

Examining the Impact of Technostress on Perceived Organizational Commitment: The Mediating Role of Individual Innovation

Hassan Hessari^{*}, Fatemeh Daneshmandi², Tahmineh Nategh³

¹Department of Business Information, Technology, Pamplin College of Business, Virginia Tech

²Academic Center for Education, Culture and Research

³Islamic Azad University

Corresponding Author: Hassan Hessari hassanhessari@vt.edu

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ABSTRACT

This research examines the influence of technostress on perceived organizational commitment (POC) and investigates how individual innovation mediates this relationship. Conducted within an engineering consulting firm, the research employs structural equation modeling (SEM) to analyze data from 147 employees. The objectives include determining the extent to which technostress influences POC, assessing how individual innovation mediates this effect, and identifying strategies to mitigate technostress impacts. Findings indicate that technostress significantly negatively affects both POC and individual innovation, with the latter showing a positive correlation with POC. Moreover, individual innovation serves as a partial mediator, mitigating the adverse effects of technostress on POC. The results highlight the necessity for organizations to foster innovative cultures while managing technostress, thus promoting a resilient and committed workforce. This study contributes to the literature by integrating the constructs of technostress, innovation, and organizational commitment, providing actionable insights for managers aiming to enhance employee engagement and organizational stability.

INTRODUCTION

The swift expansion of information and communication technologies (ICT) in the business sector has transformed numerous operational facets, resulting in marked enhancements in employee performance, job satisfaction, productivity, and overall organizational efficiency (DeLone & McLean, 2003; Hessari & Nategh, 2022a). These advancements have optimized processes, improved communications, and promoted innovation (Hessari et al., 2024). Yet, this widespread adoption of technology also carries potential disadvantages that may impede organizational growth (Hessari & Nategh, 2022b). A critical challenge organizations face today is technostress, which arises specifically from the utilization of information technology (IT) and its demands on users (Maier et al., 2015). Characterized by mental and physical discomfort, technostress manifests in symptoms such as heightened arousal, anxiety, and exhaustion, particularly among employees dependent on digital technologies for their daily tasks (Arnetz & Wiholm, 1997; Riedl, 2012). This issue has attracted significant research attention due to its adverse effects not only on the workforce but also on their families and the larger organizational setting (D'Arcy et al., 2014; Tarafdar et al., 2013).

Technostress might impacts organizational commitment, which describes an employee's psychological bond and loyalty to their employer (Boonsiritomachai & Sud-On, 2022). High levels of organizational commitment motivate employees to exceed their formal responsibilities, cultivating a culture of dedication and resilience (Lee & Kim, 2023). Such employees are profoundly engaged, showing strong intentions to remain with the organization, and are more likely to contribute positively by sharing knowledge, collaborating effectively, and supporting organizational goals (Galay, 2022; Pratama et al., 2022). Therefore, fostering organizational commitment is crucial as it significantly influences organizational stability and functionality. In the modern fast-paced environment, innovation is another key focus of research due to its significant relationship with organizational commitment (Acosta-Prado et al., 2020). Innovation correlates with both flexibility and productivity, and it is critically important for employees, organizations, and society as a whole (Saunila, 2020). Employees' ability to adopt new technologies and methodologies is vital for maintaining an organization's operational efficiency and competitive edge (Huo et al., 2023).

In terms of organizational dynamics, innovation serves as a driving force for growth and adaptation, allowing organizations to launch new products and services, enhance processes, and quickly adjust to market shifts (Tyoso et al., 2024). Employees who are proactive in innovative efforts are crucial to an organization's ability to maintain competitiveness (Le, 2020; Ye et al., 2023). Thus, nurturing an innovative culture not only increases job satisfaction and engagement among staff but also bolsters overall organizational performance (Al Wali et al., 2022; Fazal-e-Hasan et al., 2023). Technostress is particularly prevalent in the engineering sector, where organizations depend heavily on advanced software that must continually adapt to evolving scientific and engineering standards (Hessari & Nategh, 2022c). The need for frequent updates in software

principles requires employees to perpetually enhance their skills, underscoring the importance of adaptability for improving organizational outcomes in a competitive landscape. However, the relentless demand for technological adaptability can induce technostress, manifesting as both a psychological and physiological reaction to the pressures of IT (Valta et al., 2024). This stress can diminish employees' innovative capacities by creating an atmosphere filled with tension and exhaustion that obstructs creative thinking and problem-solving.

Acknowledging the intertwined roles of innovation and technostress, it is vital for organizations to develop environments that promote innovation while reducing the negative impacts of technostress (Ismail et al., 2023). Achieving this balance is essential for sustaining a workforce that is innovative, resilient, and adaptable. Strategies to achieve this include providing ongoing learning opportunities, cultivating a supportive workplace culture, and offering resources to effectively manage technostress (Aminia et al., 2023). This study enriches the existing literature by analyzing the interactions between technostress, individual innovation, and perceived organizational commitment within an engineering consulting firm—a setting heavily reliant on technological inputs. Unlike previous research that often isolated the effects of technostress or innovation, this investigation integrates these factors, examining their mutual influences (Nastjuk et al., 2024). The findings reveal that individual innovation not only mitigates the negative effects of technostress but also significantly enhances organizational commitment, offering valuable insights for managerial practices. Thus, this research advances our comprehension of how to cultivate resilient and productive work environments in sectors driven by technology.

LITERATURE REVIEW

Technostress

Technostress remains a formidable challenge within contemporary organizations, exacerbated by the critical yet often stressful adoption of new technologies. This phenomenon, initially identified by Craig Brod in his seminal book "Technostress: The Human Cost of The Computer Revolution," captures the struggle individuals face as they attempt to keep pace with the rapid evolution of global computer technologies. While Brod characterized technostress as a pathological condition, subsequent research, such as that by Dragano & Lunau (2020), suggests it also signifies a failure to adapt to technological advancements, adversely affecting both individual productivity and overall organizational performance. In the domain of information technology, swift advancements can quickly make existing organizational practices obsolete, presenting challenges for companies striving to remain competitive. Despite the stress integration of new technologies may induce in employees, potentially diminishing their productivity, the deployment of Information Technology (IT) is indispensable (Bernuzzi et al., 2024; Düzgün & Çelik, 2023). IT is crucial for ensuring timely access to up-to-date information, thereby facilitating informed and strategic decision-making (Tarafdar et al., 2007; Weil & Rosen, 1997).

Expanding on this, Tarafdar and colleagues have systematically categorized technostress into five distinct components, each highlighting a different facet of this complex phenomenon:

1. **Techno-Overload:** This occurs when individuals are compelled to work at an accelerated pace and for extended hours due to technological demands, often pushing them beyond their normal capacity and leading to burnout.
2. **Techno-Invasion:** This component points to the erosion of the distinction between personal and professional life, as technology allows individuals to be contacted at any time, encroaching on personal time and contributing to work-life balance issues.
3. **Techno-Complexity:** Individuals may feel overwhelmed by the complexity of modern Information and Communication Technology (ICT), perceiving their skills as inadequate, which can diminish confidence and increase job-related anxiety.
4. **Techno-Insecurity:** This arises when individuals fear job displacement due to new technological tools or colleagues who are more proficient with advanced technologies, creating an atmosphere of job insecurity and competition.
5. **Techno-Uncertainty:** The continuous evolution and updating of technology can lead to perpetual unfamiliarity, causing anxiety and reluctance to embrace new systems, which hampers adaptability and innovation.

Recognizing and addressing these components is crucial for organizations aiming to mitigate the adverse effects of technostress. By developing targeted strategies that specifically address these aspects of technostress, organizations can enhance employee well-being, increase productivity, and sustain a competitive edge in the increasingly digital business landscape. Proactive measures could include implementing structured training programs to reduce techno-complexity, establishing clear policies to manage techno-invasion, and fostering a supportive work environment that alleviates techno-insecurity and techno-uncertainty. This holistic approach not only addresses the immediate impacts of technostress but also contributes to the development of a resilient and adaptive organizational culture.

Organizational Commitment

In the contemporary business environment, the strategic role of human resources is increasingly recognized as central to gaining competitive advantages (Harish & Prabha, 2022; Widjaja, 2023). Organizations are intensely competing by implementing robust welfare programs and focusing meticulously on the recruitment and retention of staff (Mahanta & Goswami, 2020). This trend has been highlighted in Fortune magazine's recent ranking of the top 100 companies,

emphasizing the critical importance of cultivating an advantageous work environment for human resources (Riggle et al., 2009).

Organizational commitment (OC) has consistently been a central theme in management research, leading to a variety of definitions, theoretical models, and methods of measurement (Riaz et al., 2023). This concept has captured the interest of both academics and industry professionals due to its influence on shaping a range of behaviors and attitudes in the workplace (Chen & Francesco, 2003; Cheng & Stockdale, 2003; Meyer et al., 2002). OC is defined by an individual's deep desire to remain associated with their organization, a readiness to exert considerable effort for its success, and a firm adherence to its values and objectives (Clugston et al., 2000). Over the years, the understanding of OC has undergone substantial evolution, shifting from primarily economic considerations to including emotional factors that affect commitment.

The evolution of OC theory began with Howard Becker's concept of side-bets, which described the valuable investments that individuals stand to lose upon leaving an organization (Cohen, 2007). This initial phase emphasized the tangible and intangible costs associated with departure. Subsequently, the focus shifted towards psychological engagement, as highlighted by Allen and Meyer (1990), who defined OC as an emotional attachment, emphasizing the personal identification and emotional bonds employees develop with their organization. Further developments by Allen and Meyer in 1991 introduced a nuanced multi-dimensional approach to OC, comprising affective, continuance, and normative commitment as components of Attitudinal Commitment (Powell & Meyer, 2004). This model significantly advanced the understanding of OC by providing a more operational framework.

- **Affective Commitment:** This involves the emotional attachment an individual feels towards an organization, encompassing affection for, identification with, and a desire to remain part of the organization. Employees with strong affective commitment stay because they derive personal satisfaction from their association with the organization.
- **Continuance Commitment:** Based on Becker's investment theory, this dimension suggests that the investments individuals make in an organization grow over time, making departure financially and emotionally costly. It reflects the individual's psychological attachment resulting from the perceived costs of leaving the organization.
- **Normative Commitment:** This dimension is driven by a sense of obligation to remain with an organization, rooted in personal ethics or societal norms. It often develops through organizational socialization and the internalization of corporate values.

The significance of OC is profound as it impacts both the individual and the organization (Suwarno et al., 2023). Committed employees tend to have lower

rates of absence and reduced turnover, which leads to cost savings and increased operational efficiency (Meyer et al., 2002). They are also more loyal, experience less job stress (Muthuveloo & Rose, 2007), and are more receptive to organizational changes (Vakola & Nikolaou, 2005). At the organizational level, OC enhances overall effectiveness by reducing turnover rates and fostering a stable workforce (Guo et al., 2020). The interplay among the three dimensions of OC firmly anchors individuals to their organizations, thus diminishing turnover. This relationship is supported by various studies, including those by Allen and Meyer (1990) and confirmed by recent research such as Al-Jabari and Ghazzawi (2019). Moreover, OC consistently positively affects job performance across different cultural contexts, as demonstrated by Siu (2003) among employees in Hong Kong. Understanding and leveraging these dimensions of OC is crucial for organizations aiming to enhance employee commitment, thereby improving overall performance and sustainability. By nurturing an environment that supports affective, continuance, and normative commitment, organizations can fully engage their human resources, driving long-term success and competitive advantage.

Individual Innovation

Chen et al. (2004) define innovation as the process of forming new combinations of key production elements within a manufacturing setting. The concept of innovation capital is broad, encompassing organizational competence, engaging in research and development, and the generation of new technologies and products tailored to meet consumer needs. The Organization for Economic Cooperation and Development (OECD) interprets innovation as the commercial application of novel knowledge, essentially manifesting as new processes or practices that are distinctly different from the status quo (Du Plessis, 2007). Innovation involves six principal activities: the development of new products, the introduction of new services, the invention of new production techniques, the exploration of new markets, the procurement of new supply sources, and the formation of new organizational structures (Johannessen et al., 2001). It is widely recognized among academics and professionals that innovation is pivotal for empowering organizations (Drach-Zahavy et al., 2004). A consensus exists among economists, researchers, and managers that innovation is essential for distinguishing societies, driving competition, and promoting prosperity and stability. Japanese scholar Fumio Kodama emphasizes that the key to a society's economic vitality lies in enhancing productivity and the pace of innovation (Miller & Morris, 2008). Studying innovation is crucial for optimizing resource use, boosting productivity, expanding international trade, and enhancing both individual and community welfare (Miller & Morris, 2008).

The crucial role of individual innovation within any organization cannot be overstated, particularly in terms of its contribution to organizational success and longevity. The cultivation of innovative behaviors among employees is increasingly recognized as essential. At the core of effective management practices such as total quality management, continuous improvement initiatives, and organizational learning, individual innovation plays a pivotal role (Osayawe

Ehigie & Clement Akpan, 2004). The contribution of employees to innovation is critical, with the concept of "innovation" deriving from "invention," which is rarer, whereas more frequent incremental innovations by employees are common. Individual innovation forms the foundation of successful management strategies including total quality management, continuous improvement plans, embracing corporate boldness, fostering creative problem-solving, and promoting organizational learning (Osayawe Ehigie & Clement Akpan, 2004; Fuller et al., 2006; Elfring, 2005; Basadur, 2004; Senge, 2006). Historical research has consistently highlighted the benefits of individual innovation for organizations, with empirical evidence demonstrating a clear positive relationship between specific innovative behaviors and improved organizational performance (Miron et al., 2004).

Furthermore, individual innovation does not detract from the quality and efficiency of routine operations. Employees are capable of harmonizing innovation with critical organizational attributes. Quality and productivity should be seen as complementary rather than conflicting goals. Getz and Robinson (2003) argue that organizations which implement 80% of ideas generated by employees and 20% from planned innovation activities achieve greater advancements. The capacity of an organization to develop new products and enhance other performance metrics is intricately linked to the expertise of its human resources (Foss, 2007). As such, the most valuable and irreplaceable assets a company possesses are the individuals who have the knowledge and ability to effectively harness the organization's other resources (Argote & Ingram, 2000).

Hypotheses development

Recent studies, including those by Moore (2000), Sethi et al. (1999), and Murray and Rostis (2007), indicate that technology, while beneficial, can sometimes lead to employee disengagement or dissatisfaction, ultimately impacting productivity negatively. A significant challenge for contemporary organizations is the management of technostress – a type of stress triggered by the use of IT – which can lead to elevated job demands, information overload, and reduced motivation and job satisfaction as identified by Weil and Rosen (1997). Adding to the complexity of this issue, research conducted by Marchiori et al. (2020) titled "A relationship between technostress, satisfaction at work, organizational commitment, and demography: Evidence from the Brazilian public sector," found that job stress adversely affects job satisfaction. However, the study also pointed out that effective technology management strategies can enhance both job satisfaction and organizational commitment (OC). This is consistent with the research by Kumar et al. (2013) in their study "Impact of technostress on job satisfaction and organizational commitment among IT professionals," which examined feedback from 80 professionals in a Technology Park and identified a negative relationship between OC and job satisfaction. These findings contribute to the formulation of the following hypothesis:

H1: Technostress has a significant negative impact on OC.

Supporting this, extensive research illustrates that technostress detrimentally affects different aspects of workplace dynamics. Tarafdar et al. (2007) showed that technostress could lead to role stress and reduced productivity, negatively affecting organizational outcomes. Ayyagari, Grover, and Purvis (2011) highlighted that technostress might also lower job satisfaction and increase turnover intentions, further eroding organizational commitment. Similarly, Ragu-Nathan et al. (2008) documented that technostress impairs not just job satisfaction but also the innovative capabilities of employees. Adding to this discourse, Mani et al. (2014) employed structural equation modeling to explore the dynamics among organizational environment, work-family conflict, job stress, individual traits, job satisfaction, and OC among US pharmacists. They identified critical factors such as workload, role ambiguity, and role conflict as influencers of job stress. Their research also established significant links between individual traits, job satisfaction, and OC, suggesting a substantial adverse impact of personal characteristics on job stress, leading to the formulation of another hypothesis:

H2: Technostress has a significant negative impact on individual innovation.

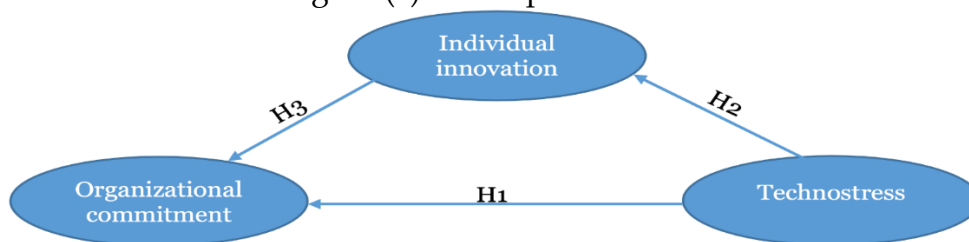
In their research titled "Organizational and Professional Commitment among Scholars and Engineers: Innovation Management," Perry et al. (2016) investigated the complex interplay between innovation, innovation management, and organizational commitment (OC) among 225 engineering researchers. The study revealed a significant positive correlation between the employees' propensity for innovation and their degree of OC, indicating that a robust organizational commitment positively influences an individual's capacity to contribute innovatively. Organizational commitment influences more than just workplace attendance; it permeates all facets of organizational operations. Individuals with high affective commitment not only fulfill their roles but also actively participate in activities that support the organization's goals and values. This level of commitment results in improved job performance and increased productivity. Empirical research, including studies by Mowday et al. (2013) and Boshoff and Mels (1995), affirm the positive impact of OC on job performance and productivity, emphasizing the pivotal role of commitment in organizational success. Building on this foundation, Meyer et al. (2002) hypothesized that deeply committed individuals not only perform better but also foster a positive workplace environment, significantly enhancing organizational effectiveness. Allen and Meyer (1990) further dissected OC into three components: affective, continuance, and normative commitment, each influencing employee-organization relations in unique ways. Affective commitment involves emotional attachment, continuance commitment relates to the costs of leaving, and normative commitment stems from a felt obligation to remain. Understanding these dimensions is critical for comprehending how OC impacts innovation and organizational dynamics (Susanto et al., 2023). Given this theoretical backdrop, we propose the following hypotheses:

H3: Individual innovation positively and significantly impacts OC.

H4: Individual innovation mediates the relationship between technostress and OC.

The discussion culminates in the presentation of a model (Figure 1), derived from the review of theoretical foundations and empirical research.

Figure (1): Conceptual Model.



METHODOLOGY

The research methodology adopted in this investigation is pragmatic, aimed at comprehending phenomena in real-world settings. Employing a descriptive-correlative strategy, this study utilized structural equation modeling (SEM) as described by Guenther et al. (2023) to analyze the data. Data gathering was executed through the dissemination of standardized questionnaires directly to participants. This methodological approach facilitated a thorough examination of the interconnections between the study variables, yielding significant insights into the primary themes explored in the research.

Study Context

This study was carried out in an engineering consulting firm, selected for its extensive technological activities. The prevalence of technology in this field made it an ideal setting for the investigation. The study involved 240 employees from the organization in Mashhad, Iran. According to the Morgan Table (Krejcie & Morgan, 1970), a stratified random sampling technique was used to distribute 170 questionnaires to the employees. From these, 147 were returned and met the criteria for inclusion in the analysis. The selection of participants followed the updated 2020 guidelines provided by the Morgan Table. The diversity of the sample was represented across various demographic variables such as gender, educational background, and years of professional experience, details of which are summarized in Table 1.

Table (1): Table of frequency and its percentage for research samples.

Variable	Sub-group	Frequency	Frequency percentage
Sex	Male	95	64/6
	Female	52	35/4
Age	22 to 30	41	27/9
	31 to 39	66	44/9
	40 to 48	28	19/0
	49 to 57	12	8/2
Educational level	High school	11	7/5
	Bachelors	62	42/2
	Masters	66	44/9

	PhD	8	5/4
Work experience	1 to 4	25	17/0
	5 to 9	46	31/3
	10 to 14	37	25/2
	15 to 19	22	14/9
	20 to 40	17	11/6

Measures

In this investigation, multiple instruments were utilized to evaluate the constructs of interest. The Organizational Commitment (OC) Questionnaire by Allen and Meyer (1990) was applied, which included eight items each to measure affective, normative, and continuance commitment. Similarly, the Technostress Questionnaire by Tarafdar et al. (2007) was used, featuring six items on technology overload, three on stress due to technology, five on the complexity of technology, five on insecurity due to technology, and four on uncertainty related to technology. The Individual Innovation Questionnaire developed by Janssen (2004) was also administered, with three items each assessing idea generation, idea advancement, and idea implementation. Responses were recorded on a five-point Likert scale, ranging from "completely disagree" to "completely agree," with potential scores from 1 to 5.

After gathering the data, it was analyzed using SPSS 21 and SMART-PLS 3 software. Descriptive statistics including frequencies and percentages were calculated to provide a summary of the data. Inferential statistics, specifically partial least squares structural equation modeling (PLS-SEM), were performed using the SMART-PLS software. This analysis was aimed at testing the hypotheses and examining the interactions among the variables (Cheah et al., 2023). This rigorous methodological framework ensured the reliability and validity of the research outcomes, offering detailed insights into the interplay between organizational commitment, technostress, and individual innovation (Bai et al., 2024a).

RESEARCH RESULT

To validate the measurement instruments utilized in this study, the questionnaires were rigorously reviewed by a panel of academic professionals and subject matter experts to ensure adherence to established standards of reliability. The instruments used to measure Organizational Commitment, Technostress, and Individual Innovation demonstrated high internal consistency, as evidenced by Cronbach’s alpha values. Specifically, the Organizational Commitment scale achieved a Cronbach’s alpha of 0.970, indicating excellent reliability. The Technostress scale recorded a similarly high reliability score of 0.962, as did the Individual Innovation scale, which also posted a Cronbach’s alpha of 0.962. These values, significantly surpassing the commonly accepted reliability threshold of 0.7, underscore the robustness and consistency of the scales used to assess the constructs in this research (Bai et al., 2024b; Field, 2024).

The analytical phase of the study was conducted using partial least squares structural equation modeling (PLS-SEM), an advanced statistical technique ideal for examining linear relationships between latent and observed variables. This method integrates Confirmatory Factor Analysis, which assesses the measurement model, with Regression or Path Analysis, which evaluates the structural model. Such a comprehensive approach facilitates simultaneous hypothesis testing, making it especially suited for validating or refining theoretical frameworks based on empirical data. For the statistical analysis in this study, we utilized SMART-PLS software, which is specifically tailored to manage intricate structural equation models with multiple variables that can display direct, indirect, and interactive effects. This software played a critical role in analyzing the outputs and conducting a comprehensive examination of the research hypotheses. It was essential in identifying the direction (positive or negative) of the T values obtained from the Structural Equation Modeling within our established estimation framework. The insights gleaned from these results significantly deepened our understanding of the interrelations among the study variables, providing a solid basis for the conclusions reached in this research.

Figure (2): Structural equation model in standard estimation model.

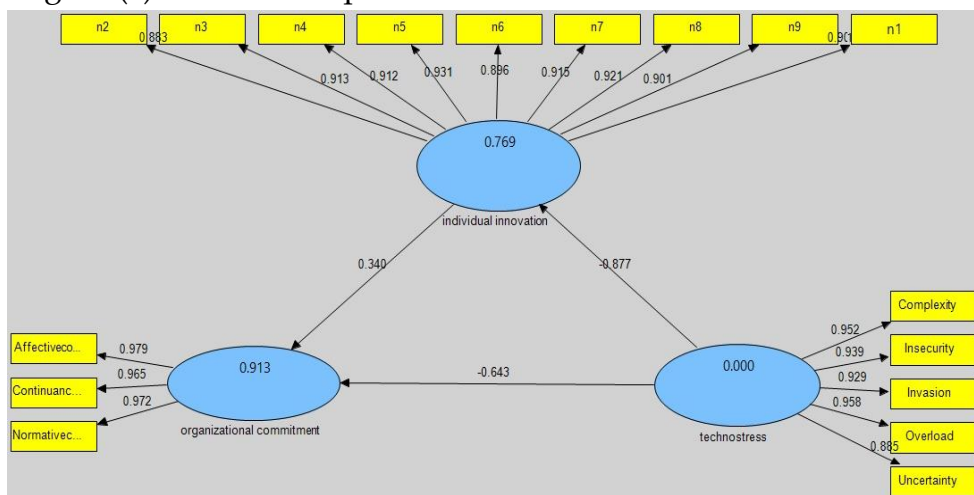


Figure (3): Structural equation model in the case of meaningful coefficients.

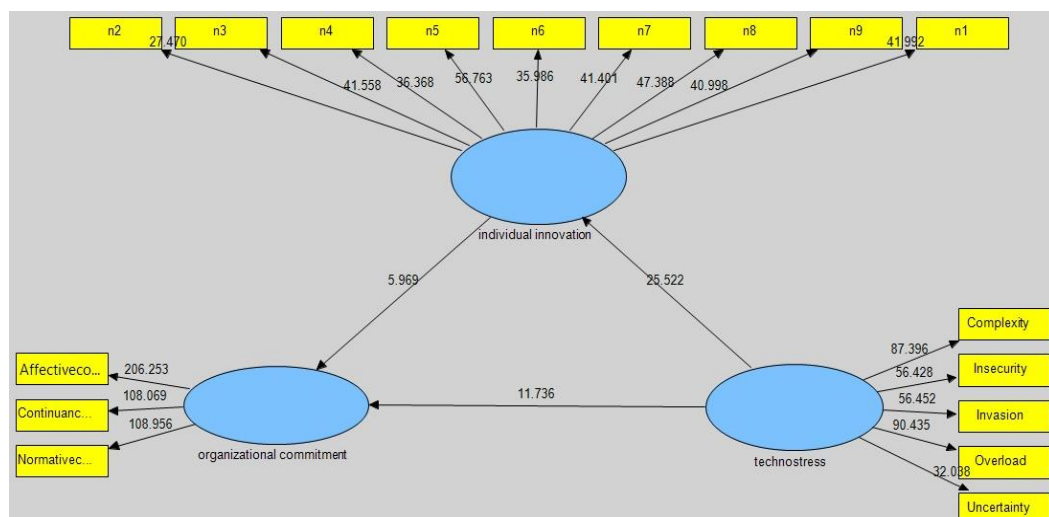


Table (2): test results regardless of impact of the mediating variable.

Direction	t-Value	Standard	Meaningful level	impact rate
Technostress -> OC	-11.736	-0.643	Significant	Negative
Technostress -> Individual innovation	-25.522	-0.877	Significant	Negative
Individual innovation -> OC	5/969	0.34	Significant	Positive

Evaluating the Mediating Effect

This hypothesis investigates the mediating role of individual innovation in the dynamics between technostress and perceived Organizational Commitment (OC). Using the regression method and SPSS software according to Baron and Kenny’s framework (1986), initial analyses revealed significant correlations among technostress, perceived OC, and individual innovation, fulfilling the initial three conditions for mediation. In the final step of the analysis, the introduction of the mediator variable resulted in a decrease in the standard beta from 0.940 to 0.644 in the relationship between technostress and perceived OC, though it remained significant. This change suggests a partial mediation by individual innovation, thus supporting the fourth hypothesis. The complete findings from this investigation are detailed in Table 4, which outlines the role of individual innovation in the relationship between technostress and perceived OC. The path analysis showed that the indirect effect of technostress on perceived OC, mediated by individual innovation, was significant: the path coefficient from technostress to individual innovation was 0.877, and from individual innovation to perceived OC was 0.902. This led to a calculated indirect effect of 0.791, confirming a strong mediation effect ($B_{indirect} = a \times b$).

Additional findings from hypothesis testing, as detailed in Table 2, uncover several pivotal insights. The first hypothesis reveals a negative impact of technostress on organizational commitment (OC), with a path coefficient of -0.643 and a t-value of -1.736, highlighting the harmful effects of technostress on employee commitment levels. The second hypothesis confirms the detrimental influence of technostress on individual innovation, indicated by a path coefficient of -0.877 and a t-value of -25.522, which reflects the obstacles that technostress creates for innovative endeavors. In contrast, the third hypothesis establishes a positive link between individual innovation and OC, with a path coefficient of 0.34 and a t-value of 5.969, indicating that innovative activities contribute positively to organizational commitment. Furthermore, the fourth hypothesis, as shown in Table 3, illustrates that individual innovation plays a mediating role in the relationship between technostress and OC, with a path coefficient of 0.644. The finding highlights how individual innovation can mitigate the adverse effects of technostress on organizational commitment.

Table (3): The Mediating Effect.

Dependent variable	Independent variable	β R ²	R Sig
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Technostress	Perceived OC	0/883 0/940	0/000 0/940
Technostress	Individual innovation	0/770 0/877	0/000 0/877
Individual innovation	Perceived OC	0/902 0/814	0/902 0/000
Technostress, Individual innovation	Perceived OC,	0/644 0/910 0/337	0/954 0/000

Table (4): Results achieved from investigation of hypothesis.

Hypothesis	Path	Confirmation / rejection
H 1	Technostress -> OC	Confirmed
H 2	OC -> individual innovation	Confirmed
H 3	Individual innovation -> OC	Confirmed
H 4	Technostress- individual innovation -> OC	Confirmed

In this study, we employed Partial Least Squares (PLS) to analyze two distinct models. The Outer Model, which functions similarly to a measurement model, and the Inner Model, comparable to the structural model utilized in analytical software such as LISREL, EQS, and AMOS, underwent thorough examination (Sarstedt & Moisescu, 2024). We assessed the congruence of the Outer Model with the structural model using the Communality index, which measures the degree to which the measurement model aligns with the structural model. Typically, a communality value exceeding 0.5 is considered sufficient for statistical purposes (Lee et al., 2008), with higher values indicating an adequate alignment of the models. Furthermore, the model's explanatory power was evaluated by examining R^2 , which reflects the amount of variance in the dependent variable that can be explained by the independent variables. R^2 is a critical measure of the model's explanatory capability. According to the data in Table 5, the results confirmed that the proposed model provides an effective structural representation, demonstrating its ability to accurately encapsulate the relationships among the variables and offer a solid description of the phenomena being studied.

Table (5): Model compatibility.

Variable	Communality	R^2
Technostress	0/8704	
Individual innovation	0/8248	0/7687
OC	0/9446	0/9127

DISCUSSION

This research investigates the impact of technostress on Perceived Organizational Commitment (POC) within an engineering consulting firm, with a particular emphasis on the mediating role of individual innovation. Our findings robustly demonstrate that technostress detrimentally affects both POC and individual innovation. Conversely, individual innovation positively influences POC and serves to mitigate the detrimental effects of technostress. These results emphasize the critical need for managerial strategies aimed at mitigating technostress and cultivating individual innovation to enhance organizational commitment among employees. The analysis presents compelling evidence of a strong negative impact of technostress on perceived organizational commitment, with factor loading values that substantially corroborate strong correlations. These findings align with the research conducted by Kumar et al. (2013), who identified a significant adverse link between technostress, organizational commitment, and job satisfaction. For organizations heavily reliant on technology, it is imperative to provide substantial technical support that is both responsive and accessible during working hours, managed by well-informed personnel. Essential operational processes such as data entry, email communication management, and the implementation of suitable information systems need to be streamlined for efficiency. Furthermore, it is vital that managers involve employees in decisions regarding the adoption of new technologies to ensure alignment with the broader organizational goals. This participatory approach is supported by recent research, including studies by Harunavamwe and Ward (2022) and Raza et al. (2022), which discuss the profound adverse impacts of technostress on employee well-being and performance.

Additionally, the study uncovers a significant negative effect of technostress on individual innovation, corroborating findings from seminal works by Tarafdar et al. (2011) and Ragu-Nathan et al. (2008). These studies underscore the damaging relationship between technostress and aspects such as employee productivity and satisfaction. To counteract these effects, it is crucial for organizations to nurture an open, engaging environment that encourages employees to embrace risks and seek new experiences. Prioritizing training and consultations to alleviate employee fears and stress is fundamental, as is fostering a collaborative work culture that champions continuous learning and innovation. Furthermore, our results reveal a significant positive correlation between individual innovation and perceived organizational commitment. Although direct previous research on this specific relationship might be limited, the implications are clear: fostering a culture of innovation can significantly bolster organizational commitment. Organizations should cultivate environments that encourage risk-taking, active engagement, and the recognition and rewarding of innovative efforts. Managers play a crucial role in this by supporting and incentivizing innovative employees, actively engaging with new ideas, and developing a vibrant, dynamic atmosphere that promotes creativity.

Our mediation analysis, as indicated by a path coefficient, shows that individual innovation plays a crucial role in mediating the relationship between

technostress and perceived organizational commitment, effectively reducing the negative impacts of technostress. Although specific prior research may not extensively cover this, the implications for management are evident. Managers should encourage the sharing of knowledge concerning new technologies, facilitate collaborative problem-solving, and promote the adoption of advanced technological solutions. Establishing a reward system that supports the implementation of innovative ideas and minimizes bureaucratic obstacles is also essential. Therefore, the findings from this study underscore the pivotal role of individual innovation in mediating the effects of technostress on organizational commitment. Effective management strategies that foster a collaborative and innovative work environment are indispensable in mitigating the negative impacts of technostress. By prioritizing training, providing substantial support, and maintaining open communication, organizations can cultivate a resilient and committed workforce, thereby ensuring long-term success and competitiveness in a technologically driven landscape.

Implications for practice and policy

In response to the swift pace of technological developments, organizations are compelled to develop strategies that help employees adapt to new technologies effectively, thereby reducing technostress and enhancing productivity. A holistic approach is imperative, encompassing training, support, innovation, learning, and participation, to cultivate a workforce that is proficient with technology. Organizations are encouraged to invest in comprehensive training programs that are specifically designed to meet the needs of their employees. Targeted training sessions that focus on improving technological competencies can decrease error rates and enhance operational efficiency (Hessari et al., 2024). Fostering a culture of knowledge sharing also plays a pivotal role in mitigating technostress by promoting group collaboration, collective problem-solving, and the exchange of expertise, which together reduce the complexity and uncertainty often associated with new technologies. Personalized training efforts help ensure that employees feel well-prepared and confident in utilizing new tools and systems, which significantly alleviates anxiety associated with technological changes. It is crucial to provide robust technical support and ongoing assistance to employees as they navigate new technologies. This support is vital during critical times to ensure that workflow remains uninterrupted. The presence of accessible, responsible expert assistance markedly enhances this support structure. Such supportive measures not only boost employee satisfaction but also diminish the uncertainty associated with technological reliance. Regular check-ins and feedback sessions are essential to promptly identify and resolve issues, facilitating a seamless integration of new technologies.

Moreover, creating an environment that values innovation is key. This involves encouraging staff to remain abreast of technological advancements, devising creative problem-solving methods, and rewarding those who drive innovation and help their peers. These initiatives not only promote individual innovation but also strengthen organizational commitment. Cultivating a

learning culture and experimentation significantly lowers technology-induced insecurity, while rewarding those who embrace new experiences, learn new skills, and take risks cultivates a proactive workforce. Recognition programs that celebrate innovative efforts further embed a culture of creativity and ongoing improvement. Active involvement of employees in the adoption of new technology is also critical. Keeping employees informed about new tools, soliciting their input prior to the deployment of new systems, and engaging them in customizing these systems to meet organizational needs enhances both the effectiveness of the technology and the organizational commitment. Involvement in decision-making processes boosts employees' sense of ownership and their commitment to the successful implementation of new technologies.

Additionally, organizations can alleviate technology-induced overload by implementing measures such as reducing unnecessary data entry and efficiently organizing information. Employing knowledge-based systems that integrate seamlessly into daily operations can streamline information management and reduce technostress. Establishing clear guidelines and best practices for technology usage helps employees manage their workloads more effectively. Regular evaluations of how technology impacts workflow is crucial to making adjustments that optimize productivity and minimize stress. By implementing these strategies, organizations can foster a supportive, adaptive, and innovative technological environment, leading to higher employee satisfaction, increased organizational commitment, and reduced technostress. An integrated approach that includes robust technical support, ongoing learning opportunities, and a strong emphasis on innovation equips organizations to effectively navigate the complexities of rapid technological advancements. To address the challenges posed by rapid technological changes, organizations must adopt a comprehensive and proactive strategy that emphasizes training, support, innovation, and employee involvement. Investing in these key areas not only enhances employee well-being and productivity but also ensures long-term organizational success and competitiveness.

Limitations and Suggestions for Future Studies

This study has several limitations. Firstly, the study was conducted exclusively within one engineering consulting firm based in Mashhad. As a result, it is impractical to extend these findings broadly to other organizations or similar entities due to the unique context of the research. The control over variables such as economic and political factors was limited, which may have influenced the research outcomes. Additionally, constraints related to time and financial resources curtailed the depth and breadth of the study. Administrative barriers and an uncooperative corporate culture in the selected companies also posed significant challenges, impeding the smooth execution of the research. Limited engagement from participants was observed, largely attributed to their heavy workloads and other commitments. Furthermore, some respondents demonstrated a lack of thorough understanding of managerial concepts, which might have affected the accuracy of their responses.

For future research, it is essential to conduct similar studies across a variety of organizational settings to improve the validity of the findings and to

expand their applicability. Comparative studies could provide critical insights and allow for more detailed analyses. Additionally, examining employee satisfaction within engineering consulting firms and comparing these findings with similar international firms could offer valuable cross-cultural perspectives. Such studies would deepen our comprehension of organizational commitment and the effects of technostress across different work environments, leading to a more detailed understanding of these issues. This research examines the effects of technostress on organizational commitment, focusing particularly on the mediating influence of individual innovation. The study suggests the exploration of alternative models for each aspect of the investigation to achieve more profound insights. Additionally, it recommends that the findings be reassessed with a broader statistical population to increase the robustness and generalizability of the results. While this study contributes valuable insights into the dynamics between technostress, individual innovation, and organizational commitment within an engineering consulting context, its limitations underscore the necessity for additional research. Expanding the research scope to include various organizational contexts and larger, more diverse populations would aid in drawing more generalized and comprehensive conclusions.

CONCLUSIONS AND RECOMMENDATIONS

This research examined the effects of technostress on perceived organizational commitment, specifically analyzing the mediating role of individual innovation in an engineering consulting firm. The study was structured into four hypotheses, which were tested through a structural equation model. The methodology and results of these tests are elaborately presented in chapters three and four, respectively. Using path analysis on a sample of 147 respondents, the findings reveal a significant negative correlation between technostress and organizational commitment. Furthermore, the study found a negative association between technostress and individual innovation, whereas individual innovation demonstrated a positive and significant impact on organizational commitment. Crucially, the analysis confirmed that individual innovation significantly alleviates the harmful effects of technostress on organizational commitment.

The outcomes of this study highlight the detrimental impact of technostress on individual innovation and organizational commitment. Nevertheless, individual innovation serves a key role in mediating these effects, lessening the negative influence of technostress and enhancing organizational commitment. This underscores the critical importance of nurturing an innovative work environment to counterbalance the negative effects of technostress and to foster greater organizational commitment. In summary, the research advocates for organizational strategies that mitigate technostress through the promotion of individual innovation. By investing in comprehensive training programs, robust technical support, and fostering a culture of continuous learning and innovation, organizations can effectively reduce the adverse effects of technostress. These initiatives are vital for sustaining a dedicated and productive workforce, thereby ensuring the organization's long-term success and competitive edge. Future

research should extend these findings to a variety of organizational settings to broaden their applicability and deepen our understanding of these crucial interactions.

ADVANCED RESEARCH

In writing this article the researcher realizes that there are still many shortcomings in terms of language, writing, and form of presentation considering the limited knowledge and abilities of the researchers themselves. Therefore, for the perfection of the article, the researcher expects constructive criticism and suggestions from various parties.

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