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ABSTRACT

The objective of this study was to examine university students' technostress as it relates to their academic commitment in South Africa, in accordance with the technostress creators' model and the adapted organizational commitment model. Through an online survey, a closed-ended questionnaire was employed to collect data from a randomly selected sample of 199 first-year undergraduate students at a South African university of technology. The findings reveal that techno-complexity has a significantly direct negative relationship (-.74) with students' academic commitment. However, techno-uncertainty significantly positively (.42) impacts students' commitment. In addition, techno-invasion insignificantly positively impact (.11) on students' academic commitment. Interestingly, students' age negatively correlated with techno-complexity, with older students being less affected by the complexity of technology for learning. Surprisingly, time spend using information communication technologies is positively correlated with techno-uncertainty; thus, more time spent using information communication technologies is associated with more effect from techno-uncertainty. In addition, the findings revealed that gender differences significantly impacted on the differences in the levels of students' technostress, with techno-invasion being more highly perceived by male students. These findings may assist universities in implementing remote teaching and provide valuable insights for online and remote teaching for scholars. However, these findings have generalizability limitations as the study focused on one institution of higher education. Future longitudinal studies that include other universities are encouraged; such studies may determine technostress changes as the institutions migrate back to multimodal teaching and learning systems post-Covid 19.

KEYWORDS

techno-stressors, academic commitment, information and communication technologies, emergency remote teaching, university, South Africa

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1 INTRODUCTION

The pedagogical delivery methods in higher education (HE) have been transforming over time, driven by the associated socioeconomic and technological changes. Global HE has accepted the significance of transforming into spaces that afford students innovation and creativity [24, 31]. Thus, it has become imperative for HE institutions to keep up with changing environments to sustain their relevance. This study concentrates on the technologically driven challenges faced by first-year undergraduate university students brought about by the trajectory and changing South African HE spaces. Since the beginning of the year 2020, South Africa has been antagonized by the effects of the COVID-19 pandemic. As a measure to curtail the further spread of the virus, the South African government-imposed risk-adjusted lockdowns and related measures. The measures included the closure of HE physical spaces and the emergent adoption of remote academic activities (teaching, learning, research, and community engagements). Online teaching resultantly thrived globally [31], through the leverage of information and communication technologies (ICTs) for continuity in times of disruptions such as the COVID-19 pandemic [89].

Under normal circumstances, HE students would familiarize themselves with university systems and processes during orientation sessions and through face-to-face interaction with university lecturers, academic advisors, and peers over the course of the first few weeks of the first study period (semester). However, during the emergency remote teaching (ERT) period, due to the sudden closures of university campuses, first-year students were mostly left in the cold, with their gadgets and online applications such as the student portals, learning management systems, student emails, and WhatsApp groups being their self-regulated sources of information. The move resulted in a sudden change in students' academic lives, and some were affected psychologically due to increased pressure, anxiety, and uncertainty, among other things [7]. [29] reported that students struggled with technology and related stress. [16] emphasized that students registered in online courses reveal significantly higher levels of technology-related irritation, anxiety, and vulnerability. As [40] mentioned, the online shift thus demanded a completely new pedagogy in academia, characterized by a high possibility for an increase in occupational stress and associated illness, thus the result of readjustment during COVID-19. There is a plethora of scholarly suggestions that social seclusion can induce stress-related emotions and diminish welfare [12, 39, 64]. It is unarguably true that online learning environments afford students many benefits, including self-paced learning and flexibility [58].

inexperienced (i.e., first-year undergraduate) students may possess

diminished self-confidence and experience undesirable feelings [1]. Considering the above, ERT was characterized by the fast-paced advancement and absorption of ICTs in education spaces with a vision for seamlessness in academic activities. Consequently, potential negative consequences were imminent, possibly affecting both lecturers' and students' wellbeing [33, 80], as ERT differs from online teaching, which is planned [44]. As argued by [45], unforeseen events such as COVID-19 may result in varied behavioral adaptations. Despite the potential benefits brought about by ICTs, they have a strong connection with high stress levels among users [36]. The increased use of ICTs has changed learning dynamics and inculcated a perpetual urgency by fostering expectations about students being available all day and delivering efficiently [10]. The volume of educational information increased, and the expectation was that students would interact and engage with the information faster and complete given tasks. The assumption that an online presence for the execution of tasks is possible at anytime and anywhere creates the expectation that students can perform tasks conveniently regardless of place and time. This leads to adverse effects, such as increased student stress [65]. Symptoms such as anxiety, physical diseases, behavioral strain, technophobia, mental fatigue, memory disturbances, poor concentration, irritability, feelings of exhaustion, and insomnia [9] have been synonymized with technostress in literature.

The sudden transition to remote teaching triggered fears concerning readiness and the success of online education [8, 26, 47]. Therefore, this study advances some possible contributions to the literature on online education and students' technology driven stress. First, the study introduces the concepts of stress in online learning based on the technostress creators' model by focusing on techno-overload which denotes ICTs' probability to force users to execute duties efficiently, work for long hours or alter their work habits, techno-uncertainty which pertains to technological innovations bringing about unpredictability, techno-insecurity where individuals' insecurities are threatened by knowledgeable others, techno-invasion which pertains to ICTs' ability to take over users' own private life and results in the boundaries between work life and private life being greatly distorted, and techno-complexity where ICTs' characteristics and complexity lead users to feeling insufficiently skilled. Despite recent studies having concentrated on the challenges of online teaching and learning, online learning behavior [18, 92], the researcher found few to no studies focusing on the stress that technology imposes on students, especially in the context of a developing economy. In addition, consideration is given to the effects of technostress on students' academic commitment during ERT. Therefore, the study seeks to answer the following question: What are the effects of techno-stressors on South African higher education students' academic commitment?

1.1 African HE Trajectory

1.1.1 Internationalisation of programmes. African higher education has witnessed an expanding inclination toward academic and student exchange programs in response to the phenomenon of globalization and internationalization. Accordingly, the globalization process continues to shape higher education policy discourses using ICTs. Consequently, several African countries presented ICT policies and strategies to improve higher education delivery. Liberalization and deregulation of the digital sector enabled numerous African countries to simultaneously embrace an improvement in the superiority of ICT infrastructure [91]. Responsively, African higher institutions have increasingly been tapping and leveraging ICTs in a bid to internationalize their study programmes and offerings to remain competitive. These developments are also driven by the commercialization of the African HE sectors [50, 75]. In such situations, the ICT enabled teaching and learning offers the benefits of borderless and wide access to students from different parts of the African continent and the world at large.

1.1.2 Massification in higher education. In addition to the efforts to integrate digital tools into the provision of higher education, there is an ever-increasing demand for access to higher education in Africa [90]. Masses of students are now being enrolled in academic institutions that were historically designed to accommodate a few. However, with such increased enrollments, ICT infrastructure and related resources are unmatched and lead to student stress. Massification in a South African higher education environment characterized by financial problems, ICT resource constraints, and other resource constraints gives rise to stress and frustration, which in turn create new challenges such as high student dropout rates, low throughput, and student protests, especially by students from poor backgrounds. For example, [55] reported that, "on average, 70% of the families of the higher education dropouts surveyed were in the category 'low economic status. [25] reported that conflicts among university students were fueled by the differences in their socio-economic backgrounds. Despite the existence of these challenges, there is evidence of students' commitment to academia in South Africa. Such commitment is seen as students' protests with the aim of accessing academic programmes. For example, the "fees must fall" movement aimed to provide access to higher education for all.

1.1.3 Unequal access to resources. Some of the challenges in higher education are historically shaped, while others are derived from recent developments such as deepening socio-economic hardships and pandemics. From a historical point of view, access to quality education (i.e., ICT education) by African nationals was deliberately limited by colonial authorities. As such, throughout the African continent, the number of key university enrollments was kept low, resulting in small academic systems at the time of independence. In addition to limited enrollments, the curricula in African universities were limited at the time of independence. Despite African countries having attained independence, the effects of colonial limitations such as unequal access to ICT material resources, power relations, and structural racism are still evident in the higher education system [54]. The effects of the colonial past remain significant as discussions are made about the challenges faced by African

higher education today that lead to stress among higher education students. For example, differentiation in the allocation of ICT resources across universities based on unequal government spending during the apartheid era [28], and the subtle exclusion of black students in historically privileged institutions [88].

1.1.4 The COVID-19 pandemic. In addition to problems of access to quality higher education, the COVID-19 pandemic and its demands for distancing, which caught many South African HE institutions off-guard, resulted in the uncovering of the level of institutional and student under-preparedness for online teaching and learning. Most South African higher education institutions that have been lagging in the integration of ICTs for programme offerings were pushed to emergently lean on ICTs for survival during the COVID-19 pandemic. Universities in Africa operate in an environment that has the lowest internet penetration rate in the world [46], resulting in most university undergraduate rural and township students possessing little, if any, knowledge, skills, and resources essential for participating in digital pedagogies in an emergently shifted teaching and learning space. Consequently, the COVID-19 pandemic and the need for involuntary social distancing pushed students to emergently upskill and acquaint themselves with online learning platforms to guarantee the continuity of their academic journey, potentially adding on to the students' stresses and negatively impacting their academic commitment.

1.2 Context of the study

The dynamics of South African HE institutions are shaped by socioeconomic and historical contexts. Just like most universities in South Africa, the university studied draws its students from urban areas, rural areas, and townships, and there exist inequalities and imbalances pertaining to resource access, including ICTs for ERT. South African learning environments have been historically shaped by apartheid policies [89]. As such, rural and township black students are mostly affected by a lack of access to ICTs and related technological devices, a lack of ICT knowledge, and a lack of skills due to the unavailability of ICT offerings in such schools. According to Statistics South Africa, about "42.9 % of rural schools had access to the internet in 2017" [77, 120). The learning environment in which the study university is situated is described as one of the most unequal societies in the world [78], and the vast majority of poor black South Africans cannot afford to buy data for connectivity [14, 66], all of which are essential for online learning.

The learning environment is characterized by the failure of e-Education policies, as demonstrated in separate studies by [67, 68, 87], and the rapid increase in rural and township students' access to HE [6], driven by current massification in HE. In addition, issues of poverty, unaffordability of devices and data, network problems, and the unavailability of related technologies for self-development exacerbated the challenges during the COVID-19 pandemic [27]. The Education White Paper 3, of 1997, conceded that South African institutions of higher learning are challenged 'to redress past inequalities and to transform the HE system to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities' [23] that advance inclusive initiatives for HE accessibility by diverse groups of students [22]. In the Department of Basic Education Action Plan to 2019 report, the Department of Basic Education ('Department of Education') accepted that technology-supported education has not progressed as envisioned in South Africa.

The study university draws most students from previously marginalized communities, mostly affected by the problems discussed above. Regardless of this background, students at the university studied were expected to acclimate themselves quickly to ICTs before learning to participate and engage in the academic activities during the ERT. This situation might have imposed pressure on students, especially first-year undergraduate students from rural and township backgrounds who needed to adapt to the changing learning environment driven by ICTs, potentially leading to technostress. The preceding sections discussed the context in which the study was undertaken, the following section discusses the problem statement.

1.3 Problem statement

The failure of e-Education policies and the emergent and demanding nature of remote teaching in an environment already characterized by socio-economic challenges might have led to further deterioration of study conditions. In a developing country already characterized by high university dropout rates [55], a sudden increase in study demands for students could potentially worsen the situation. Indeed, as [3] argues, stress is triggered by an action or a demand, in this instance, a sudden shift to unfamiliar online learning environments. Against this backdrop, this study argues that students with inadequate ICT knowledge and skills responsive to contemporary realities and opportunities in HE might have been haunted by technostress and deserve attention. Therefore, the study focuses on technostress and its effects on academic commitment by first-year students at a South African university during the COVID-19 period. Despite various South African institutions going back to a more balanced course design, such as blended learning, results from such an emergency remote teaching periods are helpful for future higher education directions. South Africa is prone to various emergencies, for example, the recent floods and the 2021 political unrest, which are all detrimental to the normal face-to-face teaching and learning processes. The following sections offer a discussion of the literature review.

2 CONCEPTUAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 Technostress

Technostress is a phrase coined to describe stress emanating from the continuous use of ICTs [72]. In the context of this study, students are demanded by the universities to migrate from face-to-face lectures to a fully online presence due to the demands of the COVID-19. Given the multitude of problems in ICT integration in the South African education system, including the failure of ICT in education policies and the unavailability of ICT resources, a misfit between the demands of online presence (eLearning) and students' ICT skills and abilities can exist. In addition, the constant online presence and the need to respond to never-ending disruptive notifications on ICT gadgets can lead to fatigue, concentration problems, and disruption in daily routines [38]. For example, South African university students were expected to familiarize themselves with the new norm through eLearning policies and procedures, trainings, and workshops [37]. As argued by [69], the bombardment of students with such workshops and emails from academics and university management often leads to stress. In addition, the availability of too many technological resources to individuals who lack technological skills and knowledge causes a misfit between students' usability and their adopted technology [49]. Consequently, this study submits that misfits in a context of emergent adoption can influence students' technostress and, consequently, academic commitment.

Although a few studies exist on technostress in the global north [17], it is not well understood how technostress develops through students' use practices or how technostress can affect their academic commitment in the South African context. Literature on stress emanating from ICTs is still scarce [81], despite the red flags and concerns regarding the need for research documenting ICTrelated stresses [21, 61, 80]. While studies conducted in developed economies report evidence that characteristics of users (i.e., students) can influence aspects of ICT acceptance and use [20, 35, 43]. Studies demonstrate that stress is inversely correlated with vital work attitudes (for example, organizational commitment and job satisfaction) [30, 79], and positively correlated with anxiety, disorders, and burnout [34]. For example, a study by [85] in China found that technostress affected employees differently. Chinese employees were negatively affected by hastily advancing and progressively complex technologies. However, techno-overload had a positive effect on productivity, while techno-invasion and techno-insecurity negatively impacted productivity. [57] revealed that technostress negatively impacted the work performance of university teachers. A separate study on teachers in Palestine by [48] revealed that technostress had negative effects on both perceived usefulness and attitudes towards mobile technology use. As agreed by [43], there is a scarcity of studies specifically related to the effect of technostressors on students' academic commitment.

Based on the above discussion, a scenario of potentially increased technostress emanating from the nature of ERT and the increased demands for the use of ICTs in an environment characterized by a lack of ICT resources might have led to South African students' low academic commitment and therefore deserves attention. Despite increased interest by scholars in the comprehension of the negative effects of stress caused by digital technologies, there is a dearth of studies on the existence of technostress and its effects on university students' academic commitment in the African context. This study extends knowledge on technostress to a different context characterized by a lack of ICT resources and skills. Accordingly, it became of vital importance to investigate the phenomenon of technostress among first year South African university students during the ERT. Understanding the phenomenon affords opportunities to comprehend its characteristics and, therefore, to recommend potential strategies that curb its further devastating effects on the African university student populace. In addition, it becomes of vital importance to understand students' needs should another pandemic or disaster occur or an extended ERT occur [66]. As supported by [74], comprehension of evidence supported by practices for teaching and learning becomes more germane.

2.2 Academic commitment

Academic commitment can be related to as comprising affective commitment, continuance commitment, and normative commitment. Firstly, the affective commitment construct from [63]'s theory of organizational commitment can be contextualized to represent the extent to which students are attached to their academic programmes in which they are enrolled. As students remain in the academic programmes because of their strong beliefs in the university's goals and values, they are happy and willing to do anything (i.e., upgrade their ICT knowledge and skills) to progress with their academic activities during ERT periods. Secondly, the continuance commitment is measured by the extent of the students' beliefs about how much it will cost them if they leave the academic programmes that they are currently enrolled in. This can be contextualized to represent the aims of the students to stay put in their academic programmes due to the trouble of getting enrolled in other programmes that might not incorporate ICTs during the ERT. Continuance commitment is driven by the unavailability of alternative options if students leave their academic programmes. According to [63], constant commitments happen if an individual stays in a situation due to a lack of alternatives if they leave. Lastly, normative commitment becomes the degree to which students' commitment to continue studying in their enrolled programmes due to pressure from peers [63].

2.3 Technostress creators

Difficulties in adapting to technology and the demands arising from the expanded use of ICTs have been evident in organizations [83]. These lead to technostress and are referred to as technostress creators or techno-stressors [80]. Problems such as reduced productivity, organizational commitment, anxiety, and fatigue are reported as users struggle to use ICTs in their environments [82, 83]. Technostressors often pertain to information overload, leading to fatigue and a loss of information screening and mining for the students. Secondly, techno-stressors pertain to continued availability, where students can connect anytime and anywhere and are expected to instantly respond to their study demands. Among other stressors, poor network connectivity, data shortages, disturbances at home, and instructional jargon. [83] classified technostress creators into five categories; thus,

Techno-overload refers to ICTs' probability of forcing users to execute duties efficiently, work for long hours, or alter their work habits [83]. This could imply a greater student workload, where students study for longer hours, demand faster completion of assignments, and alter their study habits because of the integration of technology during ERT. Therefore, the study suggests:

Hypothesis 1: Techno-overload significantly influences students' academic commitment.

Techno-invasion pertains to ICTs' ability to take over users' private lives and results in the boundaries between work life and private life being greatly distorted. Students' family lives could be taken over, for upskilling on ICTs instead of going on holidays and vacations. Therefore, the study proposes:

Hypothesis 2: Techno-invasion significantly influences students' academic commitment.

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Figure 1: The proposed research model: adapted from Tarafdar et al. (2007).

Techno-complexity refers to circumstances where ICTs' characteristics and complexity lead users to feel insufficiently skilled. This may imply students' inability to understand or cope with the complexity of ICTs for learning. Techno-complexity pushes students to consider their ICT skills inadequate and pushes them to learn and comprehend various features [83]. Technological complexity brings with it various challenges, including a burden on students and lower academic performance. However, complexity generally comes with the integration of ICTs [32], and the unavailability of time to learn the technologies also puts students under unwarranted pressure [60]. Therefore, the study suggests:

Hypothesis 3: Techno-complexity significantly influences students' academic commitment.

Techno-insecurity is associated with potential students' academic insecurities being threatened by knowledgeable students. Techno-insecurity can push students to constantly upgrade their ICT skills and knowledge. Therefore, the study proposes:

Hypothesis 4: Techno-insecurity significantly influences students' academic commitment.

Techno-uncertainty, which pertains to technological innovations bringing about unpredictability and uncertainty [70]. It is linked to constant improvements and alterations in ICTs that unsettle users and drive them to upskill [82]. This can be contextualized to mean constant changes in ICTs for teaching and learning, thus threatening students' academic commitment, in line with [83], who reported that as students are compelled to constantly learn new features of the learning management systems, they become mentally unsettled. Therefore, the study suggests:

Hypothesis 5: Techno-uncertainty significantly influences students' academic commitment.

The section above discussed the technostress creators, which are mapped to the academic commitment constructs adapted from Meyer and Allen's commitment scale. As depicted in Figure 1 below, a combination of different techno-stressors has the potential to negatively affect students' commitment to academic studies. Guided by the model, the study seeks to determine the influence of technostress on students' overall academic commitment.

2.4 Demographic variables (age and gender) and technostress

In addition to the above-mapped constructs of techno-stressors and academic commitment, the study seeks to determine the differences in the effects of demographic variables such as gender and age on technostress. Diminished cognitive abilities associated with aging have been linked to increased technostress in studies [41, 42). [86]. A study in India also revealed that older students demonstrated higher technostress than their younger counterparts. Contrary to these findings, [72] had earlier found that age was inversely correlated to levels of technostress. Consequently, it becomes inconclusive on the relationship between age and technostress. In addition, gender differences and technostress have been reported in literature; for example, a recent report by [19] suggested that male students had lower levels of technostress in comparison to females. The findings by [19] are supported by [86], whose recent study on Indian students revealed that females demonstrated higher levels of technostress in comparison to males. However, an earlier study [72] demonstrated the opposite, in that female employees had lower levels of technostress in comparison to male employees. The issue of age and gender differences in relation to technostress level disparities becomes an issue of contention. Therefore, the study proposes:

H6: Gender differences impose significant differences in technostress among university students.

H7: Age differences impose significant differences in technostress among university students.

2.5 ICT skills and experience on technostress

Literature [72, 94] revealed that individuals who are ICT skilled and possess adequate experience in using ICT demonstrate low levels of technostress. This was reinforced by [86], who demonstrated in their study in India that students with less ICT experience demonstrated higher technostress levels. Therefore, the study suggested.

H8: ICT skill differences impose significant differences in technostress among university students. AfriCHI 2023, November 27-December 01, 2023, East London, South Africa

H9: ICT experience differences impose significant differences in technostress among university students.

3 MATERIALS AND METHODS

This quantitative study was conducted at a multidisciplinary university of technology in South Africa. ICTs are used for various academic activities in the university in the form of Moodle, MS Teams, an electronic library and an electronic students' portal for e-academic advising, e-assessments, e-tutorials, and virtual classes.

3.1 Operationalization of constructs

Technostress among students was measured on a five-point Likert scale, using the adapted scales from [83]. The technostress constructs included techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. In addition, academic commitment, adapted from the previous work of [63], was measured on a five-point Likert scale. However, the constructs were adapted and modified to fit into the academic context.

3.2 Data collection process

The research questionnaire was developed, piloted, validated, and converted into an online questionnaire for emailing to a randomly selected sample of 250 first-year undergraduate students from five faculties within the study university. After the ethics clearance was granted, the researcher requested and received a list of students' emails from different faculties. Links to the online survey questionnaire were sent to students through their emails and the students' portal. Data collection started in January 2022 and ended in April 2022, when COVID-19 regulations were still in effect and most South African institutions of higher education were still delivering academic activities mainly through online platforms. A total of 202 responses were received after the third follow-up. From the original 202 electronic responses, 3 incomplete responses were dropped, leaving 199 complete responses for analysis. Of the completed responses, 48.7% were from male students and 51.3% were from female students. Most of the students (92.7%) had less than 8 years' experience using ICT in a formal learning environment. In addition, 91.7% indicated that they spend more than 4 hours online daily, executing the demands of their studies. However, 79.6% of the respondents indicated that their ICT skills were (not at all aligned not aligned) to the skills needed for conducting online academic activities, as shown in Table 1 below.

4 DATA ANALYSIS

Stress has been documented as a significant determinant of human behavior in organizations [15, 72, 83]. This is especially significant in the context of institutional change, for example, changes brought about by the need to respond to the COVID-19 pandemic in academia. Through the technostress creators' model and the adapted organizational commitment model, the study aimed at examining the effects of technostress on students' academic commitment.

Factor analysis with Promax rotation was applied to the 19 technostress items. Three factors were extracted, which account for 59.67% of the variance in the data. A Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of 0.913 and a significant Bartlett's test indicate that the data was adequate for successful and reliable extraction. Rotation converged in six iterations. During the process, Item 3.19 (I must constantly update my technology skills to avoid poor grades) was dropped because it did not load strongly enough onto any factor. Thereafter, items 3.1(I am forced by this technology to spend more time on my studies than I can handle), 3.2 (I am forced by this technology to study with very tight time schedules), 3.4 (I am forced to change my study habits to adapt to new technologies), and 3.8 (I feel my personal life is being invaded by this technology) were dropped, one at a time, as they cross-loaded onto more than one factor. As a result, three technostress factors emerged as valid from the survey data, namely techno-complexity, techno-invasion, and techno-uncertainty as demonstrated by the factor loadings in Table 2 below.

4.1 Confirmatory Factor Analysis (CFA) (techno-stressors)

The proposed measurement model was then analyzed using CFA (a component of SEM). The table below provides a summary of item loadings as well as reliability and validity statistics. In addition, in Table 3, there are some model fit statistics that show that the measurement model is an adequate fit.

Academic commitment as a latent variable with measured variables could not be added. This was due to the limitation on attainment of convergent validity. Resultantly, in place of using a latent variable, a measured variable for academic commitment construct was formed by calculating the average of items that are included in the construct as per the factor analysis. A composite variable using these four items was used for commitment in the model. This has a reliability value for Cronbach's alpha of 0.683 which is acceptable. The results from the SEM showing the causal paths between the techno-stressors and commitment results are depicted in Table 4 below.

These results show that techno-complexity is a significant predictor of lack of academic commitment by first year students (negative beta value, p<.001), therefore H3 was supported. In addition, techno-uncertainty is a significant predictor of first-year students' academic commitment (positive beta, p<.001) resulting in H5 being supported. However, techno-invasion insignificantly positively effect on students' academic commitment, therefore H2 was not supported. Finally, H1 and H4 were not supported as these constructs did not emerge as valid from the survey data. This is represented in the model in Figure 2 below.

5 DISCUSSION AND CONCLUSION

The rapid development and adoption of technologies has drastically shifted the information sharing methods in different contexts including the higher education [11, 37). The digital technological revolution has been catalyzed by the COVID-19 pandemic, amid the 4th industrial revolution further shifting the higher education trajectory. The research aimed at applying the technostress creators' model and the adapted organizational commitment model to assess the effects of stress emanating from the use of information technology on academic commitment by a group of South African university students. The study was motivated based on the sudden increase in the use of technologies to process information in higher

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Characteristics	Valid Percentage (100%)
Gender: Male	48.7
Female	51.3
Age: 17-22	28.8
19-20	43.5
21-22	20.4
23-25	6.3
More than 25 years	1.0
Average daily online presence: 0-<2 hours	0.5
2-<4 hours	7.9
4-<6 hours	28.8
6-<8 hours	48.2
8-10 hours	12.6
More than 10 hours	2.1
Respondent's faculty: Arts and design	21.5
Management sciences	24.6
Accounting and informatics	18.8
Applied sciences	16.2
Health sciences	8.9
Engineering and built environment	9.9
Experience in ICT use: <3 years	51.3
3 - <8 years	41.4
8 - <12 years	6.3
12 - 15 years	1.0

Table 1: Respondents' demographics

Alignment between your ICT skills and the skills needed for online academic activities:

Not at all aligned	14.7
2	37.7
3	27.2
4	16.2
Very well aligned	4.2



Figure 2: The refined model

Table 2: Factor loadings

	Factor		
Cronbach's Alpha	Techno- complexity (.909)	Techno- invasion (.812)	Techno- uncertainty(.853)
3.14 I find new technologies too complex for me to understand and use.	.851		
3.17 I feel a constant threat to my pass grades due to new technologies	.827		
3.16 I do not know enough about this technology to handle my academic studies satisfactorily.	.798		
3.13 I take a long time to understand and use new technologies	.710		
3.10 There are constant changes in the computer software used for my academic activities	.660		
3.18 I am threatened by classmates with newer technology skills	.637		
3.15 I find my peers know more about computer technology than I do.	.627		
3.9 There are always new developments in the technologies we use in our university	.625		
3.3 I am forced by this technology to study much faster.	.504		
3.7 I must sacrifice my vacation and weekend time to keep current on new technologies		.895	
3.6 I spend less time with my family due to this technology.		.734	
3.5 I must be in touch with my studies even during my vacation due to this technology		.539	
3.12 There are frequent upgrades in computer networks in our university.			.892
3.11 There are constant changes in computer hardware in our university			.761

Table 3: Techno-stressors CFA

CONSTRUCT	Measured	l variables	Loadings
Techno-complexity (TS	1)3.3	I am forced by this technology to study much faster.	0.665
	3.9	There are always new developments in the technologies we use in our university	0.716
	3.10	There are constant changes in computer software used for my academic activities	0.741
	3.13	I take a long time to understand and use new technologies	0.797
	3.14	I find new technologies too complex for me to understand and use.	0.814
	3.15	I find my peers know more about computer technology than I do.	0.586
	3.16	I do not know enough about this technology to handle my academic studies satisfactorily.	0.798
	3.17	I feel a constant threat to my pass grades due to new technologies	0.751
	3.18	I am threatened by classmates with newer technology skills	0.678
		Composite reliability (CR)	0.811
		Average variance extracted (AVE)	0.534
		Maximum shared square variance (MSV)	0.530
Techno-invasion (TS2)	3.5	I must be in touch with my studies even during my vacation due to this technology	0.681
	3.6	I spend less time with my family due to this technology.	0.858
	3.7	I must sacrifice my vacation and weekend time to keep current on new technologies	0.782
		Composite reliability (CR)	0.819
		Average variance extracted (AVE)	0.604
		Maximum shared square variance (MSV)	0.530
Techno-uncertainty	3.11	There are constant changes in computer hardware in our university	0.915
(TS3)		There are frequent upgrades in computer networks in our university.	
	3.12		0.814
		Composite reliability (CR)	0.857
		Average variance extracted (AVE)	1.750
		Maximum shared square variance (MSV)	0.371
Model fit indices X^2 / d	f = 1.841 (p	<.001); IFI = .961; CFI = .960; TLI = .950; RMSEA = .065	

Independent variable	Dependent variable	Standardized regression coefficient	p-value
Techno-complexity (TS1)	Academic commitment	740	<.001*
Techno-invasion (TS2)	Academic commitment	.111	.367
Techno-uncertainty (TS3)	Academic commitment	.418	<.001*

Table 4: Structural Equation Modelling

education environments as a respond to the covid-19 pandemic imperatives. [62] argued that too much exposure to information and the associated processing can lead to result in an imbalance between such technologies and the individuals' cognitive abilities. Despite being in post covid-19, a study of this nature remains pertinent as South African higher education and the African higher education continue to leverage academic activities on information technologies for academic purposes. The following sections discuss findings from this study.

5.1 Gender differences on technostress

Results demonstrate that techno-invasion is more highly perceived by male students (3.88) than by female students (3.68), t (185.097) = 2.192, p=.030. The finding disagrees with [51], who found no statistically significant sex difference in occupational stress and organizational commitment. This finding also diverges with [4], whose study found no statistically significant differences in the development of technostress among male and female workers in Nigeria. In South Africa, [52] revealed no significant influence of gender differences on technostress. The study finding is also inconsistent with findings in a study by [57] that revealed no impact of gender differences in relation to technostress. Therefore, H6 was supported.

5.2 Age differences on technostress

Students' age negatively correlated with techno-complexity, and older students are less affected by the complexity of technology for learning. However, the results were inconsistent with separate studies by [42] and [86]. In a study by [57], older university teachers demonstrated the need for support on technostress creators of complexity and overload in comparison to their younger counterparts. Therefore, H7 was supported.

5.3 ICT skills and experience on technostress

Interestingly, time (in years) using ICTs in formal learning contexts is positively correlated with techno-uncertainty. This result was inconsistent with findings by [72]. Furthermore, results further revealed that better alignment of students' ICT skills and skills needed for online academic activities, are both significantly associated with less impact of techno-complexity and techno-invasion. Therefore, H8 and H9 were accepted.

5.4 Techno-invasion and students' academic commitment

As unexpected, findings revealed insignificant positive correlation between techno-invasion and academic commitment, meaning that ICTs' capability to force students to execute assessments and other study related work efficiently, work for long hours or alter their study habits does not necessarily lead to decreased level of student academic commitment. This finding agrees with [73] whose study suggests that stress can positively and negatively influence individuals. According to [3], some individuals fail to cope at the slightest manifestation of stress, whereas some fail give their best in the absence of stress. It can be argued then, that much of students' response to technology use and related demands hinge on the circumstances and their abilities in anticipation and copying mechanisms.

5.5 Techno-uncertainty and students' academic commitment

In addition, findings revealed significant positive correlation between techno-uncertainty and students' commitment to their studies. The study suggests that potential alterations and constant improvements in ICTs demonstrated the potential to unsettle students and to drive them to upskill and survive in the new realities. However, this did not necessarily lead to students' decrease in their commitment to their studies. These findings agree with [5], who reported that academic librarians' organizational commitment positively correlated to techno-uncertainty and techno-overload. The finding resonates with findings by [2] whose study reported that Palestinian students perceived techno-complexity and technouncertainty.

5.6 Techno-complexity and students' commitment

Findings revealed a significant negative correlation between stress emanating from techno-complexity and students' commitment to their studies. The study suggests that when ICTs' characteristics and complexity lead to students feeling insufficiently skilled, students become less committed to their studies. This finding is supported by [76], who found that job stress had a negative impact on employees' organizational commitment. This finding also resonates with [57], whose study found that techno-complexity had significant negative effects on university teachers' work performance. The finding from the current study is reasonable in the context of first-year undergraduate students who have recently migrated from secondary and high schools where ICTs are not generally used for teaching and learning in South Africa. There is documented lack of use and exposure to ICTs for learning by learners in secondary education systems. The gap exists as learners transition into HE, that is more supported by ICTs and related technologies for teaching and learning, potentially leading to stress.

Despite the current study concentrating on technostress in students' academic commitment, the study findings agree with [71], who found that technostress in the workplace resulted in employees' decreased productivity. In addition, prior studies generally agree on their findings that stressors negatively correlate with organizational commitment [13, 53, 59, 93]. However, the technological burden and potential sources of stress might also be sources of students' inspiration. In addition, students might be taking the techno-stressors as positive challenges towards the fulfillment of their study requirements and the attainment of their qualifications. Some degree of stress is healthy as it exerts a positive influence on students' well-being as they engage in their studies.

By adopting the technostress creators' model and adapting the organizational commitments model, the study affords some contributions to expand our comprehension of the complex relationship around technostress and students' academic commitment in online learning during COVID-19. This study provides empirical findings that techno-invasion and techno-uncertainty positively impact students' academic commitment. However, techno-complexity negatively affect first-year students' academic commitment.

6 IMPLICATIONS

The study has implications for theory, policy, and practice.

6.1 Theoretical implications

On the theoretical side, the model tested is formed by integration well-established models, i.e., the technostress creators' model and adapted organizational commitment model. No academic papers have been found to explore the effects of technostress on academic commitment. The relationships established have empirically proven their suitability and inclusion in the final model and demonstrated statistical significance. Therefore, the theoretical contribution of this study is that it fills the gap in ERT literature which seemed to have given limited attention to technostress and academic commitment in HE environments. That is, this study is the first of its kind to examine and effectively confirm the relationships between technology related stresses and academic commitment.

6.2 Implications for policy

The study demonstrates an urgent need to revisit admissions policies in HEIs. Accordingly, the university and other HE institutions in comparative contexts may need to design and implement ICT bridging courses that acclimatize first-year undergraduate students to ICTs for teaching and learning in the HE spaces. These ICT courses could be implemented as part of the first-year student experience (FYSE) programmes.

6.3 Practical implications

It is envisaged that HEIs, educational technologists, HE academics, e-Learning developers would benefit from this study to concentrate on the aspects that demonstrated to be worth in the relationships examined. Furthermore, the afore mentioned entities should give attention when considering online learning. Measures need to be put in place by the university to enhance the experience of first-year undergraduate students, in the form of coping mechanisms such as social support (instrumental and emotional). In addition, study load amounts need to be monitored and rationally allocated to students by lecturers and departments. The impression that students are available online, at any time, and at any place stretches students mentally and physically. Accordingly, curriculum design and delivery must be revisited, to align curriculum with the demands of emergent remote teaching. First-year university undergraduate students' voices concerning technostress and its effects on academic commitment should be heard and considered in the redesign of curriculum, the provision of much needed ICT resources and knowledge, and the skills support anticipated in the context of online teaching and learning.

7 LIMITATIONS AND FUTURE WORK

Generalizing these findings is limited as they relate to a specific academic context characterized by a small group of first year undergraduate students in a single South African institution of HE. The findings may not fully embody the varied groups within South Africa and the world. However, the findings are applicable to the global context as most developing and underdeveloped countries share similar characteristics to the selected university in South Africa. Future longitudinal studies could be conducted to study the phenomenon from a wider population. In addition, a study of a similar nature could be conducted to make comparative analysis of differences in the technostress and academic commitment dichotomy during and post-COVID-19.

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Data availability

Data sets associated with the study are available upon reasonable request.

Ethical considerations

This manuscript is guided by all ethical etiquettes for enquiry with no unswerving contact with beings or animals. The study was approved by the Institutional Research Ethics Committee of the University: Ethics Clearance Number 271/21

Competing interests

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REFERENCES

- Abdous H. M'hammed. 2019. Influence of satisfaction and preparedness on online students' feelings of anxiety. The Internet and Higher Education, 41, 34–44. https://doi.org/10.1016/j.iheduc.2019.01.001
- [2] Abuzant Maysa, Sabbah K. Ahmad, Ghanem Monji. 2022. Technostress and Students' Academic Productivity: A Positive Impact. In: Burgos, D., Affouneh, S. (eds) Radical Solutions in Palestinian Higher Education. Lecture Notes in Educational Technology. Springer, Singapore. https://doi.org/10.1007/978-981-19-0101-0_4
- [3] Agboola A. Ayodeji and Olasanmi O. Omoneye. 2016. Technological Stressors in Developing Countries. Open Journal of Applied Sciences, 6, 248-259. http://dx.doi. org/10.4236/ojapps.2016.64025
- [4] Agbu Jane-Frances and Olubiyi K. Simeon. 2011. Technostress in the Age of Information Communication Technology: A Case Study of Distance Education. International Research Educational Journals, 2, 1654-1660.
- [5] Ahmad U. Norulkamar Ungku, Amin S. Mohamad, and Ismail W. Khairuzzaman Wan. 2012. The relationship between technostress creators and organisational commitment among academic librarians. *Procedia-Social and Behavioral Sciences*, 40, pp.182-186. https://doi.org/10.1016/j.sbspro.2012.03.179

AfriCHI 2023, November 27-December 01, 2023, East London, South Africa

- [6] Akoojee Salim, and Nkomo Mokubun. 2007. Access and quality in South African higher education: The twin challenges of transformation. *South African journal* of higher education, 21(3), pp.385-399. https://hdl.handle.net/10520/EJC37345
- [7] Alex K. Jogymol. 2022. Impact of the COVID-19 Pandemic on the Academic Life of Higher Education Students: A Rural South African Perspective from a Global Study. *South African Journal of Higher Education* 36 (1), 20-40. https: //doi.org/10.20853/36-1-4303
- [8] Ali Wahab. 2020. Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. Higher Education Studies, 10(3), 16–25. https://doi.org/10.5539/hes.v10n3p16
- [9] Arnetz B. Bengt and Wiholm Clairy. 1997. Technological stress: Psychophysiological symptoms in modern offices. *Journal of psychosomatic research*, 43(1), pp.35-42. https://doi.org/10.1016/S0022-3999(97)00083-4
- [10] Ayyagari Ramakrishna, Grover Varun, and Purvis Russell. 2011. Technostress: Technological antecedents and implications. *MIS quarterly*, pp.831-858. https: //doi.org/10.2307/41409963
- [11] Duzenli Hulya. 2018. Teaching in a digital age: Guidelines for designing teaching and learning for a digital age.
- [12] Beaunoyer Elisabeth, Dupéré Sophie, and Guitton J. Matthieu. 2020. COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers* in Human Behavior, 111, 106424. https://doi.org/10.1016/j.chb.2020.106424
- [13] Boshoff Christo, and Mels Gerhard. 1995. A Causal Model to Evaluate the Relationships among Supervision, Role Stress, Organizational Commitment and Internal Service Quality. *European Journal of Marketing*, 29 (2), 23-42. https://doi.org/10.1108/03090569510080932
- [14] Bottomley Edward-John. 2020. SA Has Some of Africa's Most Expensive Data, A New Report Says – But It Is Better for the Richer. https://www.businessinsider. co.za/how-sas-data-prices-compare-withthe-rest-of-the-world-2020-5
- [15] Brillhart E. Peter. 2004. Technostress in the workplace: Managing stress in the electronic workplace. Journal of American Academy of Business, 5(1/2), pp.302-307
- [16] Butz T. Nikolaus, Stupnisky H. Robert, and Pekrun Reinhard. 2015. Students' emotions for achievement and technology use in synchronous hybrid graduate programmes: A control-value approach. *Research in Learning Technology*, 23. https: //doi.org/10.3402/rlt.v23.26097
- [17] Califf B. Christopher, Sarker Saonee, and Sarker Suprateek. 2020. The Bright and Dark Sides of Technostress: A Mixed-Methods Study Involving Healthcare IT. MIS Quarterly (44:2), pp. 809-856. http://dx.doi.org/10.25300/MISQ/2020/14818
- [18] Çebi Ayça, Araújo D. Rafael, and Brusilovsky Peter. 2022. Do individual characteristics affect online learning behaviors? An analysis of learners sequential patterns. *Journal of Research on Technology in Education*, 1-21. https://doi.org/10. 1080/15391523.2022.2027301
- [19] Chandra Shalini, Shirish Anuragini, and Srivastava C. Shirish. 2019. Does technostress inhibit employee innovation? Examining the linear and curvilinear influence of technostress creators. Communications of the Association for Information Systems, 44(1), 299–331. https://doi.org/10.17705/1CAIS.04419
- [20] Çoklar A. Naci, and Sahin Y. Levent. (2011). Technostress levels of social network users based on ICTs in Turkey. *European Journal of Social Sciences*, 23(2), pp.171-182.
- [21] Cooper L. Cary, Dewe J. Philip, and O'Driscoll P. Michael. 2001. Organizational Stress: A review and critique of theory, research, and applications. Sage Publications. *Thousand Oaks, CA.* doi: http://dx.doi.org/10.4135/9781452231235
- [22] Council on Higher Education (CHE). 2004. Improving Teaching and Learning (ITL) Resources. http://www.che. ac.za/documents/d000087 (accessed 30 April 2022).
- [23] Council on Higher Education (CHE). Education White Paper 3. 1997. A Programme for the transformation of Higher Education. http:// www.che.ac.za/documents/d000005/index.php (accessed 30 April 2022).
- [24] Crosling Glenda, Nair Mahendhiran, and Vaithilingam Santha. 2015. A creative learning ecosystem, quality of education and innovative capacity: a perspective from higher education. *Studies in Higher Education*, 40(7), 1147–1163. https://doi. org/10.1080/03075079.2014.881342
- [25] Cross Michael, and Johnson B. 2008. Establishing a space of dialogue and possibilities: Student experience and meaning at the University of the Witwatersrand. South African Journal of Higher Education, 22(2), 302-321.
- [26] Cutri R. Maile, Mena Juanjo, and Whiting E. Feinauer. 2020. Faculty readiness for online crisis teaching: Transitioning to online teaching during the COVID-19 pandemic. European Journal of Teacher Education, 43(4), 523–541. https: //doi.org/10.1080/02619768.2020.1815702
- [27] Czerniewicz Laura, Agherdien Najma, Badenhorst Johan, Belluigi Dina, Chambers Tracey, Chili Muntuwenkosi, de Villiers Magriet., et al. 2020. A wake-up call: Equity, inequality and covid-19 emergency remote teaching and learning. Postdigital Science and Education 2: 946–67.
- [28] Czerniewicz Laura, Ravjee Neetha, and Mlitwa Nhlanhla. 2006. Information and communication technologies (ICTs) and South African higher education: Understanding/s (of) the landscape. In T auf der Heyde, C de la Rey, J Jansen, T Mthembu, M Nkomo, J Reddy, M Singh, S Badat, L Lange and S Njarnason (Eds) Review of Higher Education in South Africa: Selected Themes. Pretoria: Council on Higher Education.

- [29] Dennen P. Vanessa, Bagdy M. Lauren, Arslan Ömer, Choi Hajeen, and Liu Zhichun. 2022. Supporting new online instructors and engaging remote learners during COVID-19: a distributed team teaching approach. Journal of Research on Technology in Education, 54(sup1), S182-S202. https://doi.org/10.1080/15391523.2021. 1924093
- [30] Déry Johanne, Clarke P. Sean, D'Amour Danielle, and Blais Régis. 2018. Scope of nursing practice in a tertiary pediatric setting: Associations with nurse and job characteristics and job satisfaction. *Journal of Nursing Scholarship*, 50(1), pp.56-64. https://doi.org/10.1111/jnu.12352
- [31] Ding Lili, Zhao Zhongchao, and Wang Lei. 2022. Does online teaching strategy matter: exploring the effect of online teaching strategies on students' ambidextrous innovation capacities based on the online teaching situation in China. *Journal of Research on Technology in Education*, 1-24. https://doi.org/10.1080/15391523. 2022.2038315
- [32] Fauscette Michael, and Perry Randy. 2014. Simplifying it to Drive Better Business Outcomes and Improved ROI: Introducing the Complexity Index. White Paper, IDC# 249440. Retrieved from. http://www.oracle.com/us/corporate/ analystreports/itcomplexity-index-2222715.pdf
- [33] Fischer Thomas, and Riedl René. 2017. Technostress Research: A Nurturing Ground for Measurement Pluralism? Communications of the Association for Information Systems (40), pp. 375-401. http://dx.doi.org/10.17705/1CAIS.04017
- [34] Frögéli Elin, Rudman Ann, and Gustavsson Petter. 2019. The relationship between task mastery, role clarity, social acceptance, and stress: An intensive longitudinal study with a sample of newly registered nurses. *International journal of nursing studies*, 91, pp.60-69. https://doi.org/10.1016/j.ijnurstu.2018.10.007
- [35] Fuglseth Anna. Mette, and SørebøØystein. 2014. The effects of technostress within the context of employee use of ICT. Computers in Human Behavior, 40, pp.161-170.
- [36] Ghislieri Chiara, Molino Monica, and Cortese G. Claudio. 2018. Work and organizational psychology looks at the fourth industrial revolution: how to support workers and organizations?. Frontiers in psychology, 9, p.2365. http: //dx.doi.org/10.3389/fpsyg.2018.02365
- [37] Govender R. Gerald. 2021. Embracing the fourth industrial revolution by developing a more relevant educational spectrum. In J. Naidoo (Ed.), *Teaching and learning* in the 21st century (pp. 30–49). Brill. https://doi.org/10.1163/9789004460386 003
- [38] Guardian. 2017. Our Minds Can Be Hijacked: The Tech Insiders Who Fear a Smartphone Dystopia. (https://www.theguardian.com/technology/2017/oct/05/ smartphone-addiction-siliconvalley-dystopia; accessed February 3, 2022).
- [39] Händel Marion, Stephan Melanie, Gläser-Zikuda Michaela, Kopp Bärbel, Bedenlier Svenja, and Ziegler Albert. 2020. Digital readiness and its effects on higher education students' socio-emotional perceptions in the context of the COVID-19 pandemic. *Journal of Research on Technology in Education*, 1-13. https://doi.org/10.1080/15391523.2020.1846147
- [40] Hardman Joanne, Watermeyer Richard, Shankar Kalpana, Ratnadeep Suri, Crick Tom, Knight Cathryn, McGaughey Fiona, and Chung Roger. 2022. Does Anyone Even Notice us?andquot; COVID-19's Impact on academics' Well-Being in a Developing Country. South African Journal of Higher Education 36 (1), 1-19. https://doi.org/10.20853/36-1-4844
- [41] Hauk Nathalie, Goritz S. Anja, and Krumm Stefan. 2019. The mediating role of coping behavior on the age-technostress relationship: A longitudinal multilevel mediation model. PLoS One, 14(3), e0213349. https://doi.org/10.1371/journal.pone. 0213349
- [42] Hauk Nathalie, Hüffmeier Joachim, and Krumm Stefan. 2018. Ready to be a silver surfer? A meta-analysis on the relationship between chronological age and technology acceptance. Computers in Human Behavior, 84, 304–319. https: //doi.org/10.1016/j.chb.2018.01.020
- [43] He Jun, and Freeman A. Lee. 2010. Are men more technology-oriented than women? The role of gender on the development of general computer self-efficacy of college students. *Journal of Information Systems Education*, 21(2), pp.203-212.
- [44] Hodges B. Charles, Moore Stephanie, Lockee B. Barbara, Trust Torrey, and Bond M. Aaron. 2020. The difference between emergency remote teaching and online learning. http://hdl.handle.net/10919/104648
- [45] Hong Jon-Chao, Cao Wei, Liu Xiaohong, Tai Kai-Hsin, and Zhao Li. 2021. Personality traits predict the effects of Internet and academic self-efficacy on practical performance anxiety in online learning under the COVID-19 lockdown. *Journal* of Research on Technology in Education, 1-15. https://doi.org/10.1080/15391523. 2021.1967818
- [46] Internetworldstats. 2020. Usage and Population Statistics. Internet world stats. https://www.internetworldstats.com/
- [47] Kara Mehmet. 2022. Revisiting online learner engagement: exploring the role of learner characteristics in an emergency period. *Journal of Research on Technology* in Education, 54(sup1), S236-S252. https://doi.org/10.1080/15391523.2021.1891997
- [48] Khlaif N. Zuheir, Sanmugam Mageswaran, and Ayyoub Abedulkarim. 2022. Impact of Technostress on Continuance Intentions to Use Mobile Technology. Asia-Pacific Edu Res. https://doi.org/10.1007/s40299-021-00638-x
- [49] Khoza S. Bhekimuzi. 2019. Lecturers' reflections on curricular spider web concepts transformation strategies. Transformation of Higher Education Institutions in Post-Apartheid South Africa, 1(2019), 15–26. https://doi.org/10.4324/ 9781351014236-2

AfriCHI 2023, November 27-December 01, 2023, East London, South Africa

- [50] Knight Jane. 2008. The internationalization of higher education: Complexities and realities, *Higher education in Africa: The international dimension*, 1-43.
- [51] Kumasey S. Anthony, Delle Eric, and Ofei B. Samuel. 2014. Occupational stress and organisational commitment: Does sex and managerial status matter. *International Journal of Business and Social Research (IJBSR)*, 4(5), pp.173-182.
- [52] le Roux J. Daniël, and Botha A. Petrus. 2021. Investigating the impact of technostress on productivity and overall life satisfaction of managers working at a South African ferrochrome smelting company. SA Journal of Human Resource Management, 19, 12.
- [53] Lee B. Hee, and Jamil Maqbul. 2003. An Empirical Study of Organizational Commitment: A Multi-Level Approach. *Journal of Behavioral and Applied Management*, 4 (3), 176-189.
- [54] Leibowitz Brenda. 2012. Understanding the challenges of the South African higher education landscape. Community, self and identity: Educating South African university students for citizenship, 3-18.
- [55] Letseka Moeketsi, and Maile Simeon. 2008. High university dropout rates: A threat to South Africa's future. Pretoria: Human Science Research Council, 1-7.
- [56] Li L. Yi, and Tsai C. Chung. 2017. Accessing online learning material: Quantitative behavior patterns and their effects on motivation and learning performance. Computers and Education, 114, 286–297. https://doi.org/10.1016/j. compedu.2017.07.007
- [57] Li Lu, Wang Xinghua. 2021. Technostress inhibitors and creators and their impacts on university teachers' work performance in higher education. *Cogn Tech Work* 23, 315–330. https://doi.org/10.1007/s10111-020-00625-0
- [58] Lim M. Janine. 2016. Predicting successful completion using student delay indicators in undergraduate self-paced online courses. Distance Education, 37(3), 317–332. https://doi.org/10.1080/01587919.2016.1233050
- [59] Lopopolo B. Rosalie. 2002. The Relationship of Role-Related Variables of Job Satisfaction and Commitment to the Organization in a Restructured Hospital Environment. *Physical Therapy*, 82 (10), 984-999. https://doi.org/10.1093/ptj/82. 10.984
- [60] Luchtvaartfeitennl, 2015. Human factors as a symptom of systematic problems. Hum. Factors Fact. Sheet 1e9. Retrieved from. www.luchtvaartfeiten.nl
- [61] Maier Christian, Laumer Sven, Weinert Christoph, and Weitzel Tim. 2015. The Effects of Technostress and Switching Stress on Discontinued Use of Social Networking Services: A Study of Facebook Use. *Information Systems Journal* (25:3), pp. 275-308. https://doi.org/10.1111/isj.12068
- [62] Matthes Jörg, Karsay Kathrin, Schmuck Desirée, and Stevic Anja. 2020. "Too much to handle": Impact of mobile social networking sites on information overload, depressive symptoms, and well-being. *Computers in Human Behavior*, 105(2020), 106217. https://doi.org/10.1016/j.chb.2019.106217
- [63] Meyer P. John, and Allen J. Natalie. 1997. Commitment in the workplace: Theory, research, and application. Sage publications. doi: http://dx.doi.org/10.4135/ 9781452231556
- [64] Miller Greg. 2020. Social distancing prevents infections, but it can have unintended consequences. *Science*. https://doi.org/10.1126/science.abb7506
- [65] Molino Monica, Cortese G. Claudio, and Ghislieri Chiara. 2019. Unsustainable working conditions: The association of destructive leadership, use of technology, and workload with workaholism and exhaustion. *Sustainability*, 11(2), p.446. http://dx.doi.org/10.3390/su11020446
- [66] Ontong M. Juan, and Mbonambi Sthabile. 2021. An Exploratory Study of First-Year Accounting students' Perceptions on the Socio-Economic Challenges of the Transition to Emergency Remote Teaching at a Residential University. South African Journal of Higher Education 35 (5), 256-76. https://doi.org/10.20853/35-5-4174
- [67] Padayachee Keshnee. 2017. A snapshot survey of ICT integration in South African schools. South African Computer Journal, 29(2), 36-65. https://doi.org/10.18489/ sacj.v29i2.463
- [68] Pelgrum Willem. 2008. School practices and conditions for pedagogy and ICT. In N. Law, W. J. Pelgrum, and T. Plomp (Eds.), Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study (pp. 67–120). Hong Kong: Springer and Comparative Education Research Centre, The University of Hong Kong. https://doi.org/10.1007/978-1-4020-8928-2_4
- [69] Penado Abilleira Maria, Rodicio-García M. Luisa, Ríos-de Deus M. Paula Ríos-de Deus, and Mosquera-González, M. J. 2021. Technostress in Spanish university teachers during the COVID-19 pandemic. *Frontiers in Psychology*, 12(1), 617650. https://doi.org/10.3389/fpsyg.2021.617650
- [70] Rafferty E. Alannah, and Griffin A. Mark. 2006. Perceptions of organizational change: A stress and coping perspective. *Journal of Applied Psychology*, 91(5), 1154–1162. https://doi.org/10.1037/0021-9010.91.5.1154
- [71] Rafter, M. (1998). Technostress takes toll on internet users. Akron Beacon Journal D, 8.
- [72] Ragu-Nathan T. S, Tarafdar Monideepa, Ragu-Nathan S. Bhanu, and Tu Qiang. 2008. The consequences of technostress for end users in organizations: Conceptual development and validation. Information Systems Research, 19(4), 417–433.

https://doi.org/10.1287/isre.1070.0165.

- [73] Rowden W. Robert. 2005. The Impact of Workplace Learning on Job Satisfaction in Small US Commercial Banks. Journal of Workplace Learning, 17, 215-230. http://dx.doi.org/10.1108/13665620510597176
- [74] Rudolph W. Cort, Allan Blake, Clark Malissa, Hertel Guido, Hirschi Andreas, Kunze Florian, Shockley Kristen, Shoss Mindy, Sonnentag Sabine, and Zacher Hannes. 2021. Pandemics: Implications for research and practice in industrial and organizational psychology. *Industrial and Organizational Psychology*, 14(1-2), pp.1-35. https://psycnet.apa.org/doi/10.1017/iop.2020.48
- [75] Rumbley E. Laura, Altbach G. Philip, and Reisberg Liz. 2012. Internationalization within the higher education context. *The SAGE handbook of international higher education*, 3, p.26.
- [76] Ruzungunde V. Sarah, Murugan Chan, and Hlatywayo K. Clifford. 2016. The influence of job stress on the components of organisational commitment of health care personnel in the Eastern Cape province South Africa. *International Business and Economics Research Journal (IBER)*, 15(5), pp.219-226.
- [77] Statistics South Africa. 2017. see Statistics South Africa.
- [78] Statistics South Africa. 2019. Inequality Trends in South Africa. http://www. geocurrents. info/economic-geography/inequality-trends-in-south-africa.
- [79] Sureda Elena, Mancho Javier, and Sesé Albert. 2019. Psychosocial risk factors, organizational conflict and job satisfaction in Health professionals: A SEM model. Anales de Psicología/Annals of Psychology, 35(1), pp.106-115. https: //doi.org/10.6018/analesps.35.1.297711
- [80] Tarafdar Monideepa, Cooper L. Cary, and Stich Jean-François. 2019. The Technostress Trifecta: Techno Eustress, Techno Distress and Design: Theoretical Directions and an Agenda for Research. *Information Systems Journal* (29:1), pp. 6-42. https://doi.org/10.1111/isj.12169
- [81] Tarafdar Monideepa, Darcy John, Turel Ofir, and Gupta Ashish. 2015. The dark side of information technology. MIT Sloan Management Review, 56(2), p.61. Available at:http://sloanreview.mit.edu/article/the-dark-side-of-informationtechnology/
- [82] Tarafdar Monideepa, Tu Qiang, and Ragu-Nathan T.S. 2010. Impact of technostress on end-user satisfaction and performance. *Journal of management information* systems, 27(3), pp.303-334. https://doi.org/10.2753/MIS0742-1222270311
- [83] Tarafdar Monideepa, Tu Qiang, Ragu-Nathan S. Bhanu, and Ragu-Nathan T.S. 2007. The impact of technostress on role stress and productivity. *Journal of management information systems*, 24(1), pp.301-328. https://doi.org/10.2753/MIS0742-1222240109
- [84] Tseng Hungwei, Yi Xiang, and Yeh H. Te. 2019. Learning-related soft skills among online business students in higher education: Grade level and managerial role differences in self-regulation, motivation, and social skill. Computers in Human Behavior, 95, 179–186. https://doi.org/10.1016/j.chb.2018.11.035
- [85] Tu Qiang, Wang Kanliang, and Shu Qin. 2005. Computer-Related Technostress in China. Communications of the ACM, 48, 77- 81. http://dx.doi.org/10.1145/ 1053291.1053323
- [86] Upadhyaya Pallavi. 2021. Impact of technostress on academic productivity of university students. *Education and Information Technologies*, 26(2), 1647-1664. https://doi.org/10.1007/s10639-020-10319-9
- [87] Vandeyar Thirusellvan. 2015. Policy intermediaries and the reform of e-Education in South Africa. British Journal of Educational Technology,46, 344–359. https: //doi.org/10.1111/bjet.12130
- [88] Walker Melanie. 2005. Higher education pedagogies. McGraw-Hill Education (UK).
- [89] Wangenge-Ouma Gerald, and Kupe Tawana. 2020. Uncertain Times: Re-imagining universities for new, sustainable futures. Pretoria. https://www.usaf.ac.za/covid-19-fosters-a-need-to-re-imagine-theuniversity-as-a-social-institution/. (Accessed 27 December 2021).
- [90] Woldegiorgis E. Tadesse, and Doevenspeck Martin. 2015. Current trends, challenges and prospects of student mobility in the African higher education landscape. International Journal of Higher Education, 4(2), 105-115.
- [91] Woldegiorgis E. Tadesse. 2021. Configurations of progress and the historical trajectory of the future in African higher education, Educational Philosophy and Theory. https://doi.org/10.1080/00131857.2021.1940955
- [92] Yang T. Chi, and Chen Y. Sherry. 2020. Investigating students' online learning behavior with a learning analytic approach: Field dependence/independence vs. holism/serialism. Interactive Learning Environments. https://doi.org/10.1080/ 10494820.2020.1817759
- [93] Yousef A. Darwish. 2002. Job Satisfaction as a Mediator of the Relationship between Role Stressors and Organizational Commitment: A Study from an Arabic Cultural Perspective. *Journal of Managerial Psychology*, 17 (4), 250-266. https: //doi.org/10.1108/02683940210428074
- [94] Zhao Xi, Xia Qihui, and Huang Wei. 2020. Impact of technostress on productivity from the theoretical perspective of appraisal and coping processes. Information and Management. https://doi.org/10.1016/j. im.2020.103265