Vol. 10, Issue: 2026

Article ISSN: 2312-2668

International Journal of Information Sciences Management (IJIMS)

Digital Demands, Human Costs: Factors, Effects, and Coping Strategies of Technostress Among English Language University Teachers in Pakistan

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Vol. 10, Issue: 2026

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Abstract

The rapid digitalisation of higher education has transformed teaching practice while introducing a distinct occupational stressor known as technostress. Although interest in this phenomenon has grown internationally, empirical evidence from Pakistani higher education, particularly among English language (EL) teachers, remains scarce. This article synthesises a doctoral study that investigated the factors, effects, and coping strategies of technostress among Pakistani university EL teachers using a pragmatic, sequential explanatory mixed-methods design. Quantitative data were collected from 189 permanent EL teachers in HEC-recognised public, private, and semi-government universities in Punjab using an adapted five-point Likert-scale questionnaire, analysed through descriptive statistics, Pearson correlation, regression, and Hayes' PROCESS macro. A purposive qualitative sample of thirteen teachers with extreme survey responses was subsequently interviewed and analysed thematically using NVivo. Results show that techno-insecurity, techno-complexity, techno-overload, techno-invasion, and techno-uncertainty all significantly predict overall technostress, which in turn negatively affects job satisfaction, classroom performance, and career continuance, with a comparatively weaker effect on institutional commitment. Qualitative findings reveal that technostress is rooted less in technology itself than in unreliable infrastructure, inadequate training, and exclusion from technology decisions, while teachers cope through self-directed learning, peer support, and improvised workarounds. The study extends Technostress Theory and Person-Environment Fit Theory to a developing-country academic context and offers institutions concrete guidance on technical support, digital literacy facilitation, and participatory decision-making to sustain teacher well-being and effective digital transformation.

Received: January 17, 2026
Review Process: February 18, 2026
Accepted: March 11, 2026
Available Online: March 18, 2026

Keywords: *Technostress; English language teachers; Higher education; Technostress creators; Coping strategies*

1. INTRODUCTION

Artificial intelligence and generative technologies have become central to contemporary pedagogy, offering personalised learning, reduced teacher workload, and more comprehensive instruction (Chiu et al., 2023; Lim et al., 2023). Tools such as ChatGPT have altered teaching and learning practices at every level (Tlili et al., 2023), and their integration is especially visible in English language teaching, where technology mediates content delivery, assessment, and communication (Bishop, 2023). Yet the incorporation of new technologies into academic work is rarely frictionless. Teaching has become an increasingly demanding profession (Chaplain, 2008; Skaalvik & Skaalvik, 2016), and the compulsion to adopt digital tools has added a distinct layer of strain to this demand, one that researchers have labelled technostress.

The term technostress was coined by the clinical psychologist Craig Brod (1984) to describe a modern adaptation disorder arising from an inability to cope healthily with new technologies. Tarafdar et al. (2007) reconceptualised it as a state produced when technology forces individuals to work faster, learn continuously, and tolerate uncertainty about tools that are themselves in flux. Ragu-Nathan et al. (2008) operationalised the construct through five "technostress creators": techno-overload (being compelled to work faster and longer because of ICT), techno-invasion (the erosion of boundaries between work and personal life), techno-complexity (the sense that technology is too sophisticated to master easily), techno-insecurity (fear of being replaced by more technologically competent others), and techno-uncertainty (anxiety produced by continuous and unpredictable technological change). These dimensions have since anchored most empirical work on the subject (Ayyagari et al., 2011; Tarafdar et al., 2010).

Within higher education, the shift to online and technology-mediated instruction during the COVID-19 pandemic intensified these pressures considerably (Sokal et al., 2020; Strielkowski, 2020). English language teachers occupy a particularly exposed position: their work is now inseparable from learning management systems, computer-assisted language learning tools, corpus and concordancing software, and, increasingly, generative AI applications for content generation and translation (Chiu et al., 2023; Maddigan & Susnjak, 2023). Many EL teachers, trained primarily in humanities and applied linguistics rather than computing, report lower baseline familiarity with such tools, which compounds the psychological cost of adoption (Moorhouse & Kohnke, 2021).

Although technostress has been studied extensively in business, information-systems, and library contexts (Ahmad & Amin, 2012; Tarafdar et al., 2015), and increasingly among school and university teachers elsewhere (Jena, 2015; Joo et al., 2016; Wang & Li, 2019), research specifically situated in Pakistani higher education, and specifically among university EL teachers, remains limited (Shaukat et al., 2022; Siddiqui et al., 2023). This gap matters because technostress is not a uniform phenomenon: its antecedents, severity, and consequences are shaped by local infrastructural realities, institutional cultures, and disciplinary demands (Bourlakis et al., 2023; Li & Wang, 2021).

This article draws on a doctoral thesis that addressed this gap directly. The study pursued three objectives: to investigate the factors of technostress among EL teachers; to examine its effects on job satisfaction, institutional commitment, classroom performance, and career continuance; and to identify the coping strategies, namely technical support, literacy facilitation, and involvement facilitation, that EL teachers adopt. The corresponding research questions asked what factors generate technostress among EL teachers,

how technostress affects their professional outcomes, and how teachers cope with technology-related pressure. Practically, the findings are intended to help university administrators and policymakers design technical support systems, professional development programmes, and participatory technology policies that reduce technostress and safeguard teaching quality (Ragu-Nathan et al., 2008). Theoretically, the study extends Tarafdar et al.'s Technostress Framework, Person-Environment Fit Theory, and the Transactional Theory of Stress into a developing-country higher-education context where such applications remain rare.

2. LITERATURE REVIEW

2.1 Conceptualising Technostress

Brod (1984) first defined technostress as a modern disease of adaptation experienced by people unable to cope healthily with computer technology. Subsequent scholarship broadened the definition: Weil and Rosen (1997) described it as any negative effect on attitudes, thoughts, behaviour, or psychology caused directly or indirectly by technology, while Tu et al. (2005) framed it as an ill effect on human behaviour, belief, and psychology arising from technology use. Ayyagari et al. (2011) and Tarafdar et al. (2007) situated technostress as an adaptation problem stemming from individuals' failure to develop the competencies technology demands. Stress itself has long been understood as a mental and physical strain arising from a mismatch between demands and coping resources (Hansen & Sullivan, 2003; Selye, 1956), and technostress represents its technologically mediated variant.

Tarafdar et al. (2007) identified the five components that remain the field's dominant taxonomy: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. Ragu-Nathan et al. (2008) operationalised these into a validated instrument and additionally proposed technostress inhibitors, namely literacy facilitation, technical support, involvement facilitation, and innovation support, as organisational mechanisms capable of mitigating the creators' negative effects. Salanova et al. (2007, 2013) added that technostress manifests as anxiety, mental fatigue, scepticism, and a sense of inefficacy tied to present or anticipated ICT use, and demonstrated that intensive users experience markedly more strain than infrequent users. Conversely, Shepherd (2004) found that greater technological fluency is associated with reduced technostress, implying a partially remediable relationship between exposure and distress.

2.2 Theoretical Perspectives

Two theoretical traditions dominate technostress research. The Transactional Theory of Stress (Lazarus & Folkman, 1984) frames stress as the product of a transaction between an individual and a demanding environment, distinguishing primary appraisal (judging a demand as threatening) from secondary appraisal (judging one's coping resources) and separating problem-focused from emotion-focused coping. Ragu-Nathan et al. (2008) applied this lineage to derive a linear creators-to-outcomes model of technostress. The second tradition, Person-Environment Fit Theory (Edwards, Caplan, & Harrison, 1998; Edwards & Cooper, 1990), holds that strain arises from misalignment between a person's characteristics and their environment rather than from either alone. Wang and Li (2019) extended this model to university teachers in China, showing that misfit between person and organisation, person and technology, and person and colleagues jointly predicted technostress and reduced job performance, with the effect more pronounced among higher-ranked staff. Ayyagari et al. (2011) integrated technological antecedents directly into the P-E fit framework, a synthesis subsequently used in several pandemic-era education studies (Califf & Brooks, 2020; Qi, 2019).

2.3 Technostress in Educational and Higher-Education Contexts

Empirical work on educators has grown steadily. Jena (2015) found that technostress was strongly associated with lower job satisfaction and institutional commitment among Indian academics. Al-Fudail and Mellar (2008) reported that teachers using classroom technology experienced stress rooted in time pressure, technical failures, inadequate social support, and insufficient basic ICT training. Joo et al. (2016) found that Korean secondary teachers' technostress reduced their intention to use technology in instruction, while Califf and Brooks (2020) reported a comparable negative relationship between techno-stressors and continuance intention among American K-12 teachers. Verkijika (2019) demonstrated that technostress diminished South African adolescents' willingness to use digital textbooks, and Li and Wang (2021) found that techno-complexity, but not techno-overload, significantly reduced Chinese university teachers' work performance.

The COVID-19 pandemic sharply accelerated this literature. Molino et al. (2020) showed that the sudden shift to remote work increased techno-overload and techno-complexity and eroded psychological well-being. Sánchez-Gómez et al. (2023) similarly reported elevated technostress among university lecturers adapting to new digital teaching platforms. Penado Abilleira et al. (2021) linked insufficient technological infrastructure directly to heightened technostress among Spanish university teachers during emergency online instruction, a finding of particular relevance to under-resourced systems.

Within this literature, effects on professional outcomes are well documented. Ragu-Nathan et al. (2008) established an inverse relationship between technostress and job satisfaction; Tarafdar et al. (2007, 2015) linked it to reduced productivity and performance; and Ahmad, Amin, and Ismail (2009) reported adverse effects on organisational commitment among Malaysian academic librarians, consistent with Choi (2024) and Tu, Rao, Jiang, and Dai (2025), who found technostress diminished affective organisational commitment among school and STEM educators, with burnout acting as a mediator. Not all findings agree, however: Hassan et al. (2018) found that techno-uncertainty and techno-insecurity were positively associated with organisational commitment among some teachers, suggesting that moderate technological pressure can, in specific circumstances, heighten a sense of obligation toward an institution rather than eroding it.

Coping and inhibiting mechanisms have also received sustained attention. Wang, Shu, and Tu (2005) demonstrated experimentally that structured training, dedicated technology support centres, and inclusive planning processes each reduced computer-related technostress among Chinese employees. Rohwer, Flöther, Harth, and Mache (2022), synthesising the coping literature, distinguished problem-focused strategies (seeking support, training) from emotion-focused strategies (distancing, venting) and dysfunctional strategies (denial, disengagement), concluding that combining several problem-focused approaches was associated with better health outcomes than relying on a single strategy.

2.4 Technostress in the Pakistani Context

Pakistan-specific research has emerged only recently. Shaukat, Bendixen, and Ayub (2022) examined technostress, work-family conflict, and life satisfaction among 292 Pakistani educators teaching remotely during COVID-19, finding a positive relationship between work-family conflict and life satisfaction that reflected teachers' efforts to manage both domains simultaneously. Siddiqui, Arif, and Hinduja (2023) surveyed 242 educators and found that process-oriented teaching demands and technical difficulties were primary drivers of

technostress, that self-efficacy in computer use was inversely related to technostress, and that technostress increased teachers' inclination to leave the profession. Mushtaque, Waqas, and Awais-E-Yazdan (2022) reported that technostress reduced teachers' willingness to adopt online instruction, an effect moderated by job insecurity. Saleem and Malik (2023) modelled technostress, quality of work life, and job performance among Pakistani university educators, finding that techno-complexity, techno-invasion, and techno-overload harmed quality of work life while organisational flexibility buffered these effects. Saleem, Chikhaoui, and Malik (2024) further showed that instructor and institutional support attenuated the negative relationship between students' technostress and the quality of online learning.

2.4.1 Outcome Constructs: Job Satisfaction, Performance, and Organisational Commitment

The outcome variables examined in this literature draw on well-established organisational-behaviour constructs. Organisational commitment has traditionally been understood through three components: identification with organisational goals, willingness to exert effort on the organisation's behalf, and a desire to remain a member (Mowday, Steers, & Porter, 1979). Meyer and Allen (1991) refined this into affective, continuance, and normative commitment, distinguishing emotional attachment from a calculated recognition of the costs of leaving and from a felt obligation to stay. Applying this lens to technostress research helps explain why the present study, discussed further below, found that Pakistani EL teachers' institutional commitment proved comparatively resistant to technological strain: their attachment appears rooted in affective and normative dimensions tied to professional identity rather than purely in the instrumental, technology-mediated conditions of daily work.

A related construct, negative affectivity, defined as a stable disposition toward experiencing worry, anxiety, and diminished self-esteem across situations (Watson & Clark, 1984), has been proposed as a factor that can confound the stressor-strain relationship, since individuals high in negative affectivity may report elevated stress somewhat independently of objective conditions (Keogh & Reidy, 2000; Spector, Zapf, Chen, & Frese, 2000). While the present study did not directly measure negative affectivity, its theoretical presence is a useful caution against attributing all reported technostress purely to external technological conditions.

2.5 Research Gap

Despite this expanding body of work, three gaps remain salient. First, most studies isolate individual technostress dimensions or single outcomes rather than examining the full creators-to-outcomes chain together with coping strategies within one design. Second, very few studies employ a mixed-methods approach capable of explaining, rather than merely documenting, statistical relationships. Third, no substantial study has focused specifically on university EL teachers in Pakistan, a group whose disciplinary background and heavy reliance on interactive, language-specific digital tools distinguish their experience from that of teachers in STEM or general education fields (Siddiqui et al., 2023; Saleem et al., 2024). The present study was designed to close this gap by jointly examining the factors, effects, and coping strategies of technostress among Pakistani university EL teachers within a single explanatory sequential design.

3. THEORETICAL AND CONCEPTUAL FRAMEWORK

The study's guiding framework is the Technostress Model developed by Ragu-Nathan et al. (2008), extended by Tarafdar et al.'s (2007, 2011) transactional conceptualisation of technostress and complemented by Person-Environment Fit Theory (Edwards et al., 1998). Five technostress creators,

techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty, were treated as the independent constructs producing overall technostress, which in turn was hypothesised to affect four professional outcomes: job satisfaction, classroom performance, institutional commitment, and career continuance. This dependent-variable set was informed by prior applications of the model to educational contexts (Cahapay & Bangoc, 2021; Tagurum et al., 2017). Gender, qualification, university type, and experience were included as demographic variables of interest, consistent with earlier technostress research (Ragu-Nathan et al., 2008; Tarafdar & Ragu-Nathan, 2010).

Based on this framework, the following hypotheses were formulated:

H1: Techno-overload has a significant effect on technostress.

H2: Techno-invasion has a significant effect on technostress.

H3: Techno-complexity has a significant effect on technostress.

H4: Techno-insecurity has a significant effect on technostress.

H5: Techno-uncertainty has a significant effect on technostress.

H6a-d: Technostress has a significant effect on (a) job satisfaction, (b) classroom performance, (c) institutional commitment, and (d) career continuance.

Because the study's third objective, concerning coping strategies, was exploratory, no causal hypotheses were formulated for technical support, literacy facilitation, and involvement facilitation; these were instead examined descriptively in the quantitative phase and explored in depth through qualitative interviews.

4. METHODOLOGY

4.1 Research Design and Philosophy

The study was underpinned by a pragmatic research philosophy, which favours whichever combination of methods best answers the research question rather than committing exclusively to a positivist or interpretivist stance. This philosophical position supported an explanatory sequential mixed-methods design (Creswell & Creswell, 2018), in which a quantitative phase established statistical relationships among variables and a subsequent qualitative phase explained and enriched those results through participants' lived experience.

4.2 Philosophical Paradigm

Consistent with the pragmatic worldview, the study did not commit to a single ontological or epistemological position but instead selected methods according to their fitness for each research question, using quantitative instruments to establish the extent and pattern of relationships and qualitative inquiry to understand their meaning from participants' perspectives. This pragmatic stance is widely regarded as the most natural philosophical home for mixed-methods designs, since it treats the dispute between positivist and interpretivist paradigms as a practical rather than a strictly metaphysical matter, licensing the researcher to combine numerical generalisation with contextual, experience-near explanation within a single coherent study.

4.3 Population and Sample

The target population comprised full-time, permanent EL faculty (lecturers, assistant professors, associate professors, and professors) holding an MPhil or PhD and teaching at HEC-recognised public, private, and semi-government universities in Punjab, Pakistan. Verification against university websites, human resources departments, and professional networks identified 804 active EL faculty from an initial HEC-derived frame of 1,455. Using a standard sample-size formula with a 5 percent margin of error, a target sample of 267 was calculated; the final achieved

quantitative sample was 189 respondents (135 female, 54 male), obtained through convenience sampling because probability sampling was impractical given the geographically dispersed population and restricted access to a complete sampling frame (Farrokhi & Mahmoudi-Hamidabad, 2012). For the qualitative phase, cumulative mean technostress scores were computed for all 189 respondents, and teachers with extreme scores (very high or very low) were purposively selected for semi-structured interviews; thirteen interviews were ultimately analysed, with data saturation reached by the eighth or tenth interview and confirmed through additional interviews.

4.4 Instrumentation

The quantitative instrument was a five-point Likert-scale questionnaire (strongly agree to strongly disagree) adapted from established technostress scales (Fuglseth & Sørebø, 2014; Marchiori et al., 2019; Ragu-Nathan et al., 2008; Tarafdar et al., 2010). It comprised four sections: demographic information; the five technostress dimensions; the psychological, professional, and academic effects of technostress; and the three coping strategies of technical support, literacy facilitation, and involvement facilitation. For the qualitative phase, the researcher developed a semi-structured interview guide aligned with the three research objectives, combining major questions with probing prompts to elicit rich, contextualised accounts of participants' experiences.

4.5 Validity and Reliability

Content and face validity of the questionnaire were established through expert review by university-based specialists and pilot testing with twenty EL teachers in Islamabad. Internal consistency, assessed via Cronbach's alpha following pilot testing, was 0.93, indicating high reliability. The interview guide's validity was similarly confirmed by expert panel review, and its clarity and sequencing were refined through pilot interviews with three EL teachers, following the guidance of Creswell and Creswell (2018) on pre-testing qualitative protocols.

4.6 Data Collection Procedures

Quantitative data were collected via electronic questionnaires (Google Forms) distributed by email to EL faculty across Punjab, supplemented by hard copies delivered to accessible institutions. Qualitative interviews were conducted face-to-face where feasible and by telephone for distant participants, each lasting approximately 25-30 minutes, and were audio-recorded, transcribed verbatim, and stored securely for analysis.

4.7 Data Analysis

Quantitative data were analysed in SPSS using descriptive statistics, normality diagnostics (skewness, kurtosis, and Q-Q plots), Pearson correlation, simple linear regression for each hypothesis, and moderation analysis using Hayes' PROCESS macro (Model 1). Qualitative data were analysed using NVivo 15 following the six-phase thematic analysis procedure of Braun and Clarke (2006): familiarisation, initial coding, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Coding was treated as an interpretive process shaped by the researcher's perspective (Sipe & Ghiso, 2004), and themes were validated through supervisor review to enhance credibility (Saldaña, 2011). Finally, methodological triangulation (Thurmond, 2001; Jonsen & Jehn, 2009) was used to integrate the two strands of evidence, comparing them for convergence, divergence, complementarity, and expansion.

Ethical approval and informed consent procedures were followed throughout: participants were briefed on the study's purpose, participated voluntarily, and were assured confidentiality and anonymity, consistent with standard educational research ethics.

5. RESULTS

5.1 Demographic Profile

Of the 189 quantitative respondents, 135 (71 percent) were female and 54 male. Lecturers formed the largest designation group (n = 126), followed by assistant professors (n = 37), professors (n = 11), and associate professors (n = 10). The majority (n = 127) were affiliated with public-sector universities, compared with 54 from private and 8 from semi-government institutions. Most respondents held a PhD (n = 127) rather than an MS/MPhil qualification, and the largest experience band was 11-15 years (n = 58), followed by 6-10 years (n = 46). Normality diagnostics showed skewness and kurtosis values close to zero across items, and Q-Q plots confirmed an approximately normal distribution, supporting the use of parametric statistical tests.

5.2 Correlational and Regression Findings

Pearson correlation analysis showed that all five technostress dimensions were positively and significantly associated with overall technostress ($p < .001$ in each case): techno-insecurity showed the strongest relationship ($r = .735$), followed by techno-complexity ($r = .665$), techno-overload ($r = .641$), techno-invasion ($r = .580$), and techno-uncertainty ($r = .409$), the weakest but still significant association.

Simple regression analyses confirmed these relationships. Technostress predicted techno-overload ($R^2 = .411$, $\beta = .641$, $t = 11.42$, $p < .001$), techno-invasion ($R^2 = .337$, $\beta = .580$, $t = 9.75$, $p < .001$), techno-complexity ($R^2 = .442$, $\beta = .665$, $t = 12.18$, $p < .001$), techno-insecurity ($R^2 = .541$, $\beta = .735$, $t = 14.84$, $p < .001$), and techno-uncertainty ($R^2 = .168$, $\beta = .409$, $t = 6.14$, $p < .001$). ANOVA results for all five models were statistically significant ($p < .001$), confirming that technostress is a robust predictor across all creator dimensions, with techno-insecurity showing the largest explained variance and techno-uncertainty the smallest.

5.3 Hypothesis Testing Summary

All primary hypotheses were supported. H1 through H5 were each accepted, confirming that techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty each significantly contribute to overall technostress, with techno-insecurity the strongest contributor ($\beta = .735$) and techno-uncertainty the weakest ($\beta = .409$). H6a-d were also supported: technostress had a statistically significant negative effect on job satisfaction, classroom performance, institutional commitment, and career continuance, though, as the discussion below shows, the practical magnitude of the institutional-commitment relationship was smaller and was substantially qualified by the qualitative findings.

5.4 Moderation Analysis

Using Hayes' PROCESS macro (Model 1), moderation analyses examined whether organisational support and incentive-based variables moderated the relationship between technostress and teachers' behavioural intention. All three moderation models were statistically significant, explaining between 41.2 percent and 42.0 percent of the variance in behavioural intention ($F(3,185)$ ranging from 43.21 to 44.61, $p < .001$). These findings indicate that teachers who were more involved in institutional decision-making regarding technology, and who perceived greater organisational support, were better equipped to manage the negative behavioural consequences of technostress, underscoring the practical value of involvement facilitation as an organisational-level intervention.

5.5 Qualitative Findings

Thematic analysis of thirteen interviews yielded themes consistent with, and elaborating on, the quantitative results, organised around the study's three objectives.

Factors triggering technostress. Techno-overload manifested as a perceived "never-ending cycle of learning, updating, then relearning," as one participant put it, describing the frustration of mastering a corpus tool such as AntConc only to find it superseded by newer software such as Sketch Engine. Techno-complexity was compounded by infrastructural malfunction: participants described lessons "frequently disrupted because of electricity outages and projector failures," with one linking this directly to broader economic pressures in Pakistan. Techno-invasion emerged through the erosion of personal boundaries via WhatsApp and email, with participants describing an "always-on" culture and explicitly labelling after-hours messaging "unofficial and unethical." Techno-uncertainty was closely tied to generative AI: teachers expressed distrust of ChatGPT's accuracy and described the burden of having to verify and correct AI-generated content, insisting that "human agency is a must." Techno-insecurity appeared as a socially situated fear of appearing less competent than tech-savvy colleagues rather than a purely technical anxiety.

Effects on performance and commitment. Participants linked technostress to a diminished "human element" in teaching, cognitive and physical exhaustion from prolonged screen exposure, and disrupted lesson delivery when infrastructure failed mid-class. Teachers observed that their own stress was often contagious, dampening student engagement when they appeared unprepared for technical difficulties. Regarding institutional commitment, some participants reported emotional detachment and, during the pandemic, active consideration of resignation; others, however, maintained strong intrinsic motivation and framed technological setbacks as manageable challenges resolvable through peer support, a pattern of resilience that tempered the otherwise negative picture.

Coping strategies. Consistent with the technostress-inhibitor framework, three coping categories emerged, but interviews revealed that Pakistani EL teachers relied heavily on self-directed and informal mechanisms rather than institutional provision. Literacy facilitation took the form of self-teaching through YouTube tutorials and, for some, externally earned certifications from international bodies; teachers reported learning tools "reactively," only once a specific need arose. Technical support needs centred on reliable internet, functioning hardware, and adequately equipped language laboratories, resources participants described as largely absent. Involvement facilitation proved particularly salient: teachers who were consulted before new tools were adopted reported markedly lower stress, whereas exclusion from such decisions produced anxiety about unknown future expectations. Additional informal strategies included collaborating with tech-savvy colleagues and even students, preparing analogue backup materials such as printed handouts and whiteboards, and adopting a pragmatic, resilience-oriented mindset toward technology as an unavoidable feature of contemporary teaching.

5.6 Triangulation of Quantitative and Qualitative Results

Triangulation revealed strong convergence across the three research objectives. For technostress factors, both strands confirmed the salience of techno-overload, techno-insecurity, techno-complexity, techno-invasion, and techno-uncertainty, with qualitative data adding contextual explanations, such as software obsolescence in corpus linguistics tools and infrastructural instability, that the survey alone could not capture. For effects, job satisfaction, job performance, and career continuance showed strong convergence: teachers' interview accounts of exhaustion, frustration, and diminished motivation closely mirrored the negative statistical relationships. Institutional commitment was the

notable exception, showing partial divergence: while the quantitative data indicated a significant negative relationship, most interview participants described their institutional loyalty as largely intact, attributing it instead to professional identity, collegial relationships, job security, and a sense of duty to students rather than to technology-related conditions. For coping strategies, literacy facilitation, technical support, and involvement facilitation showed full convergence, with qualitative accounts explaining the mechanisms, confidence, reduced frustration, and a sense of ownership, through which these strategies operate.

6. DISCUSSION

The findings affirm the continuing relevance of Ragu-Nathan et al.'s (2008) five-dimension model within a higher-education context markedly different from the corporate and library settings in which it was originally developed and tested. Consistent with Tarafdar et al. (2007, 2011), the data show that technostress arises less from technology per se than from organisational expectations that require faculty to work faster, remain perpetually reachable, and adapt continuously to unstable systems. This interpretation is reinforced by the qualitative finding that Pakistani EL teachers did not identify digital tools themselves as the primary stressor; instead, they pointed to unreliable infrastructure, inadequate institutional planning, and insufficient professional training, a pattern that resonates with Penado Abilleira et al.'s (2021) findings among Spanish university teachers coping with infrastructural limitations during emergency remote instruction, and extends earlier work by Al-Fudail and Mellar (2008) on technology-related time and support pressures among school teachers.

The identification of techno-insecurity as the strongest predictor of overall technostress, and its qualitative elaboration as a socially embedded fear of appearing less competent than peers, extends Brod's (1984) original emphasis on individual inadequacy into a specifically collegial and status-based dimension within Pakistani academic culture. Similarly, the qualitative theme of techno-uncertainty tied to generative AI represents a context-specific contribution: while Kasneci et al. (2023) documented general concerns about the reliability and ethical implications of large language models in education, the present findings show that English language teachers experience a particular form of this uncertainty rooted in the need to verify AI output against disciplinary and linguistic standards, a labour-intensive process that paradoxically increases rather than reduces workload.

The results on job satisfaction, performance, and continuance intention align closely with prior findings (Jena, 2015; Tarafdar et al., 2015; Verkijika, 2019), confirming that technostress erodes teachers' enthusiasm, effectiveness, and willingness to persist under technology-intensive conditions. The comparatively muted effect on institutional commitment, however, diverges from studies such as Choi (2024), Hessari, Daneshmandi, and Nategh (2023), and Tu et al. (2025), which reported stronger negative associations between technostress and organisational commitment. The qualitative explanation, that Pakistani EL teachers' loyalty is anchored in professional identity, collegiality, and duty to students rather than in technological experience alone, is more consistent with Hassan et al.'s (2018) observation that certain technostress dimensions can coexist with, rather than uniformly undermine, organisational commitment. This suggests that in collectivist, relationship-oriented academic cultures, institutional commitment may function as a more stable construct that survives, or is buffered from, purely instrumental sources of workplace stress.

The moderation results, showing that organisational support and involvement facilitation weakened the negative behavioural consequences of technostress, corroborate Wang,

Shu, and Tu's (2005) experimental evidence that training environments and structured technology support centres reduce computer-related technostress, and align with Rohwer et al.'s (2022) conclusion that problem-focused coping strategies, particularly those involving institutional or social support, are more protective than emotion-focused or dysfunctional coping. The prominence of self-directed, informal coping in the qualitative data, however, indicates a gap between the theoretically prescribed inhibitors and their practical availability: teachers were, in effect, substituting personal initiative for absent institutional infrastructure, a dynamic with clear implications for sustainability and equity, since not every teacher has equal access to informal networks, paid subscriptions, or external certification opportunities.

The pattern of coping strategies observed also speaks to a broader methodological point emphasised by Braun and Clarke (2006): themes in qualitative research are not simply discovered but actively constructed through the researcher's engagement with the data, meaning that the categories of literacy facilitation, technical support, and involvement facilitation identified here should be read as an interpretive synthesis of participants' accounts rather than as objectively pre-existing categories. This does not diminish their practical value; rather, it underscores why triangulating them against the independently derived quantitative results (Jonsen & Jehn, 2009; Thurmond, 2001) strengthens confidence that these three coping mechanisms are genuinely operative for Pakistani EL teachers rather than artefacts of a particular analytic lens.

7. THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretically, the study validates the five-creator structure of the Technostress Model in a previously unexamined population, English language university teachers, and extends its application to a developing-country higher-education system characterised by infrastructural volatility. It also demonstrates the value of situating the Technostress Model alongside Person-Environment Fit Theory and the Transactional Theory of Stress, since the qualitative data show that stress emerges from the interaction between individual capacity, organisational expectation, and unreliable environmental conditions rather than from any single source. The identification of AI-specific techno-uncertainty as an emergent theme suggests the model's dimensions may require periodic reinterpretation as new technologies enter academic practice.

Practically, the findings support several concrete institutional interventions. Universities should strengthen dedicated IT support and helpdesk services to reduce the frustration and lost instructional time associated with infrastructural failure. Structured, gradual digital-literacy training, rather than one-off workshops scheduled during already demanding semesters, would address techno-complexity and techno-uncertainty more sustainably. Because involvement facilitation showed some of the clearest benefits in both datasets, consulting faculty before adopting new pedagogical technologies is a low-cost, high-leverage intervention that reduces both techno-uncertainty and the anxiety associated with exclusion from decision-making. Institutions might also establish explicit boundaries around after-hours digital communication to curb techno-invasion, and provide low-technology contingency plans, such as accessible printing facilities, to protect instructional continuity when digital systems fail. Finally, given the resilience many teachers displayed despite adverse conditions, fostering peer-support networks and recognising informal coping efforts could formalise and sustain a resource that currently exists largely by teachers' own initiative.

8. LIMITATIONS OF THE STUDY

Several limitations qualify these conclusions. The study was geographically confined to HEC-recognised universities in Punjab, limiting generalisability to other provinces or non-recognised institutions. The quantitative sample relied on convenience sampling, a non-probability method necessitated by the dispersed and only partially accessible population, which may constrain representativeness. Data were self-reported, raising the possibility of recall or social-desirability bias, and the cross-sectional design precludes causal inference regarding the relationships identified. The study also examined only five technostress dimensions and four outcome variables, leaving other plausible influences, such as organisational culture, leadership style, digital resilience, and emotional intelligence, outside its scope. Finally, because digital technologies and institutional practices continue to evolve rapidly, the findings should be interpreted as reflecting the specific technological and institutional context in which data were collected.

9. CONCLUSION AND RECOMMENDATIONS

This study demonstrates that technostress among Pakistani university English language teachers is a genuine and multidimensional occupational concern, driven most strongly by techno-insecurity, techno-complexity, and techno-overload, and carrying significant costs for job satisfaction, classroom performance, and career continuance. Importantly, the evidence indicates that technostress is fundamentally an organisational rather than a purely technological problem: teachers themselves attributed their stress primarily to unreliable infrastructure, inadequate training, and exclusion from technology-related decisions rather than to digital tools as such. At the same time, the study reveals a striking degree of professional resilience, teachers' institutional commitment proved considerably more robust than their satisfaction or performance, sustained by professional identity, collegiality, and a sense of duty to students that operates somewhat independently of technological strain.

Addressing technostress effectively will therefore require coordinated institutional action rather than reliance on individual coping alone. Universities are encouraged to establish clear technostress management policies, strengthen IT support infrastructure, provide ongoing and gradually paced digital-literacy training, cultivate collaborative professional learning communities, actively manage technology-related workload, and involve faculty meaningfully in decisions about the tools they are expected to use. Periodic institutional assessment of faculty technostress would allow such interventions to be refined over time. By treating technostress as a shared institutional responsibility rather than an individual failing, universities can better protect the well-being of their English language faculty while sustaining the digital transformation of higher education. Future research might extend this line of inquiry by incorporating additional variables such as organisational culture and digital resilience, employing longitudinal designs to track technostress over time, and examining how the specific pressures of generative AI continue to reshape the professional lives of language educators.

Note: This article is abstracted from the PhD thesis of the first author.

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