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INFLUENCE OF HUMAN-COMPUTER INTERACTION AND TECHNOLOGY-INDUCED STRESS ON UNDERGRADUATES' ACADEMIC PERFORMANCE IN OGUN STATE

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ABSTRACT

The study examined the influence of human-computer interaction (HCI) on technology generated stress among undergraduates' academic performance in Ogun state. Four research questions were answered. A descriptive survey research design was adopted. The population of this study comprised undergraduates of Tai Solarin Federal University of Education (TASFUED). 150 undergraduates were selected using stratified sampling technique. Researchers-designed instrument tagged Human-Computer Interaction, Technology Generated Stress and Academic Performance Questionnaire (HCITGSAPQ) was used for data collection with 0.85 as reliability coefficient. Frequency counts and percentages were used for presenting demographic characteristics of the respondents. Descriptive statistics of mean and standard deviation were used for answering research questions. The findings of the study revealed that there was low level of human-computer interaction (HCI) generated stress among undergraduates. There was influence of human-computer interaction (HCI) on technology generated stress. Sourcing for contemporary information for my studies, widen academic horizon, think beyond scope of taught in classroom, facilitated knowledge in academic discipline and encourages to seeks further information on new emerging and issues were among the influence of human-computer interaction (HCI) on undergraduates' academic performance. Interface, users cognitive and physical abilities, context in which technology is used, undergraduates' cultural factors and excessive usage were among the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates. The study recommended that stakeholders need to come up with policies guiding students' interaction with technology for learning purposes to avert negative consequences on their mental well-being. The management of TASUED should provide more

conducive learning environment, adequate IT infrastructural facilities, computer literacy should be encouraged to help lower stress and reduce stress in an IT environment.

Keywords: Human-Computer Interaction (HCI), Technology, Undergraduate, Academic Performance

Introduction

The role played by technology in education development cannot be over-emphasized. No meaningful educational development can take place nowadays without prominent role of technology. More reason every nation is clamoring for infusion of technology into education through teaching and learning. That is, there is the need for human-computer interaction (HCI) for educational goals achievement. Human-Computer Interaction (HCI) is the study of usability, that is the study of the user's experience with the computer (Damiete & Melanie, 2019). With the introduction of the internet, in today's economy and learning, the world has become a global village; where information sharing can move around the world at little or no cost. With the help of a better understanding of humans and how they interact with computers, developers have been able to find a centre to strike a balance in producing what they perceive the computer users need to make their computer interaction easier. Hewett (2022) defined Human-Computer Interaction (HCI) as a discipline concerned with the design, implementation, and evaluation of an interactive computing system for human use and for studying the major phenomena surrounding them. Also, HCI can be defined as an experience an individual acquires when that individual comes in contact with a computer system. It is an independent discipline which strives to improve the quality of interaction humans have with computers. As the computer has become a critical part of our everyday society, it is, therefore, important to ensure that users have an excellent experience.

So many principles have been created to guide computer developers in producing user-friendly systems; HCI has had an opportunity to play a role in providing and influencing user's experience – irrespective of the operating environments. With the development of technology within the last three decades, there seems to be a demarcation, between those individuals who were born into a more stable technological environment and those who had to adapt to technological changes. Putting this in perspective, there seems to be a disparity between younger and older computer systems users in terms of how they perceive or use technology. In higher educational learning, for example, there is a blend of people; people of different ages, from different ethnicity, academic or academic orientation. This mixture in higher educational institution gives rise to the curiosity of how people perceive and interact with these systems in a learning situation (Damiete & Melanie, 2019).

Ishola et al. (2022) opined that there is possibility of human-computer interaction (HCI) causing stress among students. They

further stated that technology breakdowns, slowdowns and electronic performance monitoring can cause stress. Furthermore, HCI tries to understand students' experiences, and resultant effects based on interaction with technology. As technology integration in education keeps rising, the need arises to examine the side effects of constant, and prolonged use of technology by students because there has been concern about how human-computer interaction, especially on devices with screens or other forms of user interfaces, influences techno-stress (technology-influenced stress) among undergraduates. HCI as a discipline, involves the designing, evaluating and implementing of computing systems designed to be interactive for humans use. It is also concerned with the study of the major phenomena surrounding the interaction. It is also a study of how human users utilize computers to carry out their daily operations in such a way that the interactions are effective and enjoyed. HCI is made up of three parts - user, computer, and interaction (Baral & Sharma, 2019). The field of HCI is often referred to as being the intersection between computer science, behavioural science, design, and other fields of study. HCI is a multidisciplinary field drawing on fields such as computer science, cognitive science, psychology, and organisational and social sciences to understand how humans experience and utilize interactive technologies (Lopes, 2016).

The aim of the field of HCI, among others, is to improve the interaction between users and their devices by ensuring that the mechanisms of computer interaction adapt to human users and the tasks, instead of the other way around (Ishola et al., 2022). Many technologies require that users interact with them. HCI has also been viewed as the combination of two powerful information processors, human and computer, both attempting to interact via a narrow-bandwidth, and highly constrained interface (Thuseethan & Kuhanesan, 2015). HCI entails the relationship between humans and computers, and their mutual understanding. The initial step to HCI is having the ability to appropriately respond to, and sense users' affective responses; detect and interpret their affective states as shown by users. There is no doubt that interactive technologies have extensively penetrated the field of education. This is because technologies now play significant roles in education via the utilization of e-learning environments and other different forms of computer-based academic support devices in almost all the spheres of instructional processes. The application of technologies in the field of education is leading the field towards an era of electronic academic supportive devices, and the extensive use of digital devices such as tablet pcs, notebooks, and smartphones, among others (Thuseethan & Kuhanesan, 2015). The gains also include the fact that technologies can create active learning for learners, improve students' thinking power, improve language competencies, and improve their skills, among other gains. Also, technologies in education offer attractive, interactive, interesting, personalised, and more realistic teaching and learning facilities to academia. In addition, technologies in and outside of classrooms assist in enhancing the teaching and learning environments for not

just undergraduates, but also their teachers and the school community as a whole. They also help to increase students' motivation toward learning, their overall learning outcomes and may lead to stress (Ishola et al., 2022).

Stress is a psychological perception that has negative effect on individual's health, comfort and career routine (Casey, 2023). Techno-stress is psychosomatic illness caused by working with computer technology on a daily basis due to too much interaction with technology. It has negative psychological link between people and the introduction of new technologies (Lalitha et al., 2022). Wang (2023) postulated that technology stress is equally technophobia, computer phobia, computer anxiety, computer stress and negative computer attitude. Wang (2023) and Casey (2023) opined that technology stress affects individual with over discovery of computer technology and who rely on it and those who under discover it and are struggling to know more of it. This implies that individual might feel knowing more of computer technology is better than not knowing anything about discovery of Computer technology which in turn can lead to stress. Monideepa, et al., 2022) posited technology stress as the stress that individuals experience due to their use of Information System. However, related studies have been conducted in the area of Human-Computer Interaction and Technology-Induced Stress as Predictors of Undergraduates' Academic Performance, few used empirical-based evidence while some use content analysis. Even, fewer studies have been conducted in Ogun state with reference to TASFUED. This is the major gap the study sought to fill.

Statement of the Problem

Although the use of technology has become an overall standard, there is a mixed approach for Nigerian institutions for higher education. Many universities did not have specific policies for the implementation and management of technology-human interaction. The investments in digital technologies indicate that educational institutions will favour the integration of new technology in the future. Today, such integration of digital technologies can already be witnessed, and the use of Information and Communication Technologies (ICTs) is not always optional for students. The use of platforms and systems are usually mandatory, including platforms for information, submission of assignments and acquisition of documents, as well as systems for schedules and booking of lecture halls or other rooms on campus. Lecturers often also expect contact through email, further highlighting the trend towards the use of digital technologies. Undergraduates are also expected to possess some degree of competence in application technologies such as word processing and presentation software. There are expectations and assumptions that undergraduates are able to use digital technologies with ease and that there is an absence of technostress within their demographic. However, undergraduates are most often composed of people from various backgrounds with a wide range of 'digital competence', learning abilities, interests and inclinations. While some undergraduates might be 'digital natives'

others might merely be familiar with the basics. Thus, this study sought to examine the influence of human-computer interaction (HCI) on technology generated stress among undergraduates' academic performance in Ogun state.

Objectives of the Study

The main objective of the study was to examine the Human-Computer Interaction and Technology-Induced Stress as Predictors of Undergraduates' Academic Performance in Ogun State. Specifically, the study sought to:

1. identify level of undergraduate stress generates from human-computer interaction (HCI);
2. find out the influence of human-computer interaction (HCI) on technology generated stress;
3. ascertain the influence of human-computer interaction (HCI) on undergraduates' academic performance;
4. determine the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates.

Research Questions

The following research questions guided this study:

1. To what level human-computer interaction (HCI) generates stress among undergraduates?
2. Is there any influence of human-computer interaction (HCI) on technology generated stress?
3. What is the influence of human-computer interaction (HCI) on undergraduates' academic performance?
4. What are the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates?

Literature Review

Theoretical Review

Techno-stress Theory

Information and Communication Technologies (ICTs) have become more and more ingrained into personal and work life in modern society. It has resulted in stress stemming from being constantly connected (or the feeling there of) and available. In 1984 clinical psychologist Craig Brod coined the term 'Technostress Theory' to refer to "the inability to cope or deal with ICTs in a healthy manner." The phenomenon, for example, more positive attitudes towards ICT use in older people tend to be correlated to higher self-efficacy and higher education, while negative attitudes tend to be related to lower self-efficacy and lower education with this intersectional reasoning in mind. Therefore, constructing "interdependent systems" of advantages and disadvantages.

Within stress theory, stress is said to be induced by stressors, and similarly, technostress is induced by so-called techno-stressors. Brod (1984) operationalised technostress into five techno-stressors from an organisational context. These are techno-overload, technoinvasion, techno-complexity, techno-insecurity and techno-uncertainty. As this study concerns an educational context rather than an organisational one, only the three techno-

stressors that were deemed relevant will be described further. Techno-overload pertains to situations where the stress from ICTs results in longer work hours at a faster pace. Techno-invasion refers to situations in which workers have access to one another and are expected to be reached anytime, meaning constant connectivity that can create an ambiguous line between the work and personal spheres. Techno-complexity pertains to situations where an individual perceives ICTs to be too complex to use and that their skills are inadequate and thus feel the need to spend time learning about different aspects to the ICTs.

Empirical Review

Ishola et al. (2022) examined human-computer interaction and techno-stress among undergraduates. The descriptive survey of the non-experimental design was adopted, and the sample comprised 313 final-year undergraduates. Findings showed that undergraduates have positive perceptions of technology-influenced stress, and based on gender and age, no significant difference exists in their perceptions. However, the study related to the current study and the major different was that it was unable to ascertain the influence of human-computer interaction (HCI) on undergraduates' academic performance. Osisanwo and Ehioghae (2022) investigated computer anxiety as a correlate of use of Information Technology (IT) tools by undergraduates of Library and Information Science (LIS) in Tai Solarin University of Education (TASUED), Ijagun, Ogun State. Descriptive survey design was adopted while Stratified Random Sampling Technique was used to select 169 undergraduates of LIS. Findings show that the level of computer anxiety among LIS undergraduates is high. The available IT tools among LIS undergraduates are mobile technology, laptops, CD-ROM, printers and internet search engines. This study also related to this study, but the different was that it was conducted in Library and Information Sciences, but the current study was done in Educational Technology.

Fitzgerald (2021) explored how technology characteristics influence students' technostress, and in turn their perceived academic performance. The study failed to talk about technology infused stress. Oladosu et al. (2020) examined learning with smart devices: influence of technostress on undergraduate students' learning at university of Ilorin, Nigeria. The study was conducted outside Ogun state even outside Southwest. Adenekan (2024) examined effect of techno stress among academic librarians in Nigeria Universities. The study is survey research anchored on positivism paradigm. The questionnaire was used as data collection instrument. Furthermore, total enumeration method was used since the population comprised of 50 academic librarians in three selected Universities in South- West Nigeria. The data was analysed using SPSS version 21. The finding revealed that the respondents experienced cognitive, affective and behavioural forms of techno stress, which had negative effect on their personal and professional development. This study only focuses on library and information science without considering the tenet of Educational Technology. Wang et al. (2021) examined the rends of human–computer

interaction studies in construction hazard recognition: A bibliometric review using bibliometric methods, systematically identified the research progress, key topics, and future research directions in this field, and proposed a research framework for human–computer interaction in construction hazard recognition (CHR-HCI). The results showed that, in the past 20 years, the application of human–computer interaction not only made significant contributions to the development of hazard recognition, but also generated a series of new research subjects, such as multimodal physiological data analysis in hazard recognition experiments, development of intuitive devices and sensors, and the human–computer interaction safety management platform based on big data. This study only used content analysis which not in support to empirical-based research.

Methodology

A descriptive survey research design was adopted for the study. The design is appropriate because it assisted the researchers to establish and collect needed data from the target audience towards answering research questions of the study. The population of this study comprised undergraduates of Tai Solarin Federal University of Education (TASFUED). 150 undergraduates of Tai Solarin Federal University of Education (TASFUED) which cut across College of Specialised and Professional Education (COSPED) were selected as sample size of the study. Stratified sampling technique was adopted in selecting sample size. Researchers-designed instrument tagged Human-Computer Interaction, Technology Generated Stress and Academic Performance Questionnaire (HCITGSAPQ) was used for this study. HCITGSAPQ was used for the collection of data from undergraduates on the level of undergraduate stress generated from human-computer interaction (HCI), influence of human-computer interaction (HCI) on technology generated stress, influence of human-computer interaction (HCI) on undergraduates' academic performance and the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates. The questionnaire requested responses on a four (4) – point scale format which is a modification of 5-point Likert scale. To ensure the face and content validity of the instrument (HCITGSAPQ), copies of the instrument were given to an expert in the Department of Educational Technology, Tai Solarin Federal University of Education (TASFUED) for contents and construct validation.

Reliability test of the instrument (HCITGSAPQ) was done using a test-retest method. In this case, copies of the instrument (HCITGSAPQ) were administered twice on ten (10) 400 level undergraduates in the Faculty of Education, Olabisi Onabanjo University, Ago-Iwoye, that were not part of the sample size within a week interval. The collected data from the dual administration of the instruments were compared using Pearson Product Moment Correlation (PPMC) and this yielded 0.85 as reliability coefficient. Primary method of data collection was adopted in this study. The researcher employed 3 trained research assistants in the process of questionnaire

administration. Descriptive statistics of mean and standard deviation were used for answering research questions.

Presentation of Results

Research Question 1: To what level human-computer interaction (HCI) generated stress among undergraduates?

Table 1: Descriptive statistics on the level human-computer interaction (HCI) generated stress among undergraduates

Items	Mean	SD
I don't feel any stress while on computer screen if what I am doing is academically related.	2.55	.899
I feel stressed if staying for hours using laptop or other bigger computer screens.	2.76	.905
Restlessness begins to set in for me whenever my interaction with computer screen is getting longer.	2.58	.967
Staying long on the computer screen makes me feel stressed and exhausted.	2.88	.993
I feel stressed if using computer screens for longer period of time.	2.92	.906
Cluster Mean	2.74	

Source: Field Survey, 2025

Table 1 indicated that cluster mean was 2.74 and the bench mark mean is 2.50. Since, 2.74 > 2.50; this implied that there was low level of human-computer interaction (HCI) generated stress among undergraduates.

Research Question 2: Is there any influence of human-computer interaction (HCI) on technology generated stress?

Table 2: Descriptive statistics on the influence of human-computer interaction (HCI) on technology generated stress

Items	Mean	SD
I feel tensed whenever I am working on a computer.	3.03	.811
I feel anxious whenever I am using computer.	3.14	.803
I would like to continue working with computers in the future.	3.05	.742
I experience stress whenever I sit in front of a computer connected to internet.	3.17	.799
I worry about making mistakes on the computer.	3.07	.783
Cluster Mean	3.09	

Source: Field Survey, 2025

Table 2 indicated that cluster mean was 3.09 and the bench mark mean value is 2.50. Since, 3.09 > 2.50; this implied that there was influence of human-computer interaction (HCI) on technology generated stress.

Research Question 3: What is the influence of human-computer interaction (HCI) on undergraduates' academic performance?

Table 3: Descriptive statistics on the influence of human-computer interaction (HCI) on undergraduates' academic performance

Items	Mean	SD
Computer helped me in sourcing for contemporary information for my studies.	3.29	.799
Computer helped to widen my academic horizon.	3.17	.773
Computer helped me to think beyond scope of what I was taught in classroom.	3.01	.792
Computer facilitated knowledge in my academic discipline.	2.89	.908

Computer always encourages me to seeks further information on new emerging and issues.	2.99	.865
Cluster Mean	3.07	

Source: Field Survey, 2025

Table 3 revealed that cluster mean was 3.07 and the bench mark mean value is 2.50. Since, 3.07 > 2.50; this implied that sourcing for contemporary information for my studies, widen academic horizon, think beyond scope of taught in classroom, facilitated knowledge in academic discipline and encourages to seeks further information on new emerging and issues were among the influence of human-computer interaction (HCI) on undergraduates' academic performance.

Research Question 4: What are the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates?

Table 4: Descriptive statistics on the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates

Items	Mean	SD
The design of the interface may generate stress among undergraduates	2.67	.867
The users cognitive and physical abilities may generate stress among undergraduates	2.84	.952
The context in which technology is used may generate stress among undergraduates	2.69	.899
Students' cultural factors may generate stress among undergraduates	2.81	.900
Excessive usage may generate stress among undergraduates	2.56	.968
Cluster Mean	2.71	

Source: Field Survey, 2025

Table 4 revealed that cluster mean was 2.71 and the bench mark mean value is 2.50. Since, 2.71 > 2.50; this implied that design of the interface, users cognitive and physical abilities, context in which technology is used, undergraduates' cultural factors and excessive usage were among the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates.

Discussions of Findings

The findings of the study indicated that there was low level of human-computer interaction (HCI) generated stress among undergraduates and also there was influence of human-computer interaction (HCI) on technology generated stress. Sourcing for contemporary information for my studies, widen academic horizon, think beyond scope of taught in classroom, facilitated knowledge in academic discipline and encourages to seeks further information on new emerging and issues were among the influence of human-computer interaction (HCI) on undergraduates' academic performance. Design of the interface, users cognitive and physical abilities, context in which technology is used, undergraduates' cultural factors and excessive usage were among the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates. These findings correlate with Ishola et al. (2022) who examined human-computer interaction and techno-stress among undergraduates and they found that undergraduates have positive perceptions of technology-influenced stress, and based on gender and age, no significant difference exists in their perceptions. Osisanwo and Ehioghae (2022) who undergraduates of Library and Information Science (LIS) in Tai

Solarin University of Education (TASUED), Ijagun, Ogun State and they revealed that the level of computer anxiety among LIS undergraduates is high. The available Information Technology (IT) tools among LIS undergraduates are mobile technology, laptops, CD-ROM, printers and internet search engines. The most frequency utilized IT tools among LIS undergraduate are mobile technology and laptops. The impact of computer anxiety on students' utilization of IT tools is high. The major constraints of computer anxiety towards the utilization of IT tools among LIS undergraduates are level of computer anxiety and lack of conducive environment.

Furthermore, the findings of the study were in agreement with Fitzgerald (2021) who explored how technology characteristics influence students' technostress, and in turn their perceived academic performance and findings revealed that technology characteristics were associated with technostress, while some were not. The students' technostress could, however, not be determined to have an association with their perceived academic performance. The study discusses possible contributing factors to the results. Oladosu et al. (2020) who examined learning with smart devices: influence of technostress on undergraduate students' learning at university of Ilorin, Nigeria and their findings indicated that undergraduate students use smart devices, they become techno-stressed, and this is negatively influencing their learning with the devices. Adenekan (2024) examined effect of techno stress among academic librarians in Nigeria and finding revealed that the respondents experienced cognitive, affective and behavioural forms of techno stress, which had negative effect on their personal and professional development. Wang et al. (2021) who examined the rends of human–computer interaction studies in construction hazard recognition and showed that, in the past 20 years, the application of human–computer interaction not only made significant contributions to the development of hazard recognition, but also generated a series of new research subjects, such as multimodal physiological data analysis in hazard recognition experiments, development of intuitive devices and sensors, and the human–computer interaction safety management platform based on big data. Walker (2022) results indicated a significant linear relationship between several predictors (laptop reliance, tablet reliance, desktop competence, wearable competence, and five interactions) and the dependent variable (Web 3.0 skills). The results may enable engineering managers to make more informed, strategic decisions regarding the types of technology to invest in to improve engineer skills and productivity. The results of this study have potential implications for positive social change by helping engineering organizations overcome the information technology productivity paradox to reap the benefits from engineers who are more motivated and skilled.

The findings of the study were in agreement with Ahmed et al. (2023) who examined the impact of HCI in learning and working processes of students and staff in some selected institution of Kebbi State and their findings showed that school portal was the most common information system (IS) in all

the institution, and these portals are not meant for e-learning but rather registration. Therefore, interaction between it and respondent has less impact on learning and administrative functionalities. Also, projector is discovered to be the second prevalent device respondents interact with during learning and working activities in all the (4) institutions. However, this work observed that all the institutions are aware of how importance HCI, and Computer Information System (CIS) is and, how better it simplifies work. Also, basic modern ICT tools, devices and CIS for institutions of learning were highlighted and recommended to be deployed for improving learning efficiency and productivity. The work also stresses the need to train both the staff and students on devices and systems usability.

Conclusion

This study examined the influence of human-computer interaction (HCI) on technology generated stress among undergraduates' academic performance in Ogun state, the following conclusions were drawn based on the findings of the study that:

1. There was low level of human-computer interaction (HCI) generated stress among undergraduates.
2. Also, there was influence of human-computer interaction (HCI) on technology generated stress.
3. Sourcing for contemporary information for my studies, widen academic horizon, think beyond scope of taught in classroom, facilitated knowledge in academic discipline and encourages to seeks further information on new emerging and issues were among the influence of human-computer interaction (HCI) on undergraduates' academic performance.
4. Design of the interface, users cognitive and physical abilities, context in which technology is used, undergraduates' cultural factors and excessive usage were among the factors that may be fueling human-computer interaction (HCI) on technology generated stress among undergraduates

Recommendations

The following recommendations were raised in line with the findings of the study:

1. Stakeholders need to come up with policies guiding students' interaction with technology for learning purposes to avert negative consequences on their mental well-being.
2. The management of TASFUED should provide more conducive learning environment, adequate Information Technology (IT) infrastructural facilities, computer literacy should be encouraged to help lower stress and reduce stress in an IT environment.
3. There is the need to rework how these devices can be better used to positively affect students' learning.
4. Constant health care monitoring and the need for adequate relaxation after the use of technological tools. The study joins in discussion for creating awareness on effect of techno stress among undergraduates.

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