Examining the Role of Technostress Creators and Inhibitors on Academics Burnout

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Abstract

Recent studies have focused on examining the impact of technostress (TS) on academics and students. However, there remains a paucity of studies examining the influence of TS on burnout among academics. This study aims to explore the influence of TS on academics' feelings of burnout and to examine the mitigating role of TS inhibitors on burnout among academics when using online learning technology. A web-based survey was designed and used to collect data from 115 academics in Malaysian universities. The data were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique. The research findings reveal that academic burnout is significantly influenced by technology insecurity, technology invasion, and technology uncertainty. However, the impact of technology overload is only partially significant, while technology complexity does not exert a significant influence on academic burnout. Moderation tests reveal that literacy and involvement facilitation significantly moderate the relationship between technology uncertainty and insecurity, reducing burnout feelings. This study extends existing literature by providing empirical evidence to explain the relationship between TS and the academic burnout construct. Furthermore, it demonstrates the mitigating role of TS inhibitors on the burnout construct. Additionally, it offers potential strategies for alleviating burnout among academics, particularly in Malaysian university contexts.

1- Introduction

Online learning has become increasingly popular in higher education, leveraging ICT tools to enhance teaching and learning endeavors [1]. The rapid expansion of technology has significantly transformed the landscape of teaching and learning within universities [2]. The integration of digital resources promotes improved communication and flexibility in student learning, while also facilitating enhanced documentation for both academics and students.

The COVID-19 pandemic precipitated the widespread adoption of online learning platforms in universities worldwide, driven by restrictions on face-to-face classes and the urgent need to transition to online modalities to contain the spread of the virus. Throughout the pandemic, both academics and students faced challenges stemming from limited familiarity with online learning technologies, resulting in technology overload and difficulties in adapting to new technological frameworks [2]. Furthermore, not all academics possess uniform levels of digital proficiency necessary for effective adoption and utilization of online learning platforms in their instructional practices [1].

Despite the obstacles encountered, academics have demonstrated their ability to swiftly transition to online modalities, ensuring uninterrupted educational delivery [3]. While the integration of technologies offers flexibility and

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accessibility for both academics and students, concerns arise regarding potential drawbacks associated with online learning technologies, such as deficiencies in technical proficiency, uncertainty regarding pedagogical methodologies, and mismatches in course content compatibility, which may lead to psychological challenges among academics and students [3, 4].

Overuse of online learning can lead to technostress (TS) [3]. TS refers to the stress experienced by information technology (IT) users when utilizing technology [5]. IT users may experience high levels of TS when they perceive technology as difficult to learn, lacking in safety measures, causing uncertainty, encroaching on personal life, or imposing additional tasks [5]. In the wake of the COVID-19 pandemic, many universities have opted to continue employing hybrid teaching approaches, encouraging academics to blend digital resources with traditional face-to-face instructional sessions [2, 6]. This places additional demands on academics, especially those who may exhibit resistance to technology and require training to effectively utilize digital tools [6]. Failure to address this challenge may result in fatigue, frustration, and inconsistencies among academics [7].

Recently, scholars have increasingly focused on examining the impact of TS, particularly among academics and students using online learning platforms. For example, Ali et al. [3] examined the impact of TS on students' academic performance due to compulsive use of e-learning. Meanwhile, Wang et al. [4] examined the impact of TS on academics' continuous intention towards online learning. However, there remains a paucity of studies investigating the impact of TS on academics' burnout. Previous studies have examined this relationship among senior managers [8], students [1], nurses [9], and K-12 teachers [10], but not among academics in higher education settings. Hence, examining this impact is imperative, as it can assist university management in fostering a more supportive work-life balance, thereby enhancing overall well-being and job satisfaction of academics [4].

In addition to comprehending the impact of TS on the feeling of burnout in academics, it is crucial to understand how TS can be alleviated or mitigated to prevent academic burnout when utilizing online learning technology. According to the literature, inhibitors of TS, such as technology support, literacy facilitation, and involvement facilitation, can help mitigate the relationship between TS and banking employees' well-being [11], feeling of burnout among librarians [12] and among students [1, 13], and teachers' work performance [14]. However, there is a lack of empirical evidence to demonstrate the ability of TS inhibitor constructs to mitigate the relationship between TS and burnout among academics when using online learning technology. Understanding the mitigating role of TS inhibitors in different contexts is important, as mitigation strategies are tailored to specific situations [15]. Therefore, it is crucial to determine the most effective mitigation strategies for reducing burnout among academics caused by TS.

To address this gap, the aim of this study is twofold: 1) to examine the impact of TS on academic burnout. Malaysian academics were chosen as respondents due to Malaysia's implementation of one of the longest lockdown periods during COVID-19. This setting is conducive to exploring the influence of TS determinants and inhibitors on academic burnout. 2) to evaluate the mitigating role of TS inhibitors in reducing burnout among academics experiencing stress from using online learning platforms. Through this analysis, this study is able to offer more directed mitigation strategies that can help alleviate burnout among academics, especially when using online learning platforms. An online survey was conducted to gather data from academics in both public and private Malaysian universities. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze the measurement and structural aspects of the proposed model.

2- Literature Review

2-1- Online Learning and Technostress (TS)

Academic institutions across the globe are actively redefining their curricula to align with industry demands. This process involves making substantial revisions, with the focus being on integrating teaching with technology [3]. By integrating technology with traditional instructional methods, institutions aim to enhance student engagement, optimize the learning process, and provide more enriching learning experiences.

However, alongside the benefits of technological integration in education, there are significant challenges. Research indicates that employees within organizations are increasingly experiencing stress due to compulsive technology use [1, 3, 10]. This stress arises from the constant need for individuals to stay updated on rapid advancements in computer operating systems and software [4]. The continuous evolution of technology fosters feelings of insecurity and apprehension among individuals, who fear being left behind in workplace technological proficiency [1, 16]. Consequently, while technology has undoubtedly streamlined many work processes, it has also precipitated various clinical issues associated with its use [16]. Academics, similarly, are not immune to the stressors resulting from compulsive technology use in both their personal and professional lives [10, 17].

2-2- Technostress

Organizations have adopted ICTs, leading them to redefine their structure, business processes, and, to some extent, alter the social interactions between employees within the organization [5]. Constantly adapting to these changes has led to a phenomenon called TS, attributable to the growing use of technology by end-users.

According to Ragu-Nathan et al. [5], the definition of TS has changed through time. Firstly, TS was defined as the phenomenon of the user's inability to cope with using the new technology within a health context. Later, the definition was expanded, where it focuses on the user's struggle to accept the negative impacts of computer technology on users' attitudes, thoughts, behavior, or physiology. Finally, the latest definition, which was accepted most of today in the literature, defined TS as the user's IT experiences of stress when using technologies [5]. The abundance of information and the inability to process it cause this psychological pressure for users who are not proficient in information technology [18]. Hence, based on the above discussion, this study defines TS as negative experiences obtained by academics when overusing online learning platforms.

2-3- TS Creators (TSC)

Hwang et al. [14] and Jena [17] and emphasized that TS is caused by five primary factors that acted as stimuli leading to TS. These five factors have been used in the majority of cross-sectional studies examining this topic. According to these authors, the factors are:

1) Techno-overload (TO): Users are required to work faster and longer due to increased work demands when using technology.

2) Techno-invasion (TIN): Users are constantly connected, can be reached anytime, and, as a result, their personal lives are invaded by work-related tasks and communications.

3) Techno-complexity (TC): The increasing complexity of technology leads to users experiencing difficulties in performing their tasks, forcing them to continuously learn and relearn skills to cope with the technology's complexity.

4) Techno-insecurity (TI): Users experience a fear of being replaced by the technology or by other individuals who have greater capabilities in using the technology.

5) Techno-uncertainty (TU): Users feel unsettled about the integration of technology into their work environment, which results in ambiguous work requirements and expectations.

Table 1 summarizes previous studies that examine this topic. The literature analysis, however, only includes previous studies that examine the topic of TS within educational settings.

Table 1. Summary of previous studies examining the topic of TS in educational settings

Reference	Context of study	Dependent Variable	Causes of TS	Results
[12]	Librarians in the Malaysian universities.	Organizational commitment	Tech-overload Tech-invasion Tech-uncertainty Tech-complexity Tech-insecurity	Tech-overload and uncertainty were found as significant causes of TS.
[17]	Academics in Indian universities.	Job performance	TS Creator (Combine the constructs of tech-overload, invasion, uncertainty, complexity and insecurity as a single construct)	TS creator was found as significant cause of TS.
[19]	Medic students in Peru universities.	Academic performance & Exhaustion	Social overload Communication overload	Social and communication overload were found as significant causes of TS.
[14]	Academics in Chinese universities.	Job performance	Tech-overload Tech-invasion Tech-uncertainty Tech-complexity Tech-insecurity	Tech-complexity and insecurity were found as significant causes of TS.
[1]	Students in Chinese universities.	Burnout	Administration support Peer support	Administrative support was found as significant cause of TS (negative relationship).
[10]	K-12 teachers in the US.	Burnout	Tech-overload Tech-invasion Tech-uncertainty Tech-complexity Tech-insecurity	Tech-invasion, overload and insecurity were found as significant causes of TS.

The literature analysis presented in Table 1 highlights a significant interest in exploring the factors influencing TS within educational environments. Previous studies have explored this subject with a range of participants, encompassing librarians, teachers, students, and academics. These studies have investigated the impact of TS on various outcomes, including job performance, academic achievement, exhaustion, burnout, and organizational commitment. However, only a limited number of studies have specifically addressed burnout as a consequence of TS [1, 10], and among these, none have specifically examined academics' feelings of burnout.

Furthermore, the majority of previous studies have utilized TS creator constructs (such as tech-overload, tech-invasion, tech-uncertainty, tech-complexity, and tech-insecurity) to predict the TS construct. Only a small proportion of past studies have employed constructs unrelated to technology to predict TS. For instance, Zhao et al. and Alvarez-Risco et al. [19] incorporated social and organizational constructs to assess TS. However, the use of technology-related constructs appears more pertinent due to the intrinsic nature of the TS construct, which seeks to evaluate the stress induced by technology use.

The analysis indicates that the predictive efficacy of TS creator constructs on TS is contingent upon the context and focus of the study, yielding inconsistent results across different research settings. For instance, Li and Wang [14] identified tech-complexity and insecurity as more dominant predictors of TS concerning academic job performance. Conversely, Califf & Brooks [10] reported that tech-invasion, overload, and insecurity were more dominant predictors of TS in relation to K-12 teachers' burnout feelings. Thus, based on these observations, this study underscores the need for further examination to determine which TS creators predominantly predict the TS construct within the context of academic burnout.

2-4- Academic's Burnout

Previous studies have identified burnout as one of the negative consequences of TS [1, 14]. Both students and educators participating in educational processes can experience academic burnout. Academic burnout can lead to problems such as decreased in learning engagement, frustration, loss of interest in learning, reduced in performance and the intention to quit using online learning platforms [1, 14, 17, 19, 20]. In general, burnout is defined as an individual's negative emotion caused by long-term stress [1]. According to Li and Wang [14], academics experiencing TS are particularly vulnerable to burnout. Therefore, in this study, burnout is defined as a negative emotional state experienced by academics due to TS resulting from the use of online learning platforms.

2-5- TS Inhibitors

The implementation of new technology in organizations presents challenges, inducing both social and technical changes that necessitate resource allocation to aid employees in adapting [11]. This transition often elevates technostress levels [21]. Organizations employ TS inhibitors to mitigate its negative impact. TS inhibitors encompass various strategies:

1. **Literacy Facilitation**: Organizations promote knowledge acquisition and sharing related to the technology, fostering an informed workforce [12].

2. **Technical Support Provision**: Organizations offer support and problem-solving mechanisms to assist end-users in utilizing the technology effectively [14].

3. **Involvement Facilitation**: Organizations initiate efforts to inform end-users about the rationale and effects of the technology. This encourages experimentation and usage [17].

To assist employees in reducing technostress, organizations employ a range of methods, including redesigning stress-inducing situations, management training, information sharing, social support, healthcare programs, counseling, and other forms of assistance [5, 13]. Table 2 lists the previous studies that examine the influence of TS inhibitors on TS consequences.

Based on the literature analysis presented in Table 2, it is apparent that prior investigations into the moderating influence of TS inhibitors have not specifically addressed their role within the realm of academic burnout. While [14] Li & Wang (2021) [14] explored the moderating impact of TS inhibitors, its focus was directed towards predicting academic work performance.

Additionally, existing literature suggests that the moderating impact of TS inhibitors varies depending on the specific setting and context of the study. For instance, within a university setting, a librarian may assert that technology support serves as an effective strategy for alleviating TS [12]. Conversely, students and academics advocate for literacy facilitation as a vital means of mitigating TS [1, 14]. Thus, based on these findings, there is a warrant to examine how TS inhibitors moderate the relationship between TS and academics' burnout.

Table 2. Summary of previous studies examining the mitigating role of TS inhibitors

Author	Context of study	Dependent Variable	TS Inhibitors Construct Operationalized	Results
[12]	Librarians in a university	Commitment	• Tech Support provision • Literacy Facilitation • Involvement Facilitation	Tech support provision significantly moderate the relationship.
[11]	Senior managers in a business organization	Employee's well being	• Tech Support Provision • Involvement Facilitation	Tech support provision significantly moderate the relationship.
[13]	IS workers in a financial organization	Organizational Commitment Compliance Intention	• TS Inhibitors (as a single construct)	TS inhibitors significantly moderate the relationship.
[1]	Students in a university	Student's Burnout	• Literacy Facilitation	Literacy facilitation significantly moderate the relationship.
[14]	Academics in a university	Work performance	• Tech Support provision • Literacy Facilitation • Involvement Facilitation	Literacy and involvement facilitation significantly moderate the relationship.

2-6- Proposed Research Model and Hypothesis

The research model in Figure 1 proposes that TS creators—i.e., technology overload, technology invasion, technology complexity, technology insecurity, and technology uncertainty—significantly influence academics' burnout when using online learning platforms. Additionally, TS inhibitors—i.e., literacy facilitation, technical support provision, and involvement facilitation—are expected to significantly moderate the relationship between TS creators and academics' burnout.
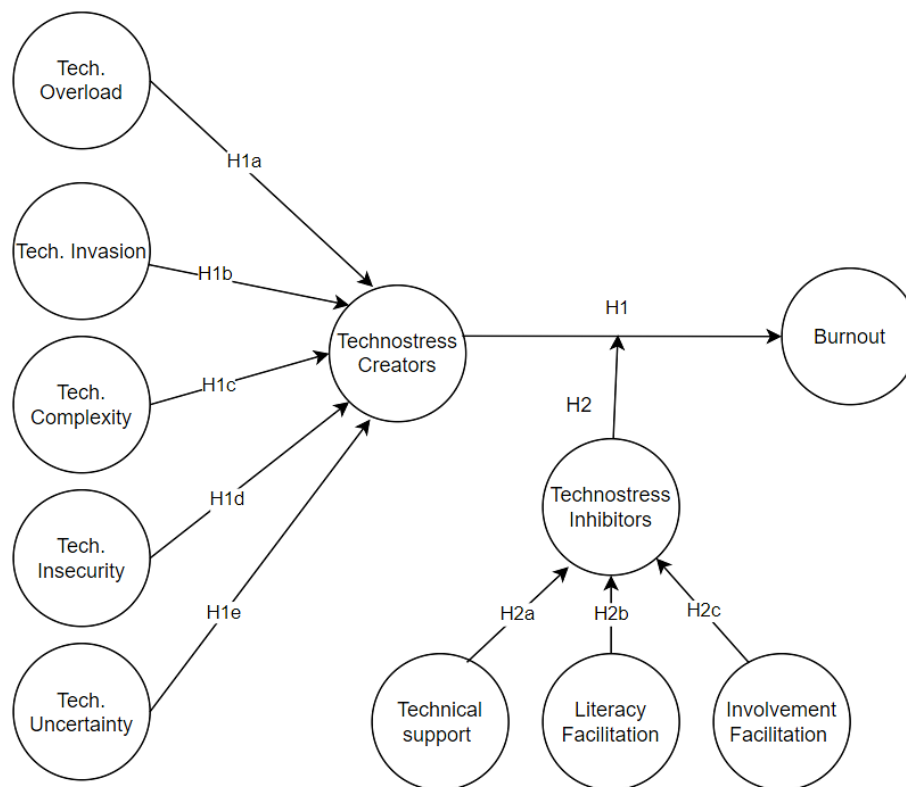
Figure 1. Research model

This section presents the hypotheses that will be tested in this study. The hypotheses are as follows:

H1: TS creators have a significant positive influence on academics' burnout.

H1a: Technology overload has a significant positive influence on academics' burnout.

H1b: Technology invasion has a significant positive influence on academics' burnout.

H1c: Technology complexity has a significant positive influence on academics' burnout.

H1d: Technology insecurity has a significant positive influence on academics' burnout.

H1e: Technology uncertainty has a significant positive influence on academics' burnout.

H2: TS inhibitors have a significant moderating influence on the academics' burnout.

H2a: Technical support has a significant moderating influence on the relationship between TS creators and academics' burnout.

H2b: Literacy facilitation has a significant moderating influence on the relationship between TS creators and academics' burnout.

H2c: Involvement facilitation has a significant moderating influence on the relationship between TS creators and academics' burnout.

3- Research Methodology

3-1- Sampling & Data Collection Technique

The researchers examined academics from both public and private universities in Malaysia. They employed a purposive sampling technique to select participants for this study. Data was collected during the third period of the Malaysian movement control order (during COVID) from September 2021 to December 2021. This timeframe coincided with universities transitioning predominantly to online classes, offering valuable insights into technologically facilitated learning experiences.

Utilizing an online survey platform, the researchers administered the questionnaire. The link to the questionnaire was shared through multiple social media platforms across the country. Academics who answered the questionnaire were encouraged to share the survey link with fellow academics. To prevent multiple submissions, an IP restriction was enforced.

The sample comprised academics teaching undergraduate online courses for at least one full semester. This is to ensure that the researchers were able to collect data from a cohesive group of respondents that is aligned with the research goals. Notably, those teaching postgraduate courses were deliberately excluded to maintain homogeneity and research objectives alignment [22]. The purposive sampling technique guaranteed participants' ability to meaningfully contribute to the study's objectives.

3-2- Research Instrument

The research instrument for this study was developed based on previous studies in the field of technostress. The questionnaire consisted of two main sections. The first section aimed to collect demographic information from the participants. In the second section, the questionnaire was divided into three sub-sections: TS creators, TS inhibitors, and TS consequence (i.e., burnout).

The items in the second section were adapted from prior studies that had already established the validity and reliability of these measures. Slight modifications were made to the wording of these items to ensure their appropriateness for the context of this study, which focused on academics using online learning platforms. All the items, together with their references, are listed in the Appendix I.

To ensure the content validity of the questionnaire, expert opinions were sought. Three experts in the fields of information systems management and organizational behavior were consulted. Based on their feedback, minor adjustments were made to enhance the clarity of the items. The questionnaire comprised a total of 21 items to measure TS creators, including techno-overload (TO) (5 items), techno-invasion (TIN) (3 items), tech-complexity (TC) (5 items), techno-insecurity (TI) (4 items), and techno-uncertainty (TU) (4 items). Additionally, 10 items were dedicated to measuring TS inhibitors (literacy facilitation (LI), technical support (TS), and involvement facilitation (IF), and 5 items to measure Burnout (BO).

4- Research Findings

4-1- Demographic Analysis

This study employed a web-based survey methodology to gather data from academics employed in Malaysian universities. During a three-month data collection period, 300 individuals accessed the survey. Of these, 135 academics successfully completed the survey. However, 20 responses were excluded from the analysis because they did not comply with the sampling criteria or were incomplete. This exclusion led to a final sample of 115 responses for analysis.

The majority of participants in this study worked at public universities in Malaysia and possessed more than 25 years of teaching experience. Moreover, most respondents reported excellent computing skills, particularly in word processing, spreadsheets, presentations, and internet software. A small percentage of participants indicated having skills ranging from poor to adequate in these areas. Demographic statistics for the respondents are summarized in Table 3.

Table 3. Demographic statistics of the respondents

		Percentage	Frequency (n=115)
Gender	Male	56.6%	65
	Female	43.4%	50
Academic Position	Lecturer	39.2%	45
	Senior Lecturer	38.4%	44
	Associate Professor	18.5%	21
	Professor	3.9%	4
Nationality	Malaysian	84.3%	97
	Non-Malaysian	15.7%	18
Highest academic qualification	Master	44.3%	51
	M.Phil	3.5%	4
	PhD	52.2%	60
Age	Below 25 years	15.6%	18
	25 – 35 years	18.3%	21
	35 – 45 years	37.4%	43
	45 – 55 years	19.1%	22
	Above 55 years	9.6%	11
Types of university	Public	77%	66.9
	Private	38%	33.1

4-2- Measurement Model Assessment

4-2-1- Convergent Validity

The assessment of convergent validity requires consideration of several performance metrics, such as the average variance extracted (AVE), composite reliability, and factor loadings of individual measures. According to Hair et al. [23], a valid measurement model is considered to have convergent validity when factor loadings and composite reliability values are equal to or greater than 0.7 and AVE values are greater than 0.5. The results presented in Table 4 indicate that the item loadings for each construct in this study fall within the range of 0.693 to 0.965, with the exception of technology complexity (TC4), which had a loading of 0.485. However, this item was not removed from the analysis, as its removal did not significantly affect the CR and AVE values for the construct of technology complexity. Additionally, it was determined that the AVE, Cronbach's alpha, and composite reliability values all exceeded the required thresholds, thereby confirming the convergent validity of the measurement model.

4-2-2- Discriminant Validity

Discriminant validity is a crucial aspect in determining the validity of a study model. It assesses the extent to which a concept in the model differs from other constructs [24]. To establish discriminant validity, several factors are considered, including cross-loadings, the Fornell-Larcker criterion, and the Heterotrait-Monotrait ratio of correlations (HTMT). According to Hair et al. [25], a measurement model demonstrates discriminant validity when indicators exhibit high factor loadings on one latent variable and low factor loadings on other latent variables. In this study, the measurement model was evaluated using these criteria to indicate that the study's measurement model has achieved discriminant validity.
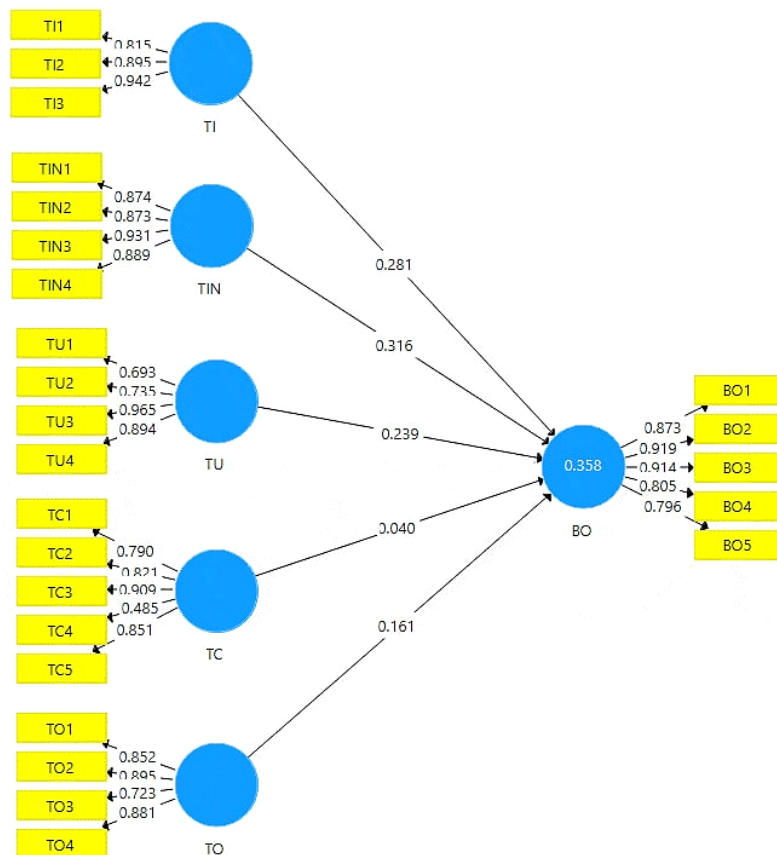
According to the Fornell-Larcker criterion, discriminant validity is established when the AVE square root for each latent variable is higher than the correlation coefficient values between the latent variable and any other latent variable in the model [26]. Based on the analysis, all the AVE square root values for each latent variable were greater than the correlation coefficient values for each latent variable. Additionally, the study also employed the HTMT analysis to further examine the discriminant validity of the measurement model. As per Kline [27], to establish discriminant validity, the calculated HTMT values should be less than 0.85. Based on the analysis, all the calculated HTMT values were less than 0.85. This indicates that the measurement model for this study has achieved discriminant validity.

4-3- Structural Model Assessment

The structural model for the correlations between the constructs of the hypothesized model is presented in Figure 2 and Table 5, which includes the values of all path coefficients, P values, and T statistic values. The analysis indicates that technology insecurity (TIN) (β= 0.316, p =0.008), technology invasion (TI) (β= 0.281, p =0.004), and technology uncertainty (TU) (β= 0.239, p =0.042) have a positive and significant influence on burnout. Additionally, technology overload (TO) (β= 0.161, p =0.099) has a partial and significant influence on burnout, whereas technology complexity (TC) (β= 0.040, p =0.833) does not have a significant influence on burnout. Furthermore, the results reveal that technology complexity, technology insecurity, technology invasion, technology overload, and technology uncertainty collectively account for 35.8% of the variance in burnout.

Table 4. CA, CR and AVE of the variables

Item Code	Item Loadings	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
BO1	0.864			
BO2	0.913			
BO3	0.913	0.914	0.936	0.746
BO4	0.814			
BO5	0.807			
TU1	0.713			
TU2	0.748	0.870	0.900	0.695
TU3	0.958			
TU4	0.890			
TI1	0.814			
TI2	0.896	0.864	0.916	0.784
TI3	0.942			
TC1	0.790			
TC2	0.820			
TC3	0.906	0.876	0.884	0.613
TC4	0.485			
TC5	0.852			
TIN1	0.874			
TIN2	0.873	0.915	0.940	0.796
TIN3	0.931			
TIN4	0.890			
TO1	0.851			
TO2	0.894	0.867	0.905	0.706
TO3	0.721			
TO4	0.882			

Figure 2. Structural model

4-4- Hypothesis & Moderation Testing

The results of the hypothesis testing of the direct influence of TS creator constructs on academics' burnout are presented in Table 4. The analysis indicates that hypotheses H1b, H1c, and H1d are supported, and H1d is partially supported. However, hypothesis H1e did not receive sufficient statistical support.

Table 5 presents the moderating effects of TS inhibitors—literacy facilitation (LF), technology support (TS), and involvement facilitation (IF)—on academics' burnout. The results of the analysis indicate that the LF construct significantly moderates the relationship between TU and BO (β=0.206, p=0.006). Meanwhile, the IF construct significantly moderates the relationship between TIN and BO (β=0.166, p=0.05). The effect size (f^2) of the moderating constructs was also calculated, and according to Cohen's (1988) criteria, it is considered small (f^2=0.031). The moderation test shows that the TS inhibitor constructs (i.e., IF and LF) were able to reduce the R^2 value from 0.239 to 0.206 (TU → LF → BO) and from 0.316 to 0.109 (TIN → IF → BO), respectively.

Table 5. Path coefficient, T statistics, P values and hypothesis results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	HypothesisResults
TC → BO	0.042	0.015	0.205	0.205	0.838	H1a (Not supported)
TIN → BO	0.315	0.293	0.114	2.755	0.006	H1b (Supported)
TI → BO	0.284	0.276	0.101	2.805	0.005	H1c (Supported)
TO → BO	0.159	0.157	0.096	1.652	0.099	H1d (Partially supported)
TU → BO	0.241	0.201	0.118	2.031	0.042	H1e (Supported)
Literacy Facilitation (H2a)						
TIN → LF → BO	0.205	0.075	0.241	0.851	0.198	Not supported
TI → LF → BO	0.070	0.060	0.159	0.447	0.662	Not supported
TU → LF → BO	0.206	0.241	0.025	2.77	0.006	Supported
Technology Support (H2b)						
TIN → TS → BO	0.146	0.006	0.163	0.896	0.185	Not supported
TI → TS → BO	0.049	0.008	0.15	0.325	0.373	Not supported
TU → TS → BO	0.183	0.194	0.121	1.513	0.065	Not supported
Involvement Facilitation (H2c)						
TIN → IF → BO	0.166	0.201	0.124	1.996	0.05	Supported
TI → IF → BO	0.049	0.008	0.15	0.325	0.373	Not supported
TU → IF → BO	0.165	0.071	0.217	0.759	0.224	Not supported

However, the moderation test of TS on the relationship between TU, TIN, and TI on academics' burnout did not receive sufficient statistical support. TS was not able to significantly moderate any of the tested relationships, thereby Hypothesis 2a was not supported.

5- Discussion

The primary aim of this study is to examine the influence of TS creators on academics' burnout when using online learning platforms and assess how TS inhibitors moderate academics' burnout in Malaysian universities.

The study findings indicate that TIN, TI, and TU significantly predict the level of TS that can lead to academics' burnout when utilizing online learning platforms. These findings align with prior research [10, 12, 14]. According to Califf and Brooks [10], academics experience stress when they perceive their personal lives are being encroached upon through online teaching (i.e., TI), as prolonged online working hours blur the boundaries between home and work life. During the COVID-19 pandemic, academics were required to conduct the majority of their teaching, research, and administrative tasks virtually. Spending extensive time attending online classes, research meetings, and college sessions led many academics to feel their personal lives were intruded upon, causing stress and eventual burnout.

Similarly, TU was found to significantly elevate stress levels among academics. This is consistent with prior research [12]. According to Ungku Ahmad et al. [12], the constant introduction of new technology or rapidly changing requirements can lead to confusion and frustration. However, this study's results contradict those of Califf and Brooks [10], which empirically demonstrated that TU is not a significant predictor of TS in K-12 teachers' burnout. One plausible explanation for this discrepancy is the uncertainty surrounding the implementation of online teaching during the pandemic period. The delivery of online teaching depends not only on the abilities and capabilities of academics but

also on various factors such as the availability of students' computing infrastructure and the computing skills of both students and instructors. This uncertainty made task completion challenging and contributed to academics' burnout.

Additionally, TIN significantly contributed to TS and academics' burnout. This is consistent with previous studies [10, 14]. According to Califf & Brooks [10] and Li & Wang [14], academics experience stress when they fear their capability to use new technology and complete tasks effectively. During COVID-19, academics were often required to troubleshoot problems independently, with limited access to IT support channels, fostering feelings of insecurity and burnout.

The study found that TO partially influenced burnout. This finding aligns somewhat with Califf and Brooks [10] and Ungku Ahmad et al. [12]. According to Ungku Ahmad et al. [12], academics experience stress when tasked with overwhelming responsibilities beyond necessity. The partial significance observed may be attributed to differences in demands between public and private universities in Malaysia, each governed differently and with varying priorities. Further investigations into these differences are warranted to elucidate why TO failed to fully predict TS and hence academics' burnout.

In contrast, TC exhibited no significant impact on academics' burnout, which is consistent with Califf & Brooks [10]. According to Califf & Brooks [10], the online learning complexity is not sufficiently challenging to affect task completion. Demographic data analysis revealed that most respondents in this study possessed good to excellent computing skills, potentially explaining the non-significant relationship between these constructs.

Meanwhile, the moderation tests indicated that LF and IF constructs significantly moderate the relationship between TU and TIN, hence mitigating academics' burnout. These results are consistent with previous studies [1, 14]. According to Zhao et al. [1], the feeling of burnout can be mitigated when the university management is able to provide sufficient information about the technology and process of using the technology (i.e., LF). Sufficient distribution of information is important to reduce uncertainty and insecurity. This finding is also supported by Li & Wang [14], where the authors emphasize that IF can mitigate by making academics feel more involved in the decision-making process, hence making them more familiar with technology from the outset and making the technology fit more with their work.

However, these constructs (LF and IF) did not significantly moderate the relationship between TI and burnout. Two possible reasons that may contribute to these findings are: 1) COVID-19 caught many by surprise, and many universities focus more on how to survive by shifting their operations to online settings. As we know, LF is a mitigation mechanism that focuses on increasing academics' know-how and knowledge to avoid the feeling of burnout. During this period, many universities put less focus into providing the academics with a 'work-life' environment. During the pandemic, academics were forced to bring their work home and be available when needed. Academics believe that their private lives were invaded due to the overwhelming use of technology. Further, during this period very limited training sessions were provided to help academics handle this situation; 2) IF can have a positive effect on the feeling of TIN and burnout by promoting active participation and engagement of academics during the technology adoption process. Perhaps during this period, the academics do not have a sense of control or ownership over the technology being implemented in their work. This can lead to feelings of frustration and helplessness, which in turn can contribute to feelings of burnout.

Further, the research finding shows that IF was not able to moderate the relationship between TU and BO. One plausible reason for this is that the academics involvement in decisions related to online teaching is limited. To some extent, they were not invited to discuss or raise their concern about the operations and adoptions of the online learning platform. This is in line with Li & Wang [14], in which the authors posit that when the needs and requirements of the academics are not incorporated in the decision-making process, the feeling of uncertainty and burnout will increase. The academics need to be well informed of possible changes related to their work and associated benefits and challenges that they might face in order to ease the feeling of uncertainty and negativity.

Finally, the TS construct was not able to mitigate academics' burnout for all tested relationships. One plausible reason for this is that during the data collection period, Malaysia was still under the control of the movement order. The majority of Malaysians are working from home. Due to this, most of the IT support services in universities are disrupted. According to Lederer et al. [28], during the COVID-19 pandemic, many higher education institutions are struggling to provide decent support services to their customers (i.e., students and academics). Institutions are struggling to rapidly switch from offline to online. Hence, many academics and students suffer mentally due to this.

6- Conclusions

In this study, our investigation centers on identifying the determinants of TS that lead to academics' burnout when utilizing online learning platforms. The results reveal that academic TS is significantly influenced by technology insecurity, invasion, and uncertainty. Additionally, technology overload exerts a partial influence on academic TS, while technology complexity does not significantly impact academic TS. Moreover, the research findings highlight the significant impact of literacy and involvement facilitation in mitigating academics' burnout. However, the technology support construct does not significantly alleviate academics' burnout using online learning platforms.

Theoretically, this study makes a significant contribution by delving into unexplored territory within existing literature. It extends the existing body of knowledge by scrutinizing the impact of TS creators and the mitigating influence of TS inhibitors on academics' burnout using online learning platforms. The empirical evidence from this study confirmed that the predictive ability of TS creator and TS inhibitor constructs is context-specific and will have different dynamics when applied in different research settings.

Practically, this study contributes by providing guidelines for university management formulating suitable strategies to help academics overcome their feeling of burnout when using online learning platforms. Based on these findings, it is imperative to underscore that academics' burnout can be mitigated through the following strategies:

- Universities should implement ongoing training programs focused on online learning instructions. These programs should prioritize equipping academics with the necessary skills and knowledge related to emerging technologies, ensuring they remain technologically proficient. Additionally, these programs should aim to enhance academics' digital literacy and promote a user-friendly approach to digital education.

- Universities should involve academics in the decision-making process. By providing channels for expressing feedback and concerns, management teams can substantially reduce technology uncertainty and, consequently, mitigate burnout. Leveraging the expertise available within the university community leads to more inclusive and well-rounded decisions. To enhance this process, conducting sentiment analyses and organizing periodic town hall meetings are invaluable. These initiatives not only deepen the understanding of others' sentiments within the community but also demonstrate a genuine commitment to valuing diverse opinions.

The interpretation of the findings is subject to the following limitations: First, the concern relating to the sample size, which can lead to generalization issues. As discussed in the data collection section, this study was conducted during the COVID-19 pandemic. The strict order movement control in Malaysia limited the ability of the researchers to collect more data from various data sources. Second, this study was conducted in a single country and did not consider cultural and organizational differences between different countries. According to Kupang et al. [15], TS creators and inhibitors is a multi-dimensional construct. Using a suitable theoretical framework can provide a more comprehensive understanding of TS creators and mitigators. Finally, this study uses a cross-sectional research design. Through this design, it is difficult to obtain causal relationships between TS creators, inhibitors, and burnout.

To address these limitations, future researchers should consider employing a probability sampling technique to enhance the generalizability of their findings. Increasing the sample size can also improve the predictive power of the proposed research model. Additionally, it is advisable for future researchers to construct their research model based on established theoretical frameworks, such as the Job Demands-Resources Model by Demerouti et al. [29] and the Person-Environment Fit Model by Naylor et. al. [30]. By integrating these models, researchers can gain insights into how task demands contribute to job stress and how task misfit can exacerbate stress, as suggested by Kupang et al. [15]. Furthermore, this integration can further identify determinant factors and potential avenues for mitigation strategies. Finally, adopting a longitudinal research design can help confirm the causal relationships between TS creators, inhibitors, and burnout over time.

7- Declarations

7-1- Author Contributions

Conceptualization, K.F.B.H. and F.B.T.; methodology, K.F.B.H.; formal analysis, K.F.B.H.; resources, A.R. and S.A.M.Y.; writing—original draft preparation, K.F.B.H. and F.B.T.; writing—review and editing, K.F.B.H., F.B.T., A.R., and S.A.M.Y. All authors have read and agreed to the published version of the manuscript.

7-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7-4- Institutional Review Board Statement

Not applicable.

7-5- Informed Consent Statement

Not applicable.

7-6- Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Appendix I

Variable	Items	Author
Technology Overload (TO)	I am forced by this technology to do more work than I can handle	[19]
	I am forced by this technology to work with very tight time schedules	
	I am forced to change my work habits to adapt to new technologies.	
	I have a higher workload because of increased technology complexity	
	I have to be in touch with my work even during my vacation due to this technology	
Technology Invasion (TI)	I have to be in touch with my work even during my vacation due to this technology	[19]
	I have to sacrifice my vacation and weekend time to keep current on new technologies.	
	I feel my personal life is being invaded by this technology	
Technology Complexity (TC)	I do not know enough about this technology to handle my job satisfactorily	[19]
	I need a long time to understand and use of the new technologies	
	I do not find enough time to study and upgrade my technology skills.	
	I find new recruits to this university know more about computer technology than I do.	
	I often find it too complex for me to understand and use new technologies	
Technology Insecurity (TIN)	I feel constant threat to my job security due to new technologies	[19]
	I have to constantly update my skills to avoid being replaced	
	I am threatened by co-workers with newer technology skills.	
	I feel there is less sharing of knowledge among co-workers for fear of being replaced	
Technology Uncertainty (TU)	There are always new developments in the technologies we use in our university	[19]
	There are constant changes in computer software in our university	
	There are constant changes in computer hardware in our university	
	There are frequent upgrades in computer networks in our university	
Literacy facilitation (LF)	The university emphasizes teamwork in dealing with new technology-related problems	[20]
	The university provides end-user training before the introduction of new technology	
	The university fosters a good relationship between IT department and end users	
	The university provides clear documentation to end users on using new technologies.	
Technical support (TS)	The university end-user help desk is well staffed by knowledgeable individuals	[20]
	The university end-user help desk is easily accessible.	
	The university end-user help desk is responsive to end-user requests	
Involvement facilitation (IF)	Academics are rewarded for using new technologies	[20]
	Academics are consulted before introduction of new technology	
	Academics are involved in technology change and/or implementation	
Burnout (BO)	I feel emotionally drained from my work	[10]
	I feel burned out from my work	
	I feel fatigued when I get up in the morning and have to face another day on the job	
	I feel frustrated by my job	
	Working with people around me (students, staff and other academics) directly puts too much stress on me	