionnaire. A total of 250 questionnaires were administered on the respondents who were randomly selected among the academics in the five faculties in NOUN and the randomly selected staff of the five chosen commercial banks. Five research assistants; one in each bank was employed for this study and they were given a brief training on the relevant interpersonal skills needed for the study. They were also provided with relevant materials (letter of introduction, writing materials) for the study. Every copy of the questionnaire returned was scrutinised by the researchers. The respondents were expected to respond to all the statements in the questionnaire, in addition to their demographic profile. The statements were 20 in number and were presented on a Likert-type scale. Out of the 250 copies of questionnaire distributed, a total of 201 were found usable. This made up 80.4% of the questionnaire. This figure was thus found enough for the research to proceed with the data analysis.

3.3 *Study Instrument*

A questionnaire was designed for this study. Contents of the questionnaire were adapted from Hudiburg, Computer Hassle Subscale (CHS) and Omoluabi Psycho-physiological Symptom Checklist (PSC). Experts in social and medical sciences helped to validate the contents of the questionnaire. Specifically, the research instrument contained 10 items that assessed computer hassles and 12 items assessing stress reactions. Items for computer hassles include level of IT competence, state of computer screen, incidences of virus attack and loss of data, slow booting and power fluctuation. Others include incessant keyboard error, proficiency in typing, level of competence with computer packages and the ability to use adopted software. The subscale that assesses stress reaction tries to identify the following stress manifestations: backache, headache, pain in the eyes, irritability, poor sleep, dizziness, emotional outburst, poor bowel movement, interpersonal difficulties. The questionnaire was pilot-tested on 20 participants drawn from commercial banks and two study centres of NOUN using test-retest methodology spanning two weeks interval to establish the reliability coefficient of the questionnaire. The reliability coefficient of the questionnaire is 0.71.

Data Analysis: The study employed mean, standard deviation, t-test and One-Way ANOVA for the data analysis. This was done with the aid of statistical package for social science (SPSS), version 15.0.

Results

	N	(%)
Department		
Academic	102	50.75
Financial	99	49.25
Total	**201**	**100**
Gender		
Male	107	53.23
Female	94	46.77
Total	**201**	**100**
Age (Years)		
20-29	55	27.36
30-39	57	28.36
40-49	56	27.86
50-59	27	13,43
60-69	6	2.99
Total	**201**	**100**

Table I: Demographic Profile of the Respondents (N = 201)

The demographic profiles provide information on employees' background, gender and age. A total of 201 participants took part in this study. Out of the total number, 50.75% of them were academic staff while 49.25% were selected from financial institutions. In terms of gender, 53.23% were males while females were 46.77%. An analysis of the age of the participants indicates that 27.36% were between the age group of 20 to 29 years, 28.36%, while those 30 to 39 years were 28.36% of the respondents. In addition, 27.86% were between 40 to 49 years, 13.43% were between 50 to 59 years, while 2.99% of the respondents were in the age range of 50 to 59 years. In order to examine the differences in the symptoms and manifestations of tehnostress among faculty members of National Open University of Nigeria (NOUN) and participants drawn from the banking sector, the mean, standard deviation and t-test of their responses were computed. The result is presented in Table 2.

Table 2: Mean, SD and T-test of Respondents on Technostress Scale

Department		Computer Hassle	Stress Reaction	T	Df

Academic Staff	Mean	29.8627	21.7353		
	N	102	102		
	Std. Deviation	5.36774	4.20025	8.96*	199
Staff of Financial Bank	Mean	23.3333	19.7980		
	N	99	99		
	Std. Deviation	4.96107	3.51667	3.54*	199
	N	201	201		
	Std. Deviation	6.10898	3.98896		
Total	Mean	26.6468	20.7811		

Note: * = Significance, Probability level (P) = <.05, df= 199, Critical t= 1.65

The result in Table 2 shows that academic staff obtained mean scores of 29.86 and 21.74 on computer hassle and stress reaction sub-scales respectively, while employees from the banking sector obtained mean scores of 23.33 and 19.80 on the scales respectively. For a test of significance, the t-test statistic was computed. The result indicates score of 8.96 and 3, 54 respectively for the two groups of respondents with a df of 199. Result further indicates that the observed differences in obtained scores are statistically significant at probability level = <.05, df - 199, Critical t = 1.65. Thus, hypothesis one which states that there will be statistically significant differences between faculty members of open and distance learning and bank officials on manifestations of technostress are hereby confirmed.

To ascertain the influence of gender on manifestations of technostress. The mean, SD and T-test scores of the respondents are analysed in Table 3

Table 3: Mean, SD and T-test of Male and Female Participants on Technostress Scale

Gender		**Computer Hassle**	**Stress reaction**	**t**	**df**
Male	Mean	26.5607	20.4766		
	N	107	107		
	Std. Deviation	5.87636	4.17166	-.211	199
Female	Mean	26.7447	21.1277		
	N	94	94		
	Std. Deviation	6.39377	3.76239	-1.63	199
	N	201	201		
	Std. Deviation	6.10898	3.98896		
Total	Mean	26.6468	20.7811		

Note * = Significance, Probability level (P) = < .05, df = 199, Critical t = 1.65

The result in Table 3 shows that the male respondents obtained mean scores of 26.57 and 20.47 on computer hassle and stress reaction sub-scales, respectively, while females obtained mean scores of 26.74 and 21.13 on the scales respectively. The t-test result indicates score of-.211 and -

1.63 respectively for the two groups of respondents with a df. of 199. Result further indicates that the observed differences in obtained scores are not statistically significant at P. = .05, df = 199, critical t = 1.65. Hypothesis two that states that the males will exhibit significantly higher level of technostress than the females are hereby rejected. To ascertain the influence of age on manifestations of technostress, the mean, SD and ANOVA scores of the respondents are presented in Tables 4 and 5.

Table 4: Mean and SD Scores of Age Influence on Technostress

Age Group		Computer Hassles	Stress Reaction
20-29	Mean	26.7455	19.3818
	N	55	55
	Std. Deviation	5.18266	3.93696
30-39	Mean	25.7193	20.7544
	N	57	57
	Std. Deviation	5.79333	3.66587
40-49	Mean	27.4286	21.2857
	N	56	56
	Std. Deviation	5.81177	4.53958
50-59	Mean	25.4444	21.5556
	N	27	27
	Std. Deviation	7.71279	3.51188
60-69	Mean	35.8333	26.5000
	N	6	6
	Std. Deviation	4.66548	4.18330
Total	Mean	26.7413	20,8060
	N	201	201
	Std. Deviation	6.11169	4.16259

A summary of the result in Table 4 indicates that the highest mean score was obtained among those on the age range of 60 to 69 years on the two sub-scales while the lowest mean score was observed among those aged 20 to 29 years. This result will be further analysed on the discussion section.To further ascertain if the observed differences in Table 4 are statistically significant, the ANOVA statistics was computed and presented in Table 5.

Table 5: ANOVA Summary Table

		Sum of Squares	Df	Mean Square	F
Computer	Between Groups	627.388	4	156.847	4.492*
	Within Groups	6843.159	196	34.914	
	Total	7470.547	200		
Stress	Between Groups	334.294	4	83.574	5.231*
	Within Groups	3131.138	196	15.975	
	Total	3465.433	200		

Note: * Significant, P < .05, df, 4/196, Critical f = 3.03

Result obtained in Table 5 indicates that the statistical observations were significant at P < .05, df, 4/196, critical f = 3.03. Thus, hypothesis 3 that states that older participants will exhibit significantly higher level of technostress than younger participants is confirmed. To further ascertain the relationship between the sub-measures of technostress: computer hassles and stress manifestations, the correlation statistics is presented in Table 6.

Table 6: Correlation Matrix of the Measure

		VAROOOOI	VAR 00002
VAR00001	Pearson	I	.422**
	Sig.		.000
	N	201	201
VAR00002	Pearson	422**	1
	Sig.	.000	
	N	201	201

** Correlation is significant at the 0.01 level

The result indicates that the correlation is significant at the 0.01 level (2 tailed). Hypothesis 4 that states that there will be significant and positive correlation between computer hassles and stress manifestation is thereby confirmed.

For this study, we were also curiously interested in finding out the frequency of stress reactions amongst the two groups, based on the sub-scale that assesses stress manifestations. Table 7 shows the results.

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Table 7: Stress Reactions/Manifestations among Respondents

Symptoms of stress manifestastion - Technostress	**Academics**			**Bankers**		
	Mal	Female	%	Male	Female	%
Backache	47	34	79.4	19	12	31.0
Headache	48	41	87.3	22	20	40.0
Pains in the eyes	42	36	76.5	26	21	47.5
Irritability	38	34	71.0	14	14	28.2
Poor sleep	32	26	56.8	21	18	39.4
Dizziness	38	34	71.0	22	14	36.4
Emotional Outburst	26	22	47.1	12	II	23.2
Poor Bowel Movement	31	22	44.2	14	07.	21.2
Interpersonal Difficulties	31	24	53.9	06	07	15.2

The above table shows the percentages of the technostress manifestations by the samples from both the academic community and the banking sector.

4.0 *Discussion*

The study revealed statistically significant differences on the scores of the respondents on technostress exist. Specifically, it was observed that academic staff obtained higher scores on computer hassles and stress reactions (two sub-scales of technostress) than those obtained by employees of commercial banks. The t-test result revealed that the observed differences were statistically significant at: obtained t = 8.6; 3.54, critical t = 1.65, Probability = <.05, df = 199. This is an interesting finding because one would have expected that employees of commercial banks would have presented significantly higher levels of technostress than academic staff considering the impression created by the bank workers and the myth surrounding the time they close for work. However, this study made use of a special category of academics, the open and distance learning faculty members of which job specifications and expectations are largely ICT- based. This is in recognition of the fact that the global arena is currently an e-based arena where Information and Communication Technology is chiefly employed in almost all spheres of life and education sector is not exclusive of this. This, therefore, confirms the fact that educators have adopted ICT as an effective teaching tool if they are to compete effectively and perform efficiently in the global age. The study also revealed no statistically significant differences on symptom and manifestations of technostress among the male and female respondents. In other words, technostress is not gender specific. This finding is in tandem with Raja, Azlina and Siti's [16] study on technostress wherein no significant difference among male and female respondents on technostress exists, because the global challenges are triggering competition and gender role reversal. There is visible gender role reversal in all spheres of working life, thus more women now work in formal organisations than it was in the last century. This study also discovered that older respondents manifested higher levels of technostress than the younger

ones. Specifically, it was observed that those aged 60 - 69 years and above presented highest symptoms of technostress than others. This group was closely followed by those aged 40-49 years and 50-59 years respectively. The One-Way ANOVA results indicate that the observed differences were statistically significant at P. = <.05, df = 4/196, obtained f value = 4.492; 5.231, critical f = 3.03. It is not an anomaly to assume that the low scores obtained by the younger respondents is an indication of acceptance and comfortability with the ICT. Those in this age range could be described as digital natives. This is aptly captured in Marc Prensky digital migrant and digital native dichotomy (Raja, Azlina and Siti's [16]. 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 as an individual who was born before the existence of digital technology and adopted it lo some extent later in life. It is however not surprising that older respondent manifesting more technostress than the younger could be as a result of the pressure to adjust and change to the new information communication technology. 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.

5.0 *Conclusion*

The contemporary world is a very stressful one with new different series of 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 programmes to decrease employees' stress levels and to enhance their sense of technological mastery and personal value. As an antidote to counter the problems that could emanate from technostress and other stress-induced activities in society, the following could be helpful for the individuals and institutions in general.

Implications 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, headache and backache. In addition, individuals should desist from drinking too much alcohol or caffeine. Instead of helping, these stimulants increase the stress level. They should eat regular rneals 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.

Implications for Institutions

The findings of the study have implications on Distance Learning (DL). Generally, policy measures in DL should strive to sustain an ever-present system of training using effective technologies. DL institutions should strive to adopt user friendly hardware and software with provision for adequate training for the staff. This adduced implication is in tandem with the implication of the result of the study that indicates that DL practitioners manifested higher level of technostress than those in the banking sector. Truly, the two sectors under study rely heavily on ICT for their work schedule and output. It appears that banking sectors are more active in training and exposing their staff to new and effective technologies than those in the education sector. Thus, there is the need for DL institutions and DL administrators to provide improved and adequate ICT facilities for their workforce. This observation stresses the need for adequate training for the staff. In addition to this, DL institutions and administrators should create a better communication channel within the work environment as well as encourage improved level of reassurance, patience and stability within the institution. This is because the practice and expectations of DL work requires full concentration and borderless time which can be tasking on individuals emotionally and physiologically. Also, results of this study have a lot of implications for DL in West Africa. To be able to compete globally, African countries need to bridge the digital divide in learning and development and DL is a viable tool in this area. Thus, concerted effort should be made in providing DL practitioners in the sub-region with up-to-date technology to be able to provide best practices in education.

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