

## UNVEILING GENDER DIFFERENCES: THE IMPACT OF TECHNOSTRESS ON STUDENT SATISFACTION IN ONLINE LEARNING ENVIRONMENTS

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### **Abstract**

This research investigates the moderating role of gender in the association between technostress and student satisfaction in the context of online learning. Despite the benefits that are offered by the advances of ICT, difficulties in adapting to and excessive use of technology can lead to technostress and impact the well-being of university students and their learning environment. Employing a quantitative approach, the questionnaires were distributed to the students at Universiti Teknologi MARA (UiTM), resulting in 234 valid responses. The research employs a comprehensive framework encompassing four key predictors: techno-overload, techno-complexity, techno-insecurity, and techno-uncertainty. Utilising Structural Equation Modeling (SEM) through AMOS 27.0, the study reveals a significant negative correlation between technostress and student satisfaction, emphasising the impact of technology on the overall learning experience. Notably, female students show a heightened vulnerability to technostress-induced dissatisfaction compared to males, highlighting the need

for diverse perspectives in designing online learning environments. The study underscores the importance of user-centric design in creating a conducive online learning environment. Focusing on user-friendly interfaces and continuous technology integration can mitigate student stress, enhancing satisfaction. This research contributes a validated technostress model for exploring its nuanced effects on student satisfaction. Importantly, this study highlights that these effects can differ significantly for male and female students. Educational institutions and policymakers stand to gain valuable insights from this research, enabling them to optimise online learning environments in a manner that caters to the diverse needs of all students.

*Keywords:* Gender; student satisfaction; technostress; university students

### **Abstrak**

Kajian ini menyelidiki peranan moderasi jantina dalam hubungan antara tekanan teknologi dan kepuasan pelajar dalam konteks pembelajaran dalam talian. Walaupun kemajuan ICT menawarkan banyak manfaat, kesukaran dalam penyesuaian dan penggunaan teknologi secara berlebihan boleh mengakibatkan tekanan teknologi serta menjejaskan kesejahteraan pelajar universiti dan persekitaran pembelajaran mereka. Dengan menggunakan pendekatan kuantitatif, soal selidik telah diedarkan kepada pelajar di Universiti Teknologi MARA (UiTM), menghasilkan 234 maklum balas yang sah. Penyelidikan ini menggunakan rangka kerja komprehensif yang merangkumi empat pemboleh ubah utama: beban teknologi, kerumitan teknologi, ketidakselamatan teknologi, dan ketidakpastian teknologi. Menggunakan Pemodelan Persamaan Berstruktur (SEM) AMOS 27.0, kajian ini menunjukkan korelasi negatif yang signifikan di antara tekanan teknologi dan kepuasan pelajar, menekankan impak teknologi terhadap pengalaman pembelajaran secara keseluruhan. Pelajar perempuan menunjukkan rasa tidak puas hati yang lebih tinggi yang disebabkan oleh tekanan teknologi berbanding dengan pelajar lelaki, yang mana ia memerlukan kepada pendekatan melalui pelbagai perspektif dalam merancang persekitaran pembelajaran dalam talian. Kajian ini menekankan kepentingan reka bentuk yang memfokuskan pengguna dalam menciptakan persekitaran pembelajaran dalam talian yang kondusif. Dengan memberikan tumpuan kepada pendekatan yang mudah dan mesra pengguna serta integrasi teknologi secara berterusan, ia dapat mengurangkan tekanan dan seterusnya meningkatkan kepuasan pelajar. Penyelidikan ini menyumbang kepada kesahihan model tekanan teknologi dalam meneroka kesan yang efektif terhadap kepuasan pelajar. Secara keseluruhan, kajian ini menunjukkan terdapat kesan signifikan yang berbeza bagi pelajar lelaki dan perempuan. Penyelidikan ini akan

memberikan manfaat kepada institusi pendidikan dan pembuat dasar, membolehkan mereka mengoptimalkan persekitaran pembelajaran dalam talian dengan cara memenuhi pelbagai keperluan pelajar.

*Kata kunci:* Jantina; kepuasan pelajar; tekanan teknologi; pelajar universiti

## 1.0 INTRODUCTION

Accessibility and academic performance are greatly affected by the prevalence of information and communication technology (ICT) in education today (Al-Ansi et al. 2021). Despite the benefits that are offered by the advances of ICT, difficulties in adapting to and excessive use of technology can lead to technostress, which can manifest as mental and physical health problems (Setyadi et al. 2017; White, 2023). The COVID-19 pandemic in Malaysia has led to a sudden transition which has caused difficulties for many students leading to technostress and eventually impacting their academic performance (Rafsanjani et al. 2023). A rapid shift in online learning was forcing university students to adapt to technology and online learning platforms (Chung et al. 2020).

Technostress is defined as the negative psychological response to the challenges of using complex technology (Nimrod, 2018), which can detrimentally impact the well-being of university students and their learning environment (Penado Abilleira et al. 2020; Wang et al. 2020). As the rapid use of ICT in higher education continues, the potential for technostress is increase particularly high, especially with the widespread adoption of online learning environments (Qi, 2019). This situation is worrisome because student satisfaction is seen as one indicator of retention and dropout rates in e-Learning (Pillai et al. 2021). The students are spending extra hours when engaging in online classes and assessments, thus, investigating the impact of technostress on their well-being and satisfaction with online learning becomes crucial.

Research specifically focused on technostress and its impact on university students remains scarce, indicating the importance of investigating its effects within this unique academic environment (Perera, 2021). Understanding the role of technology plays a significant influence on academic satisfaction that could enhance the quality of higher education graduates (Adams et al. 2020; Memon et al. 2022). Therefore, this study investigates four key techno-stressors, also known as factors contributing to technostress (Tarafdar et al. 2010); first, techno-overload, where users face excessive information and

multitask across multiple applications, leading to rushed work and inefficient information processing (Setyadi et al. 2017). Secondly, techno-complexity refers to difficulty in learning and using ICT due to various applications, functions, and technical jargon (Tarafdar et al. 2010). Meanwhile, techno-insecurity users experience discomfort and insecurity related to job security and maintaining adequate technological skills (Li & Wang, 2021). Then, techno-uncertainty is concerned about the pace of technological change and the constant need for skill updates (Rafsanjani et al. 2023; Tarafdar et al. 2010)

Besides, it is crucial to examine the potential moderating role of gender: male and female students may experience and respond to technostress differently, affecting their overall satisfaction (Qi, 2019; Upadhyaya, 2020). It remains unclear if gender plays a significant role in technostress or satisfaction with technical support in online classes.

## 2.0 MATERIALS AND METHODS

The conceptual framework of this study examines the relationship between technostress (TS) and student satisfaction (SS) in online learning in the context of Open and Distance Learning (ODL). Technostress is assessed through dimensions such as techno-complexity (TC), techno-insecurity (TIS), techno-overload (TOL), and techno-uncertainty (TU). The study proposes that technostress significantly influences student satisfaction with online learning during ODL mode. Besides, this study investigates the moderating role of gender as proposed by the Unified Theory of Acceptance and Use of Technology (UTAUT) theory, which was introduced by Venkatesh et al. (2003), to determine whether there is a significant gender difference between technostress and student. Eventually, the research is looking forward to contribute to a deeper understanding of how technostress impacts student satisfaction with online learning in ODL environments. By examining the potential moderating effect of gender, the study aims to disclose any differences in the technostress-satisfaction relationship between male and female students.

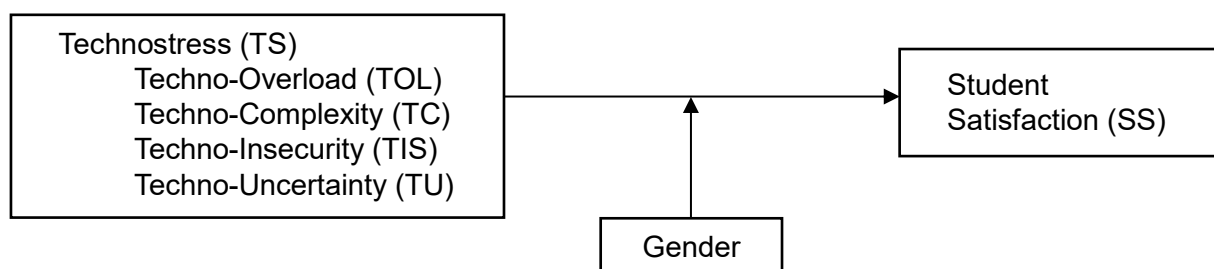


Figure 1. Conceptual framework of relationship between technostress and student satisfaction

## **2.1 Instruments**

The research instrument utilized in this study was adapted from existing work by Aziz et al. (2021), Aziz and Yazid (2021), and Aziz et al. (2023), ensuring its reliability and validity within the ODL context (Aziz et al. 2023). The survey was divided into three sections: The first Section is to assess the influence of technostress on student satisfaction and online learning acceptance using 19 items. Participants were evaluated across four technostress dimensions: techno-overload, techno-complexity, techno-insecurity, and techno-uncertainty. Meanwhile, the second section is to measure student satisfaction with online learning through 7 items. All questions used a 10-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (10). Then, the last section gathered demographic information with 10 items, including gender, age, faculty affiliation, educational level, UiTM branch, and area of residence during ODL attendance.

## **2.2 Data collection**

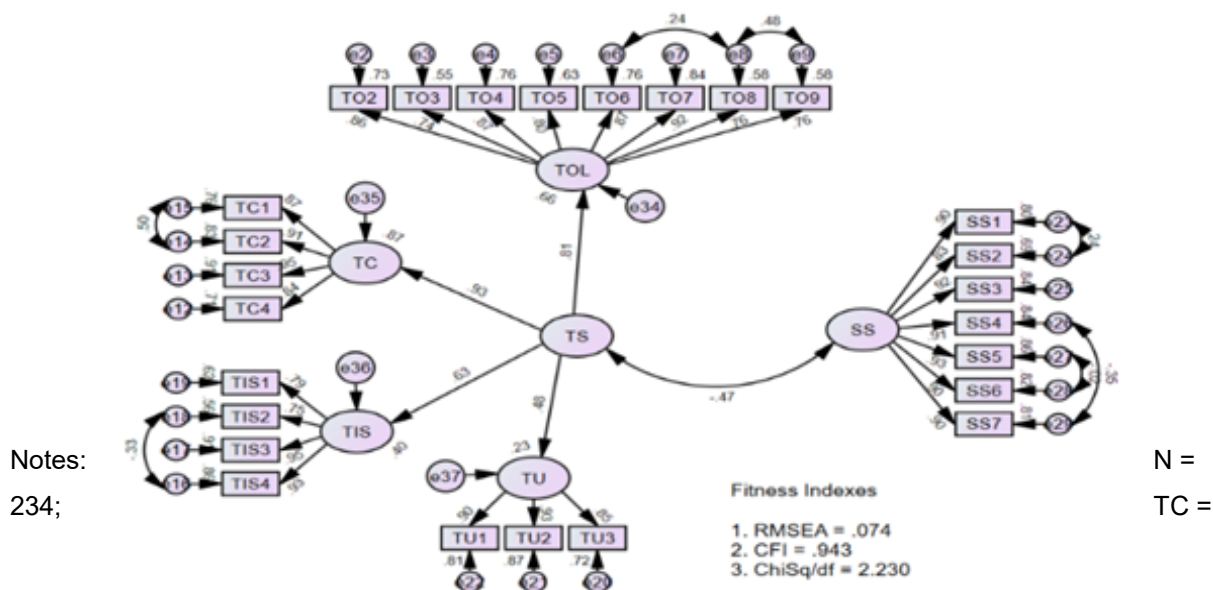
This study involved undergraduate students from Universiti Teknologi MARA (UiTM) Malaysia, aged 18 to 21. All participants were enrolled in bachelor's degree programs and were in their hometowns due to the Malaysian government's Movement Control Order (MCO) implementing Open and Distance Learning (ODL). This study used simple random sampling techniques as all the students have the same probability of facing issues on technostress. The sample comprised 51.7% females (121 respondents). Regarding residence, 47.0% were from urban areas, 29.0% from suburban areas, and 24.0% from rural areas.

## **3.0 RESULTS**

### **3.1 Confirmatory Factor Analysis (CFA)**

A confirmatory factor analysis (CFA) was conducted to evaluate the model's goodness-of-fit indices and assess the unidimensionality of each construct. The results of the CFA for the 26 items across the five-factor scale are illustrated in Figure 2 and detailed in Table 1. Each item within the techno-overload, techno-complexity, techno-insecurity, techno-uncertainty, and student satisfaction constructs was specified to load onto its corresponding factor.

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Techno-Complexity; TIS = Techno-Insecurity; TOL = Techno-Overload; TU = Techno-Uncertainty; TS = Technostress; SS = Student Satisfaction

Figure 2. The results of confirmatory factor analysis on factors related to technostress

Figure 2 and Table 1 show that the goodness index of the proposed model of student satisfaction and acceptance towards online learning fits the data reasonably well as confirmed by the root mean square error of approximation (RMSEA) = .074; comparative fit index (CFI) = .943; and chi-square degree of freedom (ChiSq/df) = 2.230. The value of this index proposes that the model is appropriate and can be utilised for further analysis.

Table 1. Goodness-of-fit indices of the proposed model of student satisfaction and acceptance

Name of Category	Goodness-of-fit Measures	Acceptable Value	Index Value
Absolute fit	RMSEA	< 0.08	0.074
Incremental fit	CFI	> 0.90	0.943
Parsimonious fit	ChiSq/df	< 3.00	2.230

The strong internal consistency of all constructs is evident from the Composite Reliability (CR) values presented in Table 2. Ranging from 0.814 to 0.968, these values exceed the recommended threshold of 0.60, as suggested by Zainudin (2014). Furthermore, the Average Variance Extracted (AVE) for all constructs surpasses the minimum threshold of 0.5, ranging from 0.537 to 0.799, as per Zainudin's (2014) guidelines. These findings support the convergent validity of the constructs. Therefore, we can conclude that the model

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demonstrates satisfactory construct validity (Zainudin, 2014).

Table 2. The Results of Composite Reliability (CR) and Average Variance Extracted (AVE)

Construct	Items	Factor Loading	Construct Reliability (CR $\geq$ 0.6)	The average variance extracted (AVE $\geq$ 0.5)
Techno-overload (TOL)	TO2	0.86	0.953	0.608
	TO3	0.74		
	TO4	0.87		
	TO5	0.80		
	TO6	0.87		
	TO7	0.92		
	TO8	0.76		
	TO9	0.76		
	Techno-complexity (TC)	TC1		
TC2		0.91		
TC3		0.95		
TC4		0.84		
Techno-Insecurity (TIS)	TIS1	0.79	0.918	0.739
	TIS2	0.75		
	TIS3	0.95		
	TIS4	0.93		
Techno-uncertainty (TU)	TU1	0.90	0.923	0.799
	TU2	0.93		
	TU3	0.85		
Technostress (TS)	TOL	0.81	0.814	0.537
	TC	0.93		
	TIS	0.63		
	TU	0.48		
Student Satisfaction (SS)	SS1	0.90	0.968	0.693
	SS2	0.83		
	SS3	0.92		
	SS4	0.91		
	SS5	0.93		
	SS6	0.90		
	SS7	0.90		

Notes: N = 234; TC = Techno-Complexity; TIS = Techno-Insecurity; TU = Techno-Uncertainty; TOL = Techno-Overload; TS = Technostress; SS = Student Satisfaction

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Table 3: Discriminant validity

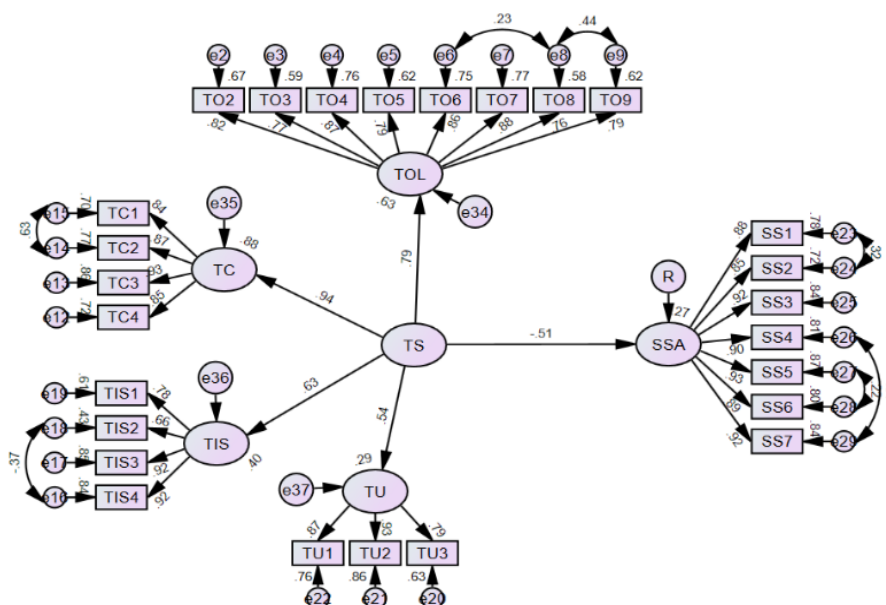
	Technostress	Student Satisfaction
Technostress	<b>0.732</b>	
Student Satisfaction	0.470	<b>0.832</b>

Notes: N = 234; TS = Technostress; SS = Student Satisfaction; the diagonal values (bolded) represent the square root of the average variance extracted (AVE). The off-diagonal values denote the correlations among constructs, extracted from Figure 2.

Table 3 displays the correlation values among the constructs. Notably, the bolded diagonal values surpass the correlation values in the corresponding rows and columns, indicating the model meets the discriminant validity criteria. Specifically, each construct's bolded square root of the average variance extracted (AVE) exceeds the correlation values with all other constructs, as recommended by Zainudin (2014). These results affirm the presence of discriminant validity in the model. Overall, the model exhibits a robust fit to the observed data, substantiated by significant path coefficients and satisfactory reliability and validity measures, as outlined by Zainudin (2014).

### 3.2 Structural Equation Modelling

The outcome of the coefficient of determination ( $R^2$ ) is depicted in Figure 3. The dimension value for technostress is 0.27, indicating a weak relationship. This suggests that 27% of the variability in the technostress dimension can be explained by the variables considered in this research, while the remaining variance is attributed to factors beyond the scope of this study.





Notes: N = 234; TC = Techno-Complexity; TIS = Techno-Insecurity; TU = Techno-Uncertainty; TOL = Techno-Overload; TS = Technostress; SS = Student Satisfaction

Figure 3. The standardised path coefficients (Direct Relationship)

The results in Figure 3 and in Table 4 reveal a notable and statistically significant negative association between technostress and student satisfaction ( $\beta = -0.877$ ,  $p = 0.000$ ). This finding suggests that as technostress increases due to the use of technology in ODL, student satisfaction towards ODL decreases.

Table 4. The standardised regression weights and its significance

	Estimate	SE.	CR.	P	Results	Hypothesis
TS→SSA	-.877	.063	-13.84	.000	Significant	Supported

### 3.3 Moderating Testing

The moderation analysis was conducted to scrutinise the role of gender in the relationship between technostress and student satisfaction has revealed noteworthy findings, as delineated in Table 5. Specifically, there is a notable variance in the chi-square values and degrees of freedom between the constrained and unconstrained models for the male group. The chi-square difference (139.83, DF = 1) surpasses the critical value of 3.84 (DF = 1), signifying a substantial moderation effect of gender on the technostress-student satisfaction association for male students.

Table 5. Results of the moderation test for the group of male students related to technostress

	Constrained model	Unconstrained model	Chi-square difference	Result of moderation test	Hypothesis
Chi-square	779.80	639.97	139.83	Significant	Supported
DF	228	287	1		

The moderation analysis for the group of females revealed that the chi-square difference between the constrained and unconstrained models was 159.47 with a degree of freedom of 1, as presented in Table 6. This difference exceeded the critical value of 3.84 (DF = 1), indicating a significant moderation effect of gender on the relationship between technostress and student satisfaction for female students. Thus, the results indicate partial moderation for both the male and female groups.

Table 6. Results of the moderation test for the group of female students related to technostress

	Constrained model	Unconstrained model	Chi-square difference	Result of moderation test	Hypothesis
Chi-square	715.68	556.20	159.47	Significant	Supported
DF	288	287	1		

In order to further examine the moderation effect of gender, parametric testing was conducted. The results, presented in Table 7, indicate that for the group of males, the standardised parameter estimate was -0.767 ( $p = 0.000$ ), while for the group of females, it was -0.823 ( $p = 0.000$ ). These findings confirm that the influence of technostress on student satisfaction is significant for both genders, with a stronger impact observed in the female group. It can be concluded that technostress has a negative effect on student satisfaction, with the effect being more pronounced in the female group.

Table 7. The moderation effect of gender on student satisfaction for a group of male and female students

Group	Hypothesised path	Estimate	SE.	C.R.	p-value	Results
Male Students	TS→SS	-.767	.121	-6.335	.000	Significant
Female Students	TS→SS	-.823	.126	-6.532	.000	Significant

Notes: TS denotes technostress; SS denotes student satisfaction.

## 4.0 DISCUSSION

### 4.1 Technostress and Student Satisfaction

The main objective of this study was to examine the impact of technostress on student satisfaction in online learning. The findings revealed that technostress is negatively related to student satisfaction, highlighting the importance of understanding the influence of technostress on online learning success. The technology can elicit negative emotions and decrease satisfaction and affect students' performance.

Despite the benefit of ICT's role in achieving online learning objectives through improving productivity, efficiency, and idea exploration (Li & Wang, 2021), incorporating ICT also could increase student's and lecturer's workload, and requires continuous improvement of ICT skills. The complexity of teaching and learning processes with ICT integration can lead to insecurity, distraction, anxiety, and decreased work performance (Skaalvik & Skaalvik, 2017; Kot, 2022). Besides, our study demonstrates that techno-overload, techno-insecurity, techno-uncertainty, and techno-complexity impact student satisfaction in online learning. Technology often pushes students to complete tasks quickly, resulting in self-induced stressors that can affect relationships and potentially lead to adverse health conditions (Apple & Mills, 2022).

There are some suggestions from a few scholars that can be used to mitigate the negative impact of technostress on student satisfaction. For example, to develop proper plans and schedules to complete academic work with sufficient time while maintaining a balanced lifestyle (Schauffel et al. 2022; Tarafdar et al. 2015). Besides, the management of the HEIs could plan academic work to avoid excessive workloads, reduce time pressure and avoid inflexible schedules, especially considering techno-invasion and techno-overload to mitigate the technostress. By implementing user-friendly educational technology and offering targeted training sessions, particularly targeted towards female students, has been shown to mitigate technological complexity (Tarafdar et al. 2015). The HEIs can utilise the technostress instrument to identify students at high risk of technostress and provide guidance to minimise it and improve their academic performance. By assigning peer mentors to students that are struggling in adapting the technology for online learning, and promoting technology education and training programs, could reduce the technostress among the student and enhance student performance and satisfaction (Graves & Karabayeva, 2020; Li & Wang, 2021; Upadhyaya, 2020), and integrating technical support and facilitation services, which have been effective in

reducing technostress among university teachers. Fostering positive relationships, effective planning, and accommodating asynchronous and synchronous work can alleviate stress in online group work (Yulia, 2020).

#### **4.2 Gender differences in technostress and student satisfaction**

The second objective of this study is to examine if gender differences play a significant role in moderating the relationship between technostress and student satisfaction in online learning. The results indicate that technostress has a significant negative effect on student satisfaction for both male and female students, with females experiencing a stronger impact. The male students were found to have stronger effects of techno-overload and techno-invasion, while female students experienced higher levels of techno-complexity and techno-uncertainty. These results provide some evidence, suggesting that male students are more focused on the extrinsic aspects of technology use and experience decreased technostress as their confidence in using computers increases. This finding is consistent with previous studies (Jena & Mahanti, 2014; Morales-Rodríguez, 2021) that highlight the influence of gender differences on technostress. Consequently, gender differences in technostress have also been found to affect academic performance (Azman & Yusoff, 2018).

Interestingly, despite higher levels of computer anxiety and greater use of social media, female students exhibit more self-control and the perception of computer self-efficacy, which significantly influences their perceived accomplishment and enjoyment in blended learning environments (Dang et al. 2016; Seman et al. 2019). The other studies also have shown that female students have more optimistic attitudes toward technology use (Egbo et al. 2011; Mabrouk & Genedy, 2019; Raman et al. 2014;). Increasing computer self-efficacy has been associated with higher student persistence and willingness to invest effort in blended learning (Li & Wang, 2021).

Thus, understanding gender differences in technostress within online learning environments is crucial for creating supportive and effective educational experiences. The male and female students are facing unique challenges which requires educators and institutions to develop strategies that could enhance learning outcomes and student satisfaction. This includes providing targeted training, designing user-friendly platforms, and ensuring robust support systems that cater to the diverse needs of all students (Aziz et al. 2024).

## 5.0 CONCLUSIONS

In conclusion, this study highlights that gender differences play a role in moderating the relationship between technostress and student satisfaction in online learning. Understanding these gender differences is important for managing technostress and enhancing student satisfaction in online learning as well as in fostering a healthy learning environment. Females tend to experience a stronger negative impact of technostress on satisfaction, while males may show specific effects related to different aspects of technostress. This highlights the need for suitable technical support as well as providing sufficient resources to ensure a conducive learning environment for female and male students. It is suggested that the university management should be aware of the potential adverse effects of online learning and take proactive action to mitigate technostress and its impact on academic performance. It is crucial to ensure that users possess the necessary technological readiness and competencies to minimise the harmful effects of technostress, especially among younger students.

This study provided valuable insights into gender difference roles on technostress that impact student satisfaction, however, it is important to acknowledge that the generalisability of the findings is limited to the study population. Future research could replicate the study with larger sample sizes and explore other potential moderating role of personality traits to provide more comprehensive insights.

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