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Defensive routines as coping mechanisms against technostress: roles of digital leadership and employee goal orientation

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ABSTRACT

In today's workplace, the proliferation of digital technologies has transformed work tasks but also led to technostress. This stress, associated with technology use, negatively impacts employees' behavioral outcomes and performance. Despite these effects, research on coping strategies for technostress and mitigation methods for individuals and organizations remains limited. This study utilizes the transactional theory of stress and coping to analyze the process of technostress, specifically focusing on defensive routines as a coping mechanism and technology-enabled performance as an outcome. Additionally, the study draws on Job-Demand Resource model to examine two critical moderators: employees' goal orientations and digital leadership. To gather data, we collected multisource data from 221 salespeople and their line managers in Pakistan. The results demonstrate that defensive routines act as a mediator between technostress creators and technology-enabled performance. Furthermore, we found that digital leadership plays a buffering role, alleviating the negative impact of technostress creators on technology-enabled performance. This research significantly contributes to the existing theories on technostress and routine dynamics.

1. Introduction

Businesses and societies are currently undergoing a profound transformation due to the Fourth Industrial Revolution, often referred to as Industry 4.0. This era is characterized by rapid advancements in digital technologies, fundamentally reshaping organizational practices and individual work experiences (Shamim et al., 2023). Investments in digitalization are crucial for companies aiming to remain competitive, as studies demonstrate its substantial impact on growth and survival (e.g., Knudsen et al., 2021; Hatami et al., 2018). COVID-19 pandemic further accelerated this trend, with global spending on digital transformation projected to reach $3.9 trillion by 2027 (Statista, 2024). However, despite the immense potential of digitalization, research indicates that 70 % of companies struggle to capitalize on the technology's benefits, often due to organizational and individual level barriers (Tabrizi et al., 2019).

One of the primary barriers to successful digital transformation is individuals' responses to technological change, driven by concerns about potential job displacement due to the introduction of new technologies and the daunting demand for reskilling within tight timeframes (Ayyagari et al., 2011). This phenomenon, known as technostress, refers to the stress individuals face when interacting with digital technologies within organizational contexts (Brod, 1982; Tarafdar et al., 2007). Research shows that technostress is linked to negative outcomes such as reduced productivity, lower job satisfaction and resistance to technological adaptation (e.g. Ayyagari et al., Khedhaouria et al., 2024; Pflügner et al., 2024). While technostress has been studied for decades, the emergence of advanced technologies like artificial intelligence has reignited interest in its "dark side," emphasizing the need for empirical research on its effects on technology-enabled performance (e.g. Nedeljko et al., 2024; Pflügner et al., 2024; Yener et al., 2021). Technology-enabled performance describes the enhancement of

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organizational processes or individual outcomes in terms of efficiency and effectiveness, achieved through the application of technology (Qiao et al., 2024; Mashat et al., 2024).

Despite growing recognition of technostress and its adverse effects, several research gaps persist. Most studies rely on theoretical deductions to explain its impact on job performance (Yener et al., 2021). Though Yener et al. (2021) evaluated the impact on job performance, it used self-reported job performance, raising concerns about objectivity and accuracy. This leaves the relationship empirically inconclusive. Additionally, while existing research highlights moderators such as technical support provision (Tarafdar et al., 2014), literacy facilitation (Tarafdar et al., 2014) and individuals' technology self-efficacy (Yener et al., 2021), there is limited exploration of non-technical factors. Some existing studies have examined individual differences, but these primarily focus on personality traits and demographic differences e.g. gender and education (Marchiori et al., 2019), age (Hauk et al., 2019), and personality (Sarabadani et al., 2018). However, goal orientation, a factor influencing individuals' way of responding to stress (Lazarus and Folkman, 1984), is not yet explored.

Moreover, the social context significantly influences individuals' responses to technology (Khedhaouria et al., 2024). Leadership, as a critical source of social support, plays a pivotal role in guiding employees through technological transitions (Fieseler et al., 2014). Leaders who integrate technology into their strategic vision and foster innovation can potentially alleviate technostress (Rademaker, 2023). This has given rise to the concept of digital leadership, defined as 'the leaders' ability to create a clear and meaningful vision for the digitalization process and the capability to execute strategies to actualize it' (Zeike et al., 2019). Digital leadership facilitates employees' performance in the digital environment by providing stimulating vision, forward looking perspective, articulating the value of digitalization, enhancing digital literacy, and equipping employees to perform their tasks more effectively (Kane et al., 2015). Yet, the potential of digital leadership to buffer the negative effects of technostress remains underexplored.

Another notable gap in the existing literature is that most studies on technostress emphasize on technostress creators and outcomes (e.g. Nedeljko et al., 2024; Pflügner et al., 2024; Wang et al., 2008). Coping mechanisms at the individual level have received insufficient scholarly attention. Specialized research is needed to examine the impact of these coping mechanisms on employee performance and how to manage this impact. This study investigates defensive routines as a coping mechanism at the individual level. Defensive routines refer to habitual actions taken by individuals or segments of organizations to avoid embarrassment or threat, which can hinder organizational learning (Argyris, 1990; Yang et al., 2022) and promote knowledge hiding (Cegarra-Navarro et al., 2021). The complexities of modern technologies, the rapid pace of technological updates, and uncertainties surrounding future job security contributes to a heightened sense of threat among employees. Particularly employees with low digital literacy and readiness might face the challenge of maintaining their performance in the new digital environment (Tarafdar et al., 2014). In response, individuals may resort to defensive behaviors to resist change and avoid embarrassment. Such emotional coping strategies, aimed at alleviating emotional distress associated with technologies, often prioritize regulating emotions rather than addressing the root cause of the stress. For instance, Zhao et al. (2020) demonstrated that emotion-focused coping strategies negatively affect individual productivity in the context of technostress. While defensive routines are commonly employed to manage situations involving threat and embarrassment, their role as a coping mechanism for technostress remains underexplored, particularly concerning their impact on technology-enabled performance.

To address these gaps, this research draws from Job-Demand Resource (JD-R) model (Hobfoll, 2002) to assess the moderating effect of goal orientation as individual resource and digital leadership as external resource. In addition, we investigate the role of defensive routines as a coping mechanism in the relationship between technostress and technology-enabled performance.

The study focuses on salespeople, a group whose roles have been significantly disrupted by digital technologies. The sales processes such prospecting, approaching, presenting, overcoming objections, closing and follow-up are undergoing substantial transformations fueled by digital technologies such as artificial intelligence, big data and ICTs, fundamentally transforming traditional practices (Singh et al., 2019; Paschen et al., 2020). However, these advancements also introduce stressors for sales employees, such as fears of job obsolescence and the need for new competencies (Bharadwaj and Shipley, 2020). Consequently, technostress poses specific challenges in this industry, which requires research to understand the coping mechanisms and the moderators (Alavi and Habel, 2021).

2. Theoretical foundations and hypotheses development

Stress is experienced by individuals when they perceive a situation as demanding more than their capabilities and resources to handle it (McGrath, 1976). Stress is viewed as a process where people appraise both the environment and them and based on this appraisal, they employ coping strategies to deal with the situation (Lazarus and Launier, 1978). This transactional perspective of stress, known as the transactional theory of stress and coping, was developed Lazarus and Folkman (1984) and formed the basis for theoretical conceptualization of the phenomenon of technostress (Tarafdar et al., 2014). The theory consists of two subprocess: the appraisal process and the coping process (Lazarus and Folkman, 1984). The appraisal process involves two synchronous stages, primary appraisal, and secondary appraisals. During the primary appraisal phase, individuals evaluate the situation and determine whether it is a threat or a positive experience. Subsequently, individuals assess their own capabilities in relation to the situation to determine if they can control or manage it (Lazarus and Folkman, 1984). Based on the outcome of this appraisal, individuals select relevant coping strategies. The occurrence of stress is dependent on how individuals evaluate their interactions with the environment (Lazarus, 1999; Gaudioso et al., 2017). Stress is a response to the imbalance between an individual and their environment (Cooper et al., 2001). Lazarus (1999) categorizes stress into three types: harm/loss, which deals with damage or loss that has already occurred; threat, which deals with potential harm or loss in the near future; and challenge which involves perceiving the situation as demanding but surmountable.

This study employs the JD-R (Job-Demand Resource) model to examine the moderating effects of goal orientation as an individual resource and digital leadership as an external resource. Bakker and Demerouti (2017, p. 274) define job demands as "physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological effort," and job resources as "physical, psychological, social, or organizational aspects of the job" that help mitigate these demands. This framework underscores how job resources are contextualized within the demands placed by the job itself. However, more recent studies suggest that resources extend beyond job-related factors to include "objects, conditions, personal characteristics, and energies" (Grandey and Cropanzano, 1999, p. 352). Drawing on Hobfoll's (1989) Conservation of Resources (COR) theory, it is posited that employees experience significant stress not only due to resource deficits but also from the effort required to acquire resources to bridge the gap between job demands and available resources (Halbesleben et al., 2014).

The JD-R model provides a theoretical foundation for discussing the increased job demands arising from the advancement and application of digital technologies in the workplace, which disrupt the balance between job demands and resources. To restore this balance, employees must seek additional resources from both themselves (e.g., goal orientation) and others (e.g., digital leadership). COR theory further explains why employees may resort to defensive routines to cope with stress induced by technology creators in situations where resources are

lacking. Notably, COR theory is frequently applied to explain adverse outcomes (Mishra and Bhatnagar, 2010).

2.1. Technostress and coping mechanisms

Technostress is a type of occupational stress occurred when individuals interacting with their workplace environment, especially when individuals feel they do not have the ability to respond to the demand and assume there are potentially associated negative consequences caused by technologies (Tarafdar et al., 2014). Due to its negative impact on people's behavior and attitude, technostress is often associated with various terms indicating its damages on the users such as technophobia, cyberphobia, computer phobia, computer anxiety and others (Wang et al., 2008). The literature on technostress has conceptualized the phenomena as consisting of five stress creators, namely techno-overload, techno-complexity, techno-insecurity, techno-uncertainty, and techno-invasion (Ragu-Nathan et al., 2008; Tarafdar et al., 2007). The five creators describe respectively the stress people experience in relation to the adoption of technologies caused by the application of multi-tasking and information overload, technical problems, continual relearning, and consequent job-related security (Tarafdar et al., 2014, Tarafdar et al., 2019). From the definition of technostress, the five technostress creators and its known negative impact on people, we can see that at large, people appraise the continuous arising technologies as a risk and threat to their established equilibrium work and person life (Zhao et al., 2020). According to transactional theory of stress, people will take relevant coping mechanisms to tackle stressful situation (Lazarus and Folkman, 1984). In the context of technostress in this study, technologies create a situation which individuals find incapable to cope with the demand of technologies in terms of speed of technology advancement, technology overload and technology invasion to personal life.

The coping processes determine, at least in part, the behavior individuals take to resolve the demand of the environment (Gaudioso et al., 2017). Coping is defined as "cognitive and behavioral efforts exerted to manage specific external and internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus and Folkman, 1984, p.141). A widely recognized coping mechanism in stress literature is classified into two types, problem-focused coping strategies and emotion-focused coping strategies (Lazarus and Folkman, 1984; Gaudioso et al., 2017). This indicates that stress is double edged with some positive elements when people perceive the stress creators as a challenge instead of harm. Nevertheless, technostress literature always associated technostress creators with negative outcomes until the recently empirical work conducted by Zhao et al. (2020). Despite knowing the fact that technostress is double-edged, we decided to explore the negative outcome of technostress as they could damage organizations' performance and individuals' well-being. Additionally, it is beneficial for organizations to recognize the negative outcomes and work to mitigate them. Hence, we focus on the emotional-focused coping strategies, defensive routines, this responds the call of Zhao et al. (2020) about more studies exploring the other types of emotional-focused coping strategies.

2.2. Technostress and defensive routines

Defensive behaviors are stimulated by the emotions associated with fear and embarrassment (Lazarus, 1999). These emotions result from the individuals' appraisal of the environment which potentially causes threat and embarrassment. Defensive behavior is a coping mechanism individuals take to protect themselves or others. Stress, emotions, and coping are a part of the whole relationship (Lazarus, 1999). Emotion-focused coping is more likely linked with individuals' appraisal of the situation being harmful and over their capability to manage (Lazarus and Folkman, 1984), and individuals tend to take maladaptive coping strategies such as denial, distancing from it and giving up (Gaudioso et al., 2017; Pirkkalainen et al., 2019) Techno-overload, techno-complexity, and techno-uncertainty often affect individuals, when they assume the application of new technologies could create more work rather than benefits and require them to spend their personal time in learning about the technologies. According to COR theory, resource depletion leads to stress, especially when replenishing those resources is challenging (Hobfall, 1989). This can result in defensive behaviors, such as resisting the adoption of workplace technologies to conserve resources. This is evident in Tarafdar et al. (2014)'s study about salespeople who would rather go out to meet customers than sitting behind a computer. Additionally, the new technologies could threaten the established routine of carrying out the work (Sharma and Gupta, 2022), which could cause technophobia (Wang and Takeuchi, 2007) with symptoms of rejecting the new technologies or using the basic functions of the new technologies.

Technology is the second most rated source of fear right behind natural disasters (Walter, 2020). It could be also perceived as a supplement to their job in the future; people would respond negatively to change through defensive mechanisms such as resistance to change. Berente et al. (2016)'s study showed the employees' dissatisfaction with the new system prompted resistance to change behavior. When people perceive the new technologies are too complicated and they lack appropriate skills to engage with the technologies, they may fear being judged as incompetent, hence adopting defensive behaviors, such as avoiding discussions about the technologies with colleagues at workplace. Lazarus (1999) suggested that defensive appraisal is likely to occur when people feel uncertain. Apart from their fear of uncertainties, people may find it embarrassing to make mistakes when they learn a new technology. Especially nowadays the technologies have become quite complex and challenging to master within a short time training. Hence, asking colleagues about how to apply the technologies to improve their performance, people may feel that asking colleagues for help would create an impression of incompetence. Hence, we have the following hypotheses.

H1. : Technostress creators are positively associated with defensive routines.

2.3. Moderator role of goal orientation

Table 1 summarizes the moderators explored in existing studies and reveals the lack of understanding of the role of goal orientation. Goal orientation is rooted in achievement motivation theory (Diener and Dweck, 1980). Dweck identified two major goal orientations, a performance goal orientation, and a learning goal orientation. People with performance goal orientation are characterized by pessimism about their ability to control the situation and a fear of failures and negative judgements (Dweck, 2000). In contrast, people with a learning goal orientation focus on advancing their capabilities and skills by acquiring new expertise and knowledge (Morris et al., 2013). For them, their intelligence is malleable and can be developed by acquiring new skills and knowledge (VandeWalle et al., 2001). According to Lazarus and Folkman (1984) and Lazarus (1999), people appraise stressors differently due to their goal motivation. Naturally, the evaluation of digital technologies and technostress creators can differ depending on an individual's inner drive. People with performance goal orientation have strong self-regulation to focus on avoiding potential negative outcomes (VandeWalle et al., 2001). They benchmark their abilities against other colleagues; this is even so for salespeople when their income is associated with their performance (Kohli and Shervani, 1998), their focus primarily will be on efficiency and achieving the sale target. Learning new technologies can be time-consuming, especially for technologies with complicated functions. This also can be explained using the JD-R model. The adaptation of new technologies can be viewed as a job demand, prompting employees to draw on personal resources, such as a learning goal orientation, to foster a positive attitude toward the

Table 1
Empirical studies on moderators of technostress in the workplace.

Study	Empirical Analysis	Theoretical explanation	Moderators considered	Key findings
Khedhaouria et al., 2024	Survey among 306 ICT remote workers	Transactional theory of stress	Emotional social support	Social mitigate the negative effects of technostress
Tarafdar et al., 2014	survey among 237 institutional sales professionals.	Social cognitive theory	Technology self- efficacy	Self-efficacy does not moderate the relationship between technostress creators and salespeople's performance; however, it directly enhances the performance of salespeople.
Fuglseth and Sørebø, 2014	survey among 216 respondents	Transactional theory of stress; Information continuance theory	Technostress inhibitors (technical support provision; literacy facilitation, involvement facilitation)	Technostress inhibitors does not moderate the relationship between technostress creators and employee satisfaction with ICT use.
Srivastava et al., 2015	Survey among 152 senior managers	Transactional theory of stress	Personality- Big Five	Personality traits moderate the relationship between technostress and job outcome
Spagnoli et al., 2020	Survey among 359 employees in an Italian University	Self-determination theory	Authoritarian leadership	Authoritarian leadership moderates the relationship between workaholism and technostress
Dutta and Mishra, 2024	Survey among 881 working employees in India	Conservation of Resources Theory and Job-Demand Resources Model	Home-work-interface	Home-work-interface is a moderator of the relationship between technostress and its outcomes
Harris et al., 2022	Survey among 253 people	conservation of resource theory	Psychological entitlement	Psychological entitlement moderates the relationship between technostress and turnover intentions, family burnout and turnover intentions
Yener et al., 2021	Survey among 328 civil-servant unions	Appraisal Theory	Technology self-efficacy Time-management	The moderators alleviate the negative effect of technostress on the context job-performance.

transition. In contrast, individuals with a performance goal orientation may rely on their existing selling techniques and familiar technologies, avoiding investing time on learning new technologies. While their past experience serves as a resource for managing the job demands, but it can also become a barrier to adopting the new technologies that could enhance their productivity. Additionally, because they are afraid of failure and negative judgement (Klein and Lee, 2006), they also will miss the opportunity to adopt technologies.

People with learning goal orientation believe that their skills can become obsolete with the time, so it is natural for them to invest time in improving their competencies through continuous learning (VandeWalle et al., 2001). Because their perception of the environment being malleable, people with learning goal orientation are more willing to invest time on learning new technologies and improve the technology-enabled performance. Although they may still experience stress from learning new technologies, they would treat the learning process more a challenge than threat or embarrassment. Consequently, they would not be less defensive toward technostress creators than people with performance goal orientation. Based on the discussion above, we propose the following hypotheses:

H2a. **:** Learning goal orientation weakens the negative relationship between technostress creators and defensive routines.

H2b. : Performance goal orientation straightens the negative relationship between technostress creators and defensive routines.

2.4. Mediating role of defensive routine

Defensive routines are ubiquitous and exist in most organizations (Argyris, 1990; Yang et al., 2022). Studies indicate that individuals resorting to defensive behaviors, aimed at shielding themselves or others from threats and embarrassment, inadvertently hinder personal and collective learning (Argyris, 2000; Yang et al., 2018). For example, within hospital environments, defensive routines could lead to poor patient care (Sales et al., 2013) and excessive prescription of unnecessary medicine and tests (O'Connell, 2021). These behaviors often manifest as coping mechanisms during stressful situations, employing strategies like playing safe, resisting change, protecting turf, passing the buck, distancing themselves from the stressor (Ashforth and Lee, 1990; Pirkkalainen et al., 2019). Notably, when people perceive potential harm outweighing the benefits of technology, it will trigger defensive behavior. Extensive literature acknowledges the detrimental effects of technostress creators (e.g. Ayyagari et al., 2011; Ragu-Nathan et al., 2008; Srivastava et al., 2015), logically leading to the inference that individuals tended to appraise the technology as a threat to their competence. Research has identified some defensive behaviors such as avoidance (Zhao et al., 2020) and resistance to adopting technologies (Beaudry and Pinsonneault, 2010). Furthermore, some emerging AI technologies with complex systems are challenging for users to understand how logic works (Glikson and Woolley, 2020). Especially in developing economies, lack of familiarity with these technologies among individuals can lead to low trust in technologies (Shamim et al., 2023) Consequently, individuals exhibiting defensive routines are more inclined to negatively affect the technology-enabled performance. Based on this discussion, we propose the following hypothesis:

H3. **:** Defensive routines mediate the relationship between technostress creators and the technology-enabled performance.

2.5. Moderating role of digital leadership

Literature concerning stress and leadership has noticeably shown that leaders influence the followers' stress, working either as a buffer against work stressors or a main source of stress (Harms et al., 2017). Drawing from JD-R model, digital technologies can amplify job-demands. For instance, they increase expectations to respond to work related emails outside of working hours (Dutta and Mishra, 2024) and create a heightened need for continuous upskilling to keep pace with technological advancements. The JD-R model posits that workplace stress arises from an imbalance between job demands and job resources (Bakker and Demerouti, 2007). In this context, job resources such as social resource from family, colleagues and line managers are seen as 'people's stress resistance armamentarium' (Hobfoll, 2002, p.312). Leadership plays an important facilitating factor for replenishing employees' resources (Bauwens et al., 2021). However, the rapid pace of technological updates undermines peoples' psychological resources such as job security and confidence in managing continuous learning. This inevitably will cause stress and resistance to change. However, leaders have always considered been important in shaping the environment and reducing followers' anxiety when changes happen (e.g. Rademaker, 2023; Spagnoli et al., 2020, Turel and Gaudioso, 2018,).

Digital leadership refers to the ability of leaders to drive digital transformation, foster technological adoption, and enable innovation through a strategic vision. The concept of digital leadership combines leadership skills and digital capabilities to harness digital technologies

(Kane et al., 2015). Sandell (2013) argues that digital leadership is about capabilities and capacities to provide a creative environment by optimizing the digital technologies and capabilities. Kane et al. (2015) argues that digital leadership is very different from a more conventional leadership style. Leaders need to create some new skills and attributes to fit into new digital environments. Transformative vision for digital technologies, forward looking, digital literacy, technological adaptability, articulating the value of digital change, owning the digital transformation, and equipping employees to success are the attributes that distinguish digital leaders (Kane et al., 2015).

Literature reports number of important outcomes of digital leaderships in different contexts. For example, Zeike et al. (2019) suggests a positive relationship of digital leadership and wellbeing of employees, Wasono and Furinto (2018) argues that digital leadership enables organization to gain sustainable competitive advantage in the era of digital disruption. Bartsch et al. (2020) argues that enabling-leadership in disruption such as digital disruption positively influences performance of individual employee. They further argue that enabling-leadership in such situations positively influence job autonomy, team cohesiveness, and reduce work tension which ultimately result in better individual performance. This is consistent with the contingency theories of leadership that suggest that leadership does not occur in vacuum and to obtain better performance, leader's traits should match the situational or contextual factors (Fiedler's, 1978). Following contingency theory leadership, in a digital context, digital leadership can enhance technology-enabled performance among employees.

Technology-enabled performance refers to the efficiency and effectiveness of organizational processes or individual outcomes supported by technology (Qiao et al., 2024; Mashat et al., 2024). We argue that digital leadership weakens the negative impact of defensive routines on technology-enabled performance by fostering a culture of openness, collaboration, and adaptability in using technology (Kane et al., 2015). Digital leaders encourage a growth mindset and innovation, reducing the defensive behaviors that hinder effective technology use. Through vision and influence, digital leaders align teams with the strategic value of technology, overcoming resistance caused by defensive routines. Digital leadership can promote psychological safety and reduce fear of failure associated with technology adoption by creating an environment where employees feel secure. Digital leaders counteract the avoidance and blame behaviors typical of defensive routines. Hence, we propose the following hypothesis (see Fig. 1)

H4. : Digital leadership moderates the relationship between defensive routines and technology-enabled performance.

3. Methods

3.1. Data collection

This study employed a quantitative research method, collecting data from salespeople in Pakistan. The choice of this specific context was deliberate, considering the challenges associated with rapid adoption of advanced technologies in the region. The competitive job market in Pakistan creates a sense of job insecurity among individuals when faced with technological advancements that could potentially replace aspects of their decision-making processes. Moreover, due to limited economic development, the country lacks a robust digital infrastructure, especially in terms of training individuals to acquire the skills necessary for emerging technologies. Low level of digital maturity and readiness makes Pakistan a suitable context to investigate technostress and its coping mechanisms. For the methodological parsimony and uniformity of digital technologies used by salespeople, we limited our data collection to the fast-moving consumer goods (FMCG) sector. In the FMCG sector, many organizations actively embrace emerging technologies to pinpoint potential customers, understand the customer behavior, and effectively handle inventory. This sector's widespread adoption of innovative tech makes it a suitable target for our study's data collection.

To mitigate common method bias, we collected multisource data from employees and their line managers. According to the recent publication from Rademaker (2023) systematically reviewing the role of leadership on technostress, very limited extant studies collected quantitative data from both leaders and followers. We distributed the questionnaires through the regional and area sales offices in multiple cities. The line managers rated employees for technology-enabled performance and employees responded the rest of questions regarding their own goal orientation, technostress, digital leadership, and defensive routines. Initially, we distributed two sets of questionnaires to team leaders, instructing them to complete the questionnaire assessing technology-enabled performance for their team members. Each set of questionnaires was assigned a unique code, facilitating subsequent matching during data collection. The team leaders then distributed the employee questionnaires, using the matching unique codes to ensure alignment with each employee. For instance, if a leader responded for an employee with the questionnaire code C1TE1, the corresponding employee received a questionnaire with the same code (C1TE1). After data collection, we merged the leader and employee questionnaires based on these unique codes. In this way we managed to get responses from 221 employees and 15 their line managers. In addition, we also used Harmon's single factor method (1967) to statistically test common method bias. The result showed that a single factor explained 37 % of the variance, which is lower than 50 %. This indicates there is no concern of common method bias.

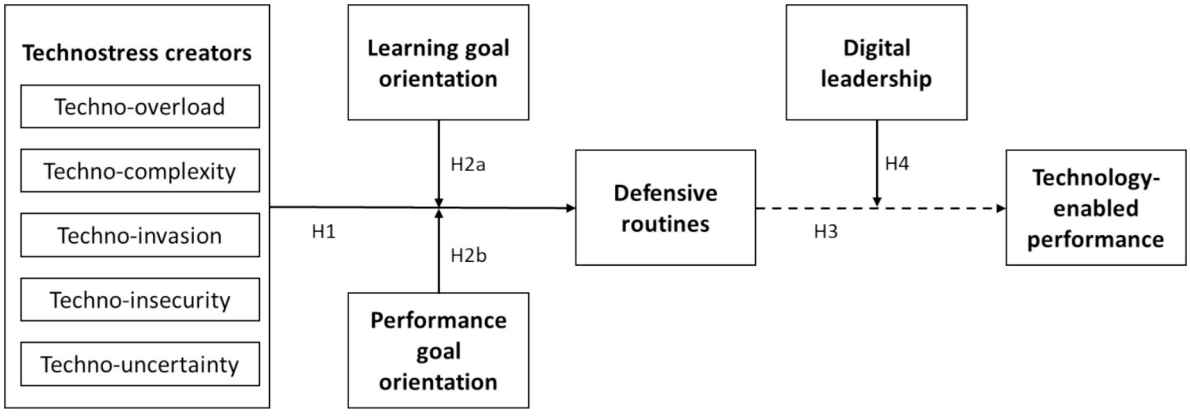

Fig. 1. The conceptual model (Dotted line refers to the indirect relationship of technostress creators and technology-enabled performance through the mediation of defensive routines).

Table 2 provides an overview of the sample characteristics and frequency distributions for the study.

3.2. Control variables

According to Stadin et al. (2021), the extent of technostress experienced differs among different job positions. Managers tend to experience more stress than non-managers. Apart from these variables, we also included gender which was categorized as 'men' and 'women', age listed '22–39 years'; '40–49 years', '50–59 years 'and '60 years to above'.

3.3. Measures

Structured questionnaires were used to measure the variables. Questionnaires were a combination of adopted, adapted, and self-developed items. For the model parsimony and validity, the construct of technostress creators is measured in two steps. The construct of technostress creators consists of techno-complexity, techno-insecurity, techno-invasion, techno-overload, techno-uncertainty. We adopted five items for techno-overload, four items for techno-invasion, five items for techno-complexity, five items for techno-insecurity, and four items for techno-uncertainty from Tarafdar et al. (2014). After testing the reliability and validity of these factors, the items for these factors were transformed into a single factor to be used in the construct of technostress creators. Finally, the construct of technostress creators is measured as a single construct by using these factors, and factor analysis is conducted to measure the reliability and validity of the construct. This method of variable transformation is consistent with Shamim et al. (2021).

Technology-enabled performance is measured from various aspects of salespeople's work outcomes including customer satisfaction, time to mature sale per customer, customer productivity, communication with customers, professionalism with customers, numeric coverage, weighted coverage, and sales target achievement. Digital leadership scale is inspired by Kane et al. (2015). Defensive routine scale is from Yang et al. (2018) but modified the wording to fit in the context of this study. Goal orientation scales are from Sujan et al. (1994).

4. Analysis for model testing

4.1. Reliability and validity

All constructs were examined for reliability and validity. The results indicate that Cronbach's alpha for all the constructs is >0.7, confirming construct reliability. To test discriminant validity, we followed the Fornell and Larcker (1981) approach. Results in Table 3 indicate that all constructs meet these requirements. Factor loadings for all items within the constructs are >0.70, apart from two items measuring digital leadership. Considering that these two items from the original scale have loadings not far from 0.7 and that the results of other tests are all above the referenced thresholds, we decided to retain them. The AVE and CR of all the constructs are >0.5, and the AVE of each construct is less than its corresponding CR. Based on these findings, convergent validity is established. The results of convergent validity are summarized in Table 3.

To establish discriminant validity, the square root of AVE of each construct should be greater than the correlation among constructs

Table 2
Sample characteristics.

Employees	%	Leaders	%
Gender		**Gender**	
Male	78	Male	85
Female	22	Female	15
Highest education		**Highest education**	
High school	6	Bachelor	41
Bachelor	53	Postgraduate	59
Postgraduate	31		
Age of participant		**Age of participant**	
22–39 years	68	22–39 years	20
40–49 years	25	40–49 years	51
50–59 years	07	50–59 years	29
Experience		**Experience**	
1–5 years	38	11–15 years	66
6–10 years	22	16 years and above	34
11–15 years	26		
16 years and above	114		

Note: No. of employees = 221; No. of line managers = 15.

Table 3
Convergent validity.

Variable	Items	Factor loadings	CR	AVE	Cronbach's alpha
Technostress creators	Techno-complexity	0.92	0.92	0.72	0.90
	Techno-insecurity	0.81			
	Techno-invasion	0.75			
	Techno-overload	0.82			
	Techno-uncertainty	0.91			
Defensive routines	DR1	0.81	0.92	0.71	0.89
	DR2	0.89			
	DR3	0.91			
	DR4	0.75			
	DR5	0.85			
Technology-enabled performance	TEP1	0.71	0.94	0.73	0.94
	TEP2	0.94			
	TEP3	0.92			
	TEP4	0,92			
	TEP5	0.92			
	TEP6	0.84			
	TEP7	0.72			
	TEP8	0.79			
Digital leadership	DL1	0.61	0.85	0.60	0.82
	DL2	0.61			
	DL3	0.85			
	DL4	0.87			
	DL5	0.83			
Learning goal orientation	LO1	0.81	0.88	0.72	0.83
	LO2	0.92			
	LO3	0.79			
Performance goal orientation	PO1	0.89	0.83	0.62	0.71
	PO2	0.70			
	PO3	0.76			

Table 4
Discriminant validity.

		1	2	3	4	5	6
1	Digital leadership	**0.77**					
2	Defensive routines	−0.29	**0.85**				
3	Learning goal orientation	0.66	−0.25	**0.85**			
4	Performance goal orientation	−0.29	0.51	−0.40	**0.79**		
5	Technology-enabled performance	0.85	−0.48	0.69	−0.30	**0.86**	
6	Technostress creators	−0.29	0.71	−0.27	0.54	−0.35	**0.85**

Note: the square root of AVE of each construct is on diagonal.

(Fornell and Larcker, 1981). The results in Table 4 show that the square root of AVE of each construct is higher than the correlation among constructs which indicates discriminant validity. The chi square of the model is 988.84, and the R-square of the dependent variable is 0.82.

4.2. Hypotheses testing

Table 5 presents the results of hypothesis testing. We found a positive relationship between technostress creators and defensive routines ($\beta = 0.61, p < 0.001$), supporting H1. Subsequently, we tested the mediating effect of defensive routines on the relationship between technostress creators and technology-enabled performance of sales employees. After introducing defensive routines as a mediator, the direct relationship between technostress creators and technology-enabled performance is insignificant ($\beta = -0.04, p > 0.05$). Nevertheless, our analysis revealed a significant indirect relationship through the mediation of defensive routines ($\beta = -0.21, p < 0.01$). This finding indicates that defensive routines fully mediate the relationship between technostress creator and technology-enabled performance, which support H3.

We also examined the moderating role digital leadership in the relationship of defensive routines and technology-enabled performance of sales employees. Results show that digital leadership can reduce the negative influence of defensive routines on technology-enabled performance by moderating this relationship ($\beta = 0.24, p < 0.01$). These findings support H4. However, results do not support the moderating effect of learning goal orientation ($\beta = 0.14, p > 0.05$) and performance goal orientation ($\beta = 0.07, p > 0.05$) on the relationship between defensive routines and technostress creators. Therefore, H2a and H2b are rejected.

5. Discussion

5.1. General discussion

This study utilized the transactional model of stress and coping as its theoretical framework to underpin the study. Also drawing from JD-R model, we aim to examine the two potential moderators which potentially could serve as buffers to alleviate the negative impact of technostress creator on the technology-enabled performance. The framework proposes that stress is a process including two appraisal stages (Lazarus and Folkman, 1984). Based on this theory, we investigated the first buffer, learning goal orientation and performance goal orientation rooted in achievement motivation theory, but the moderating effect was not found statistically significant, which seems to be counterintuitive to our theoretical deduction. There are two plausible reasons for this finding. The first reason could be the size of sample and the profession of the population. Using salespeople for the study is appropriate in consideration of the number of technologies they adopt and the failure rate of applying technologies into their work (Guenzi and Habel, 2020; Tarafdar et al., 2014). However, considering that the salespeople's performance requires short-term achievements such as meeting the sale target. Hence, they become very performance focused due to the monetary incentives. The second reason is that the impact of personality traits on the outcome of technostress is still on the infant stage and findings are inconsistent. Klein and Lee (2006)'s study indicated that conscientiousness and openness to experience, though as different traits, but positively and significantly associated to learning orientation. Srivastava et al. (2015)'s study posited that people with conscientiousness and openness to experience traits do not appraise the external technostressors as either challenges or threats. Hence the moderation effect was insignificant in their study and in ours.

Furthermore, we investigated the second buffer, digital leadership, between defensive routines and technology-enabled performance. The results supported the moderation effect assumption. Leadership was well explored in the literature of stress (e.g. Spagnoli et al., 2020; Bartsch et al., 2020), but surprisingly, limited existing studies explored the impact of leadership on technostress related topics, particularly digital leadership (Rademaker, 2023). This study consequently contributes to the much-needed study areas in the contemporary digital workplace. The finding fits the theory of JD-R model which indicates leaders are vital replenishing resource for employees (Hobfoll et al., 2018) and it is in line with some of existing studies about the influence of leadership on technostress (Turel and Gaudioso, 2018; Spagnoli et al., 2020).

This study demonstrates that technostress creators could prompt employees to adopt maladaptive coping strategies, such as defensive routines, to conserve diminishing resource caused by advancement of technologies. Drawing from the transaction theory of stress and coping, the finding empirically illustrates that the process how the technology creators can lead to the adverse outcome, preventing organizations from fully leveraging technologies to enhance performance. Our findings reveal that employees appraise the technostress creators and often perceive the new technologies as challenges to their existing capabilities or skills. This is consistent with the existing literature about the fears employees hold toward technologies (e.g. Bader et al., 2017; Berente et al., 2016; Sharma and Gupta, 2022). Some research like us also indicated that when employees perceive technologies as a threat tend to avoid using the technology for a while (Pirkkalainen et al., 2019) until they develop trust in the technology (Sharma and Gupta, 2022).

5.2. Theoretical contribution

Our research addresses a critical gap in understanding why salespeople often struggle to adopt new technologies, examining this issue through the perspective of routine dynamics and the transactional model of stress and coping. Specifically, we extend routine dynamics theory by responding Feldman et al. (2021)'s call to analyze routines through the perspective of individual actors. This aligns with suggestions made by other researchers (e.g. Giada Baldessarelli, 2021; Howard-Grenville, 2016; Salvato and Rerup, 2011) who have

Table 5
Hypotheses testing.

Path	Direct effects β/t-value	Indirect effects β/t-value	Total effects β/t-value	Moderating effect β/t-value	Result
Technostress creators ➔ Defensive routines	0.61***/8.92				Accept H1
LGO*Technostress creators ➔ Defensive routines				0.14/1.19	Reject H2a
PGO*Technostress creators ➔ Defensive routines				0.07/1.84	Reject H2b
Defensive routines ➔ Technology-enabled performance	−0.39***/6.50				–
Technostress creators ➔ Defensive routines ➔ Technology-enabled performance	−0.08/0.55	−0.21**/3.76	−0.29/4.55		Accept H3
Digital leadership*Defensive routines ➔ Technology-enabled performance				0.24**/5.93	Accept H4

Note: LGO = learning goal orientation, PGO = performance goal orientation. *** < 0.001 ** < 0.05.

highlighted the need for more research on the emotional aspects influencing routine execution. By explicitly investigating the role of technostress creators in the ineffectiveness of adopting technologies, mediated by defensive routines, our study advances the understanding of routines within digital transformation context among salespeople. We also contribute to the transactional model of stress and coping by examining the coping strategy employed in response to technostress. Although Lazarus pointed the coping strategies applied in response to stress, yet existing literature predominantly focuses on the negative outcomes of technostress, such as reduced job satisfaction, commitment, and employee performance (i.e. Kim et al., 2015; Fuglseth and Sørebø, 2014; Zhao et al., 2020). Limited attention has been given to the coping mechanisms employees employ to navigate technostress (Tarafdar et al., 2014; Pirkkalainen et al., 2019). Defensive routines are pervasive in most organizations, where employees and teams frequently adopt strategies to manage threats and avoid embarrassment (e.g. Argyris, 1990; Yang et al., 2022). By exploring defensive routines as a coping mechanism, this study extends the existing literature on defensive routines beyond their traditional focus on learning and change. It highlights the implications of these behaviors in the specific context of digital transformation, where adaptability and openness are critical. This contributes to a nuanced understanding of how organizational and individual-level defensive mechanisms can inhibit the effective utilization of technology.

Furthermore, despite the increasing number of research in technostress, a very small portion of technostress literature investigated the role of leadership (Rademaker, 2023). This study extends the literature about the influence of leadership on technostress through the prism of JD-R model and the transaction of stress and coping theory Integrating digital leadership. This is a relatively novel concept, into this framework advances leadership theory by showing its moderating role of reducing defensiveness among the application of technologies at workplace. This linkage highlights that digital leadership not only as a driver of performance, but also as a contextual enabler, providing extra resource to employees to cope with the challenges imposed by technologies.

5.3. Practical implications

This study offers several implications for the sales industry. As sales operations increasingly rely on technology, it is important for managers to realize the risk associated with the potential implication of technologies. To understand the impact of technostress, transactional model of stress and coping is a good theoretical foundation for managers to understand the formation of defensive routines in organization where people used as a coping mechanism, but unconsciously this routine prevents employees from adopting technology and improving their performance. Knowing that defensive routines could be a dysfunctional coping strategy employee to adopt to cope with the feeling of threat and embarrassment, organizations could change the way how employees interpret the technology through training and social support. In addition, as important as having the awareness of technostress, managers need to strengthen employees' resource base through digital leadership (Kane et al., 2015). Such leaders act as a buffer, mitigating the adverse effects of technostress on organizational outcomes. This underscores the significance of cultivating a leadership style that harmonizes technological integration with broader strategic objectives, thereby fostering a more conducive environment for technological adopting and employee performance enhancement within sales teams. Leaders should clearly articulate the value digital technology can offer, equip employees to create value and improve performance through digital technologies, owning the process of digital transformation, and work on enhancing the digital literature of employees and themselves.

5.4. Limitation

We acknowledge that our data are cross-sectional, limiting our ability to establish causal relationships among variables. However, we leveraged a well-established theoretical framework, the transactional process of stress and coping, and collected data from multiple sources to enhance the study's robustness. Future research should aim to replicate our findings using a larger sample and longitudinal data to strengthen causal inferences. Additionally, this study focuses on defensive routines as a coping mechanism for technostress. Future research should explore alternative coping strategies through in-depth qualitative inquiry. Another limitation concerns the generalizability of our findings. Our study examines technostress within the context of a developing economy, specifically Pakistan, where investment in technological infrastructure remains relatively limited compared to the Global West. This focus provides valuable insights for policymakers and organizations seeking to understand and mitigate technostress in similar contexts. However, our findings may not be fully transferable to highly developed economies.

Furthermore, existing technostress measurement tools are predominantly designed in Western contexts and may not fully capture the unique stressors faced by Pakistani employees. Future research could adopt qualitative methodologies to explore these context-specific technostressors in greater depth. A deeper understanding of these factors would facilitate the development of targeted strategies to mitigate technostress and reduce organizational resistance to addressing these challenges.

CRediT authorship contribution statement

Yumei Yang: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Saqib Shamim:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Alfredo De Massis:** Writing – review & editing, Supervision, Investigation, Conceptualization. **Dehua Gao:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization.

Data availability

Data will be made available on request.

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