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## **Technological Innovation and Employee Psychological Well-being: The Moderating Role of Employee Learning Orientation and Perceived Organizational Support**

### **Abstract**

A significant yet rarely explored research area is how the adoption of technological innovations impacts employee psychological well-being, such as in regard to employee anxiety and satisfaction. Accordingly, this study proposes and tests a framework of the effect of technological innovation on the psychological well-being of employees and how much effect is shaped by employee learning orientation and perceived organizational support. Empirical findings from 202 employees within 40 manufacturing SMEs show an inverted U-shaped relationship between technological innovation and employee psychological well-being (measured as employee anxiety and satisfaction). Further analysis reveals that both employee learning orientation and perceived organization support enhance the inverted U-shaped effect of technological innovation on employee psychological well-being. Our findings present important research and practical implications for innovation and organizational studies literature.

**Keywords:** Technological innovation; psychological well-being; employee learning orientation; perceived organizational support; SMEs; Pakistan.

## 1. Introduction

Small and medium-sized enterprises (SMEs) make a critical contribution to the world economy by increasing gross domestic product (GDP) and creating jobs (Hamad et al., 2018). In Pakistan, SMEs make up 90% of the private businesses that largely contribute to GDP (40% annually) and employment (80% of the labor force) (SMEDA, 2021). Moreover, manufacturing SMEs (MSMEs) make up 70% of the manufacturing businesses in the country. Despite the pivotal role of MSMEs across the world, employees in these firms are subject to greater health and safety risks and poor working conditions, due to the lack of effective production mechanisms (Ahmadi et al., 2021; Sajan et al., 2017). Moreover, the complexity involved in manufacturing operations has brought immense life pressures among employees, thereby impacting employee psychological well-being (Shang et al., 2018; Wood & Ogbonnaya, 2016). One prominent phenomenon in this regard is the increasing of negative emotions, like stress and anxiety, among employees (Conway et al., 2016; Ho & Kuvaas, 2020). Since employees are a vital resource in MSMEs to help overcome the liability of smallness (Santoro et al., 2019; Santoro et al., 2020), MSMEs require a productive and structured thinking culture to improve employee psychological well-being (Azeem & Kotey, 2021; Wikhamn et al., 2021). Thus, it is vital to understand the factors that might promote employee psychological well-being in MSMEs (Cegarra-Leiva et al., 2012; Leung et al., 2020).

Recent studies note that technological advancement can play an important role in shaping both the work environment and employee productivity (Aboelmaged, 2018; Braganza et al., 2021; Papagiannidis & Marikyan, 2020). The use of artificial intelligence, machine learning, digitalization, and automation is challenging the ways that MSMEs operate (Hanelt et al., 2021; Škare & Soriano, 2021). Indeed, these advances in technology have allowed MSMEs to become increasingly interconnected and knowledge-intensive, supporting technological innovation (Hervas-Oliver, Parrilli, et al., 2021; Shen et al., 2020), which refers to “*the implementation of an idea for a new product or a new service or the introduction of new elements in an organization's production process or service operation*” (Damanpour & Evan, 1984, p. 394). By introducing technological innovation, MSMEs enable their employees to actively process information and participate in decision-making that can improve their work effectiveness (Aboal & Tacsir, 2018; Chandra et al., 2020). Nevertheless, technological innovation creates a norm of responsiveness that is associated with amplified perceived demands, unrealistic productivity expectations, and increased mental exhaustion (Chung et al., 2017; Johnson et al., 2020).

Despite the growing scholarly interest in technological innovation, the existing literature exhibits some knowledge gaps. First, there has been fiery debate regarding the influential role of human resource management practices (e.g., training, rewards, extensive communication, and motivating job design) in employees' positive mindset and psychological well-being (Cooper et al., 2019; Huettermann & Bruch,

2019; Lamane-Harim et al., 2021). However, in the era of technology, a mere focus on human resource management is insufficient for MSMEs to ensure employees' psychological well-being, given alterations in production processes (Bhardwaj et al., 2020; Raisch & Krakowski, 2021). Due to global disruptions, MSMEs are reacting quickly in order to survive, by introducing technological innovation that offers growth and development opportunities to employees (Papagiannidis & Marikyan, 2020). In this context, Vrontis et al. (2021) have called for future research into the role of technological innovation for employee psychological well-being, noting that "*technological innovations have offered several benefits (cost savings, harmonization and integration of HR activities, efficiency, support of international strategy), but they have also created extra barriers (more HR administration, work stress, disappointments with technological properties); for employees, the implications still remain unclear*" (p. 11). Second, the potential impact of technological innovation on employee well-being may be contingent on certain boundary conditions (Harney & Alkhalaf, 2021; Seeck & Diehl, 2017). However, the existing studies have not investigated the conditions under which technological innovation drives employee well-being in SMEs. This omission is considered a critical knowledge gap in the literature, given the rate of technological transformations in firms and the changing business landscape (Loureiro et al., 2021; Wang et al., 2020). Thus, the present study proposes that the nexus between technological innovation and employee psychological well-being is moderated by employee learning orientation and perceived organizational support. These are legitimate moderators, because employee learning orientation and perceived organizational support are both related to actions intended to improve employee competence, and hence lead to their psychological well-being (Boon et al., 2019; Newman et al., 2017). Employee learning orientation relates to their personal orientation to extend their current knowledge set flexibly and solicit the skills of others (De Clercq et al., 2017), whereas perceived organizational support refers to "*a general perception concerning the extent to which the organization values [employees'] general contributions and cares for their well-being*" (Eisenberger et al., 1990, p. 51).

Against the backdrop of the foregoing arguments, our study responds to Van Lancker et al.'s (2021) and Vrontis et al.'s (2021) call for future research on employee psychological well-being in MSMEs. Our point of departure is underappreciation of the technological innovation that may be a key determinant of employee psychological well-being, and the contingency factors that can potentially enhance employee psychological well-being in MSMEs. Specifically, we examine the following research questions: *What is the impact of technological innovation on employee psychological well-being?* and *How does employee learning orientation and perceived organizational support influence the technological innovation and employee psychological well-being relationship?* In answering these questions, we collected survey data from 202 employees from 40 manufacturing SMEs in Pakistan.

Our study contributes to the extant innovation and employee well-being literature in several ways. First, although prior studies have examined employee psychological well-being (Conway et al., 2016; Leung et al., 2020), this line of research has failed to consider the role of technological innovation, despite the rise in the adoption of technologies (Papagiannidis & Marikyan, 2020; Shen et al., 2020). We fill this knowledge gap by drawing insights from innovation research streams in order to explain how employee psychological well-being is enhanced as part of employees' exposure to technological innovation in MSMEs (Lu et al., 2018; Shu et al., 2011). Consistent with job demands-resources theory (Schaufeli et al., 2009), we show that technological innovation has a curvilinear relationship with employee well-being. We show that technological innovation acts as a resource to a certain level, due to the provision of learning and the creation of idea generation opportunities for employees. However, a high level of technological innovation demands physical and psychological efforts that create stress among employees, thereby reducing their psychological well-being. As such, this study advances innovation literature by considering technological innovation as a determinant of employee psychological well-being in MSMEs (Shang et al., 2018; Wood et al., 2012).

Second, the innovation literature suggests that MSMEs need to extend organizational support towards employees and encourage their learning orientation if they are to attain competitiveness (Assadinia et al., 2019; Gentile-Lüdecke et al., 2020). Because technological innovation affects employee outcomes, such as employee satisfaction (Cheng et al., 2010), it is rational to expect that employee learning orientation and perceived organizational support may help to demonstrate the conditions under which the relationship between technological innovation and employee psychological well-being is more or less effective. As such, we empirically demonstrate the moderating role of employee learning orientation and perceived organizational support for the relationship between technological innovation and employee psychological well-being. This is an important contribution to innovation and employee well-being literature, given the lack of clarity on the boundary conditions that might impede or promote the effect of technological innovation on employee well-being in MSMEs.

Third, a major contribution of our study is to test the conceptual model in the context of SMEs originating from Pakistan – a developing market. While much of the research on employee psychological well-being has focused on large firms (Ho & Kuvaas, 2020; Huettermann & Bruch, 2019), there has been a lack of research on the determinants of employee psychological well-being in developing country MSMEs. The rapid rise in shifting global production networks from developed countries to developing countries will continue. Therefore, the understanding of how MSMEs' technological innovation can promote employee psychological well-being can guide policy formulations in developing countries.

## **2. Theory and Hypotheses Development**

Technological innovation, in the form of the introduction of products, services, and processes, provides a competitive advantage to help MSMEs to successfully compete in dynamic marketplaces (Exposito & Sanchis-Llopis, 2018; Hervas-Oliver et al., 2014). Research has modeled technological innovation as being able to influence outcomes such as international performance (Bagheri et al., 2019; Donbesuur et al., 2020), new product performance (Story et al., 2015), and firm performance (Ramadani et al., 2019), among others. However, studies on the effect of technological innovation on employee psychological well-being have remained scant (Loon et al., 2020). Also, the research has remained limited to understanding the contingencies that might impact relationships between technological innovation and employee well-being. Accordingly, we advance research by presenting employee learning orientation and perceived organizational support as moderators of the technological innovation and employee psychological well-being nexus. Figure 1 introduces the study's conceptual model.

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### ***2.1. Technological innovation and employee psychological well-being***

Technological innovation refers to the generation of products, services, and processes (Anzola-Román et al., 2018; Hervas-Oliver, Sempere-Ripoll, et al., 2021). It deals with introducing new products, services, or production processes directly for customers (Magelssen, 2020). Technological innovation is highly desirable for MSMEs because it is vital in helping them to gain a competitive advantage (Donbesuur et al., 2021). Most literature on technological innovation suggests that it enables MSMEs to attain performance benefits by exploring and exploiting market opportunities (Azar & Ciabuschi, 2017; Exposito & Sanchis-Llopis, 2018; Hervas-Oliver et al., 2014). While this line of research has focused on various performance indicators like firm growth, international market success, and sustainable development (Bagheri et al., 2019; Golovko & Valentini, 2011; Shashi et al., 2019; Sun et al., 2021), it is notable that scholarly attention has not been devoted to employee well-being, which is one of the key sources of competitive advantage.

Since technological innovation promotes the engagement of knowledge-empowered workforces in designing new tools (Walrave & Raven, 2016), it can improve employee psychological well-being in MSMEs. But technological innovation is a risky activity that can cause stress among employees and deteriorate their well-being (Zuo et al., 2019). As job demands-resources models suggest (Schaufeli et al., 2009), technological innovation demands physical and psychological (e.g., emotional or cognitive) efforts from employees, and is therefore associated with psychological costs, but technological innovation also acts as a resource, as it offers learning opportunities to employees, thereby promoting their career development and psychological well-being. Stating this differently, technological

innovation often involves complex demands that create strain among employees, whereas technological innovation as a resource induces motivational processes (Crawford et al., 2010; Johnson et al., 2020). We consequently argue that technological innovation has both benefits and pitfalls for employee psychological well-being in MSMEs. We contend that MSMEs' technological innovation can be a double-edged sword.

When technological innovation is low to moderate, it can significantly improve employee psychological well-being. First, technological innovation involves the experimentation of new ideas and novel ways of doing things (Lindholm-Dahlstrand et al., 2019). By engaging in technological innovation, MSMEs send signals to employees that they are ready to explore new trajectories by encouraging employees to take risks. This can give employees the confidence to explore and generate new ideas without being concerned about failure or job loss (Liu et al., 2020). The ensuing confidence also improves the intrinsic motivation to challenge conventional ways of doing and adopting unique practices that can provide a sense of achievement to employees (Hirst et al., 2015; Lin et al., 2019). Furthermore, technological innovation is an important resource, as it creates a learning environment in MSMEs that fosters communication and collaboration among employees (Schaufeli et al., 2009). Such an environment provides employees with access to a diverse set of ideas that are otherwise difficult to achieve alone, thereby improving their scope of knowledge (Li et al., 2020; Oksanen et al., 2021). Hence, technological innovation acts as a vital resource that enables employees to share their ideas with others in a pioneering work environment, thereby improving their psychological well-being.

Second, technological innovation emphasizes efficient production and cost-effective practices. MSMEs with high technological innovation encourage the altering of existing techniques and discovering new methods. To achieve this, MSMEs must gather ideas about new ways and evaluate existing approaches. Also, MSMEs must find solutions to upgrade their existing products, processes, and services. This process requires MSMEs to rely on employees not only to accumulate relevant information but also to search for solutions in problem-solving (Jaiswal & Dhar, 2015). Specifically, technological innovation provides a context in which employees' participation in information searching and decision-making is encouraged and appreciated (Wikhamn et al., 2021). Accordingly, employees feel valued and satisfied about their role in MSMEs, thereby resulting in higher employee psychological well-being.

Nevertheless, as technological innovation increases, it demands greater employee efforts to coordinate complex innovation activities and ensure proper communication for timely provision of innovation (Balland et al., 2019; Nambisan et al., 2019). Besides this, having a high level of technological innovation can induce employees to demonstrate their creativity and come up with new ideas. This implies that increasing technological innovation in MSMEs creates pressure and stress for employees to be creative, which can impede their psychological well-being (Crawford et al., 2010; Schaufeli et al.,

2009). Furthermore, an increase in technological innovation implies a demand for more significant efforts to integrate and combine different colleagues' knowledge in order to find the best ideas and complementary knowledge (Johnson et al., 2020). Although these concerns can be managed up to a point, employees experiencing a high level of technological innovation in an MSME would experience competition with their peers, making it difficult to interact and freely exchange ideas.

Taken together, we propose that there is likely to be a threshold effect of technological innovation: when too low, there will be no room in an MSME for employees to take up new initiatives and experience growth; when too high, employees will face stress and experience less job authority, suggesting a curvilinear relationship between technological innovation and employee psychological well-being. Thus, we form our baseline hypothesis as:

**H1:** Technological innovation and employee psychological well-being has an inverted U-shaped relationship.

## ***2.2. The moderating role of employee learning orientation***

As technological innovation increases (from low to high), the coordination challenges related to knowledge exchange and decision-making increase for employees in MSMEs. A possible solution to mitigate these challenges is to utilize employee learning orientation. Employee learning orientation is a personal factor related to an individual's dedication to generate novel knowledge combinations – personally and with peers (Gong et al., 2009). It relates to the personal motivation of employees, encouraging their achievement behavior to exert efforts in the pursuit of mastery (Dweck, 1986). Moreover, personal motivation facilitates employees to convert task conflict into creativity by promoting the ability to create unique combinations of divergent knowledge (Button et al., 1996). Consistent with motivational processes (Ames & Archer, 1988; Dweck, 1986), employees with a more robust learning orientation are inclined to experimentation that provides them with learning opportunities in an MSME (De Clercq et al., 2017). Therefore, it can be argued that employee learning orientation can enhance positive work-related emotions and promote a sense of achievement.

Literature on motivation suggests that employee learning orientation influences the intrinsic desire to improve skills and participate in metacognitive activities (e.g., planning, monitoring, and revising behaviors) (Gong et al., 2009; Harvey et al., 2019). A strong learning orientation enables employees to expand their knowledge stocks and effectively assimilate it with perspectives provided by others (Harvey et al., 2019). Moreover, a strong learning orientation of employees motivates them to learn things from the external environment (e.g., industry information, technology trends, other partners' technologies, and changing customer demands), but also encourages them to share the accumulated information internally, with other employees (Colquitt & Simmering, 1998; DeRue & Wellman, 2009).

Accordingly, employees become more flexible, which helps them to engage in complex innovation tasks and find novel solutions for problems, even if these activities involve substantial upheaval of the status quo (Coetzer et al., 2017). As such, the propensity to acquire knowledge and engage in problem-solving increases employees' ability to leverage technological innovation into their psychological well-being.

Furthermore, learning-oriented employees are also characterized by challenge-seeking behavior that directs them to replace old knowledge and skills with new ones, enabling them to take on future challenges (Matsuo, 2020). These employees view challenging innovation activities as an opportunity to generate novel ideas for their personal growth and contentment (VandeWalle et al., 1999). Specifically, learning-oriented employees not only possess superior skills to exploit technological innovations but also consider it desirable to apply their learning efforts to innovation activities (Jones et al., 2017). Employee learning orientation facilitates determination and intrinsic motivation to convert technological innovations into employees' security and welfare. In addition, the self-regulative behavior of learning-oriented employees motivates them to convert technological innovation into their own knowledge sets for achieving desirable outcomes – such as employee psychological well-being. Thus, as technological innovation in an MSME increases, greater utilization of employee learning orientation reinforces the positive relationship and mitigates the negative relationship between technological innovation and psychological well-being. Hence, the following hypothesis is proposed:

**H2:** Employee learning orientation moderates the relationship between technological innovation and employee psychological well-being such that the positive slope of the inverted U-curve is reinforced (steeper), and the negative slope is mitigated (flatter) with a high level of employee learning orientation.

### ***2.3. The moderating role of perceived organizational support***

Due to the complex and resource-intensive nature of the innovation process, a rising degree of technological innovation increases organizational uncertainty, which produces stress in MSMEs and hampers employee efficiency and job satisfaction (Brougham & Haar, 2020). Perceived organizational support can help to overcome these challenges and improve employee psychological well-being. According to organizational support theory (Eisenberger et al., 1997), perceived organizational support relates to employees' general perceptions about the extent to which their organization values their contributions and cares about their welfare (Kurtessis et al., 2015; Thompson et al., 2020). When employees believe that their organization adopts supportive and ethical practices, they are more likely to believe that the support they receive from the organization is genuine and intended to be in their best interests (Zagenczyk et al., 2020). Therefore, perceived organizational support can play a significant



role in promoting the relationship between technological innovation and employee psychological well-being.

A high level of perceived organizational support implies that employees receive appropriate treatment from MSMEs, such as getting daunting tasks, training, and developmental opportunities (Probst et al., 2020). Such treatment satisfies the employee's socio-emotional needs of care, respect, and approval (Wang & Xu, 2019). Furthermore, employees who perceive organizational support in MSMEs are less likely to experience work-life conflict; they also have lower levels of absenteeism, distress, and turnover intention, and have higher life satisfaction (Stavrou & Solea, 2021). Therefore, in the presence of high levels of perceived organizational support, employees consider technological innovation as an opportunity for their personal growth and thus engage in problem-solving activities (Li et al., 2019). This, in turn, can enhance employee psychological well-being.

In addition, perceived organizational support often entails the norms of reciprocity (Cook et al., 1993; Hofmann & Morgeson, 1999). Employees who feel that they have received higher organizational support in MSMEs tend to reciprocate more by engaging in citizenship behavior and performing better than those reporting low levels of perceived organizational support (Wayne et al., 1997). Hence, this can encourage further technological innovation in MSMEs. Specifically, employees' perception of high organizational support signals the notion that technological innovation is beneficial for their competence development, engagement in rewarding efforts, and involvement in decision-making (Rockstuhl et al., 2020). As such, this gives peace of mind to employees, thereby enhancing the positive effects of technological innovation on employee psychological well-being.

Taken together, we suggest that at a lower level of technological innovation, a higher perception of organizational support reinforces the positive relationship between technological innovation and employee psychological well-being. At a higher level of technological innovation, a higher perception of organizational support mitigates the declining relationship between technological innovation and employee psychological well-being. Hence, the following hypothesis is proposed.

**H3:** Perceived organizational support moderates the relationship between technological innovation and employee psychological well-being such that the positive slope of the inverted U-curve is reinforced (steeper) and the negative slope is mitigated (flatter) with a high level of perceived organizational support.

### **3. Methodology**

#### ***3.1. Context and data collection***

We tested our study hypotheses on a sample of MSMEs operating in Pakistan - an Asian developing country. Our choice of Pakistani MSMEs as the context of the study is based on several reasons. First, Pakistan is a fast-growing economy in Asia, with a projected gross domestic product (GDP) increase of 4% in 2020-2021 (Geo, 2021). The country introduces strategic initiatives that facilitate investments and attract foreign direct investors from developed countries. Also, the stable political structure and growing infrastructure system have resulted in organizations engaging in costly innovation activities and becoming highly competitive. This economic outlook makes it vital to understand how organizations in developing countries – such as Pakistan – promote employee psychological well-being. Second, privately-owned SMEs represent 90% (i.e., 3.3 million) of the businesses in Pakistan that contribute significantly to GDP (40% annually) and employment (80% of the labor force) (SMEDA, 2021). Thus, literature on psychological perspectives on technological innovations will benefit from studies that examine how developing country MSMEs – with their growth and development potential – support the psychological well-being of their employees.

Due to difficulty in recognizing a single database in developing countries, including Pakistan (Mahmood & Mubarik, 2020), the sampling frame was developed from multiple sources, including business directories and Pakistan Chamber of Commerce databases. The following criteria were used to identify and select the appropriate sample: (1) firms that are independent and privately-owned; (2) firms with less than 250 employees, therefore considered as SMEs; (3) firms operating in the manufacturing industry; and (4) firms actively engaging in innovation activities. Based on these selection criteria, we identified 102 MSMEs that we considered might be willing to participate in our study. In each MSME, the aim was to select a maximum of six employees from each firm to complete the questionnaire. Subsequently, 615 employees from 102 manufacturing MSMEs were approached in person with a structured questionnaire. Despite being expensive and time-consuming, this data collection approach is effective in Pakistan, due to the lack of trust in the MSMEs to respond to a postal survey (Khan et al., 2019). The survey was conducted in English because Pakistan is an ex-British colony where English is widely spoken and written among businesses (Khan, 2020; Khan et al., 2020). After a few rounds of fieldwork, the final useable sample consisted of 202 employees from 40 manufacturing MSMEs. Comparing the final sample of 202 employees from 40 SMEs to the initial qualifying sample of 615 employees from 102 SMEs yields an effective response rate of 32.85%. The number of responding employees per MSME ranged from four to six. The descriptive characteristics of the study sample are provided in Table 1.

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### **3.2. Measurements**

The study constructs comprised multi-item measurements that were adapted from the existing literature. All the multi-item constructs were measured using a seven-point Likert scale to ensure enough variability.

#### **3.2.1. Technological innovation**

Technological innovation refers to creating new products/processes or significantly improving the products/processes in an MSME (Bagheri et al., 2019). It was measured using a four-item scale adopted from existing technological innovation studies (Camisón & Villar-López, 2014; Damanpour et al., 2009; Miller & Friesen, 1982).

#### **3.2.2. Employee learning orientation**

Employee learning orientation is conceptualized as an individual's dedication to learning and improving their competence (Gong et al., 2009). It was measured using a four-item scale adopted from Vandewalle (1997). Previous studies have used this scale widely (e.g., De Clercq et al., 2017; Jones et al., 2017; To et al., 2015).

#### **3.2.3. Perceived organizational support**

We defined perceived organizational support as the extent to which employees perceive their organizational environment as fair and supportive (Allen & Shanock, 2013). It was measured using a six-item scale adopted from Eisenberger et al. (2001).

#### **3.2.4. Employee psychological well-being**

Employee psychological well-being is captured using two dimensions: job satisfaction and job-related anxiety-comfort. Job satisfaction refers to the contentment of employees with their work (Zheng et al., 2015). In contrast, job-related anxiety-comfort relates to the associated emotions and feelings that constitute subjective well-being (Mäkikangas et al., 2007). Following Wood et al. (2012), job satisfaction was measured using an eight-item scale, and job-related anxiety-comfort was measured using a six-item scale.

#### **3.2.5. Control variables**

To account for other potential influences on employee psychological well-being, we controlled for employee age, gender, education, and tenure. We measured employee age in years. Employee gender

was measured as a dummy: 1 = male and 2 = female. Employee education was measured as a dummy: 1 = not completed high school; 2 = high school; 3 = higher national diploma; 4 = undergraduate degree; and 5 = postgraduate degree (Zacher & Rudolph, 2021). We measured employee tenure as the number of years since an individual joined the company.

### ***3.3. Informant evaluation***

In line with previous studies (e.g., Boso et al., 2019; Morgan et al., 2012), the respondents' competence was assessed on three key areas: (1) knowledge about the asked questions; (2) confidence in answering questions; and (3) accuracy of the answers provided. These questions were measured on a 7-point Likert scale (1 = not at all knowledgeable and 7 = very knowledgeable). We recorded mean scores of 6.48 for knowledge about the asked questions, 6.27 for confidence in answering questions, and 6.34 for accuracy of answers. These scores are all above the mid-scale point (Heide & Weiss, 1995), thereby suggesting a high level of competence of the respondents.

### ***3.4. Common method bias testing***

As with most survey data and analysis, we test for the possibility of common method bias (CMB) as part of the validity and reliability checks before testing the study's hypotheses. Accordingly, we estimated three competing CFAs approaches as a way of assessing CMB. First, we estimated a method-only model – where all the measurement items are loaded on a single latent construct:  $X^2/DF = 5.17$ ; CFI = 0.61; TLI = 0.55; RMSEA = 0.14; SRMR = 0.17. Second, the trait-only model was estimated, with the measurement items loading on their respective latent constructs:  $X^2/DF = 1.07$ ; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.04. Finally, we estimated the method-and-trait model – which combines both models:  $X^2/DF = 1.05$ ; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.03. Comparing the three CFAs indicates that models 2 and 3 are superior to model 1; hence we could conclude that CMB does not sufficiently describe the data and the subsequent empirical results.

## **4. Results**

### ***4.1. Reliability and validity of the measurement model***

We assessed the reliability and validity of our measurement items using confirmatory factor analysis (CFA). Results of the CFA indicate acceptable model fit indices:  $X^2/DF = 1.07$ ; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.04. The Cronbach alpha and composite reliability (CR) values exceeded the minimum threshold of 0.70 (Bagozzi & Yi, 2012), while the standardized factor loadings for all items were significant. In terms of achieving discriminant validity, the CFA shows that the average variances extracted (AVE) were each greater than 0.50, and that the square root of the AVEs of each construct was greater than the correlation between each pair of constructs. Table 2 provides details of the reliability and validity fit indices (measurement model), while Table 3 provides the

correlation coefficients, the square roots of the AVEs, and the mean and standard deviations of the study constructs.

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#### **4.2. Hypotheses testing**

We tested the hypothesized relationships using hierarchical-moderated regression. This approach allowed us to test (without any ambiguity), step by step, the effects of the (1) independent variable and (2) interaction terms of the independent and moderating variables, while reporting changes in model fit indices after each model estimation. To reduce the influence of multicollinearity on our results, we mean-centered all variables before deriving their product terms. Accordingly, three interactive terms were calculated: (1) the square of technological innovation; (2) the square of technological innovation x organizational support; and (3) the square of technological innovation x learning orientation. In all, we estimated four models to appropriately test the three hypotheses. Model 1 estimates the effect of the control variables, including the linear effect of technological innovation. Model 2 tests the square of technological innovation – as the inverted u-shaped relationship, while models 3 and 4 test the moderating effects of organizational support and learning orientation, respectively. Relevant estimation indices, including the variance inflation factors (VIF), are reported for each model, as shown by Table 4.

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The results confirm H1 – that the introduction of technological innovation has an inverted u-shaped relationship with employee psychological well-being ( $\beta = -0.32$ ;  $p < 0.01$ ). We find further support for H2 – organizational support positively moderates the curvilinear relationship between technological innovation and employee psychological well-being ( $\beta = 0.36$ ;  $p < 0.01$ ). Lastly, model 4 confirms H3 – that learning orientation enhances the curvilinear relationship between the introduction of technological innovation and employee psychological well-being ( $\beta = 0.31$ ;  $p < 0.01$ ). Due to the difficulty in interpreting the significance of quadratic and quadratic two-way relationships, we plotted three interactive graphs (Figures 2, 3, and 4) to further explain the study's hypothesized relationships. Figure 2 shows that low levels of technological innovation are positively associated with employee psychological well-being, while higher levels can negatively affect the well-being of employees. Further, figures 3 and 4 indicate that high levels of both organizational support and learning orientation enhance the inverted U-shaped relationship between technological innovation and employee psychological well-being.

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## 5. Discussion

Prior research affirms that innovation matters for MSMEs' success (e.g., Exposito & Sanchis-Llopis, 2018). However, the growing recognition of individuals in an organization raises the debate of whether firm-level innovation has implications for employees' motivations and performance (Loon et al., 2020). Therefore, this study builds on prior research on innovation and organizational psychology to examine how technology innovation influences employee psychological well-being in MSMEs. Accordingly, we find a curvilinear effect of technological innovation on employee well-being. Further analysis indicates that employee learning orientation and perceived organizational support are essential boundary conditions that enhance the technological innovation/employee psychological well-being relationship. These findings present significant theoretical and practical implications.

### 5.1. Research implications

First, the findings indicate that the relationship between technological innovation and employee psychological well-being is inverted U-shaped. While the innovation literature has predominantly focused on the implications of technological innovation for firm performance (Anzola-Román et al., 2018; Camisón & Villar-López, 2014), limited evidence exists on its effect on employee-related consequences. Our findings indicate that technological innovation influences employee psychological well-being. In doing this, our study indicates that the technological innovation/employee psychological well-being relationship is more complex than previously suggested (Exposito & Sanchis-Llopis, 2018), and that technological innovation is not always beneficial for the psychological well-being of employees (Liu et al., 2020). This finding informs the understanding of the advantageous effect of technological innovation beyond the linear assessment by showing that higher levels of technological innovation generate diminishing returns for employee psychological well-being. Thus, our finding extends the job demands-resources model (Schaufeli et al., 2009) and the emerging literature on technological innovation (e.g., Jiao & Zhao, 2014). Specifically, we integrate the tenets of technological innovation and the job demands-resources model to add to the ongoing discourse of how organizational level initiatives (such as technological innovation) may affect employee psychological well-being (Bakker & Demerouti, 2018).

Second, this study adds the contingency perspective to innovation and employee psychological outcomes literature by considering the boundary conditions of the impact of technological innovation (Eisenberger et al., 2001; Harvey et al., 2019). In doing so, we highlight when technological innovation is more or less effective in driving employee psychological well-being. Thus, the findings suggest that the curvilinear effect of technological innovation on employee psychological well-being depends on the levels of employee learning orientation and perceived organizational support. For innovating MSMEs, employee learning orientation and perceived organizational support enable MSMEs to target

technological innovation better in order to promote employee psychological well-being. In particular, the results suggest that both employee learning orientation and perceived organizational support magnify the positive effects that low to medium levels of technological innovation exert on employee psychological well-being, but also reduce the negative effect of a high level of technological innovation. Employee learning orientation and perceived organizational support encourage employees to render support for technological innovation in order to promote their well-being (Athota et al., 2020; Huettermann & Bruch, 2019; Li et al., 2019). As such, technological innovation is expected to become more critical for employee psychological well-being when there are high levels of employee learning orientation and perceived organizational support. These findings shed light on the tenets of job demands and resources (e.g., Bakker & Demerouti, 2007) by demonstrating the role that learning orientation and organizational support play in enhancing employee well-being. Thus, we add to previous job demands and resources model research on sources of employee well-being – including health impairment process and motivational processes (Bakker & Demerouti, 2007; Brauchli et al., 2013) – by highlighting how key resources such as learning orientation and organizational support can be used to enhance the effect of technological innovation on employee psychological well-being. Relatedly, our findings further contribute to recent calls on organizational level factors that may condition the effects of employee well-being (see Bakker & Demerouti, 2018).

Third, our study contributes to the job demands and resources model, as well as the employee well-being literature, by focusing on a sample of MSMEs drawn from Pakistan –a developing country. The vast majority of studies have focused on developed economies that have rules and regulations related to human resource management and well-being (Athota et al., 2020; Chughtai et al., 2015; Harney et al., 2018). However, developing countries like Pakistan lack formal policies to promote employee well-being. To this end, our findings highlight how and when employee well-being can be maximized within a context that is limited by such findings. Thus, the business landscape of Pakistan is dominated by SMEs that contribute to economic growth and job creation (SMEDA, 2021). SMEs have placed the country on the growth route, as evident from the infrastructure transformations and increased FDI (Khan, 2020; Khan et al., 2019). Therefore, our study findings not only suggest that MSMEs in Pakistan can promote employee psychological well-being through technological innovation, organizational support, and employee learning orientation –they also provide significant implications for the management and growth of these MSMEs.

### ***Practical implications***

As many organizations continue to introduce new technologies and innovations, managers must understand what that might mean for the psychological well-being of their employees. Thus, findings from our current study present significant implications for managers, owners, and human resources

practitioners of MSMEs. First, the findings shed light on the extent to which the introduction of technological innovation by management can be beneficial for employees' well-being. Despite the positive aspects of technological innovation for employee psychological well-being (at least in the short term), this research has further revealed that the adoption of technological innovation by SMEs ought to be done with moderation – as over-reliance on such innovativeness can impact negatively on the well-being of employees. To this end, management and human resources practitioners should take caution when introducing new technologies in all aspects of firms' operations, as this may be detrimental to employees' psychological state in the long run. For example, a practical way of ensuring this will be for management to consider the usefulness or significance, perceived ease of use, and implementation procedures when introducing new technologies. In this way the cost and benefits of new technologies to employee well-being can easily be identified. Second, where employees are overwhelmed and overburdened by the continuous adoption of technological innovations, management and human resources officers can introduce practices and strategies that seek to buffer the negative implications of technological innovations on psychological well-being. Specifically, our findings point out that management should ensure high levels of organizational support for employees and encourage employees in their learning orientations – as these are essential processes that can enhance the well-being of employees. Thus, the availability of employee support initiatives and organizational work/life balance strategies such as flexible working arrangements, helping employees maintain a positive outlook, commending employee efforts, among others, can help mitigate the otherwise negative effect of technological innovation on psychological well-being. Again, learning orientation is vital in reducing the complexities caused by the excessive adoption of technological innovations, and can thus attenuate the negative effect of technological innovation on well-being. To this end, firms can stimulate and encourage the culture of learning by providing resources and environments (e.g., staff away days, job level training and development initiatives, exchange programs with other institutions or firms, etc.) that are conducive for continuous learning, while enhancing the relevant skills of employees. In effect, we encourage managers and human resources officers of MSMEs to provide a supportive working environment and introduce mechanisms that enhance employees' continuous learning when adopting new technologies.

## ***5.2. Limitations and future research directions***

Like many other studies, this research has some limitations that can spur future research in the technological innovation/ employee psychological well-being relationship. First, the extant literature conceptualizes employee psychological well-being to include work engagement and emotional exhaustion (e.g., Chughtai et al., 2015). Thus, just as there are variations within the conceptualization of employees' subjective well-being, we believe that there may be variations in the impact of technological innovation, depending on what aspect of employee well-being is under study. In effect,



the current literature can be extended by studies that consider different aspects and dimensions of employee psychological well-being. Second, our study has hypothesized the curvilinear relationship between technological innovation and employee well-being. This offers unique opportunities for future research to take account of the threshold effect in the conceptualization of technological innovation (Yu et al., 2021). Moreover, future studies can empirically understand the threshold effect of technological innovation in MSMEs. Third, proposed and tested perceived organizational support and learning orientation are boundary conditions that shape the relationship between technological innovation and employee psychological well-being. However, other phenomena, including employee-related (e.g., job position) and job-related (e.g., job mobility and job insecurity) factors may affect how employees react to the introduction of technological innovation (Beare et al., 2020; Brougham & Haar, 2020). Thus, future studies that consider other mediating and/or moderating variables such as job position, job mobility, and insecurity can provide further insights into the technological innovation/employee psychological well-being relationship. Fourth, while our study has considered the impact of technological innovation on well-being, there might be other consequences of technological innovation. Specifically, the outbreak of COVID-19 has led to the increased adoption of digital technologies, including artificial intelligence, robotics, and big data analytics, which might cause distress for employees (Amankwah-Amoah et al., 2021). Future studies could investigate how technological innovation, including the adoption of smart working tools, impact on employee burnout. Finally, our sample consisted of manufacturing SMEs in a developing economy. Even though this provides a unique context and contribution, it restricts the generalizability of the study findings. Future studies can expand our understanding of this area of research by considering other relevant contexts, such as larger and/or service firms, as well as developed markets.

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**Table 1.** Sample characteristics.

<b>Variables and category</b>	<b>Average/Percentage</b>
Employee age (average)	43 years
Sex	
Male	70.8%
Female	29.2%
Education	
Not completed high school	8.4%
High school	15.3%
Higher national diploma	16.3%
Undergraduate degree	51.0%
Postgraduate degree	8.9%
Employee organizational tenure (average)	9.3 years
Employee job department	
Research & Development	15.3%
Production	29.2%
Maintenance	10.4%
Administration	20.3%
Marketing	9.4%
Human resources	8.9%
Others	6.4%
Employee job position	
Managerial	21.8%
Ordinary staff	78.2%

**Table 2.** Construct validity and reliability.

Construct details and results of validity tests	Standardized Factor loadings
<b>Technological innovation (CA = 0.85; CR = 0.84; AVE = 0.56)</b>	
1. The organization continues to develop a range of products.	0.70
2. The organization can replace products that become obsolete.	0.83
3. The organization continues to adopt the latest technology in products or processes.	0.80
4. The organization integrates management activities to reduce the cost of production.	0.70
<b>Perceived organizational support (CA = 0.89; CR = 0.88; AVE = 0.60)</b>	
1. The organization takes pride in my accomplishments.	0.73
2. The organization really cares about my well-being.	0.75
3. The organization values my contributions to its well-being.	0.75
4. The organization strongly considers my goals and values.	0.77
5. The organization is willing to help me if I need a special favor.	0.85
<b>Employee learning orientation (CA = 0.84; CR = 0.84; AVE = 0.57)</b>	
1. I often read materials (books, articles, Internet, etc.) to improve my abilities.	0.73
2. I like to take on a challenging task that I can learn a lot from.	0.75
3. I often look for opportunities to develop new skills and knowledge.	0.80
4. I enjoy challenging and difficult tasks where I can learn new skills.	0.73
<b>Employee psychological well-being</b>	
<b>Job satisfaction (CA = 0.95; CR = 0.95; AVE = 0.67)</b>	
To what extent are you satisfied with	
1. the amount of influence you have over your job	0.63
2. the amount of pay you receive	0.89
3. the sense of achievement you get from your work	0.84
4. the scope for using initiative	0.91
5. the training you receive	0.89
6. your job security	0.81
7. involvement in decision making	0.82
8. the work itself	0.81
<b>Job-related anxiety-comfort (CA = 0.90; CR = 0.89; AVE = 0.58)</b>	
Thinking of the past, how much of the time has your job made you feel	
1. relaxed	0.71
2. calm	0.77
3. contented	0.76
4. tense	0.88
5. worried	0.80
6. uneasy	0.70
<b>Fit indices: <math>\chi^2/DF = 1.07</math>; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.04</b>	

Note. CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

**Table 3.** Correlations and descriptive statistics of study variables.

No.	Variables	<i>M</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
1	Employee age <sup>Ψ</sup>	3.73	0.23	1								
2	Employee tenure <sup>Ψ</sup>	1.99	0.70	0.45	1							
3	Educational level <sup>α</sup>	---	--	0.01	0.02	1						
4	Employee gender <sup>α</sup>	---	---	0.04	-0.09	0.06	1					
5	Technological innovation	4.79	1.14	-0.02	0.08	-0.28	-0.12	<b>0.75</b>				
6	Employee learning orientation	4.87	1.10	-0.04	0.05	-0.04	0.07	0.11	<b>0.75</b>			
7	Perceived organizational support	4.89	1.05	0.02	-0.03	0.14	0.04	-0.10	0.00	<b>0.77</b>		
8	Job-related anxiety-comfort	4.41	1.44	-0.01	0.03	-0.10	0.06	0.09	0.03	-0.02	<b>0.76</b>	
9	Job satisfaction	4.84	1.49	-0.19	-0.10	0.07	0.03	0.09	-0.05	-0.07	-0.10	<b>0.83</b>

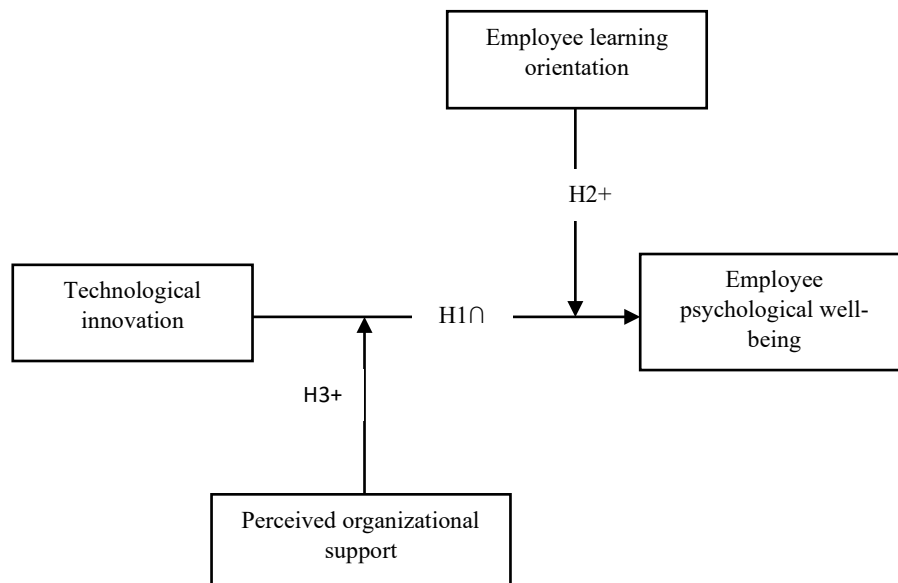
*Note.* Correlations above 0.10 and 0.17 are significant at  $p < 0.05$  and  $p < 0.001$ , respectively.  $\alpha$  = dummy variables; and  $\Psi$  = natural logarithm transformation of original values.

**Table 4.** Results of hierarchical moderated regression.

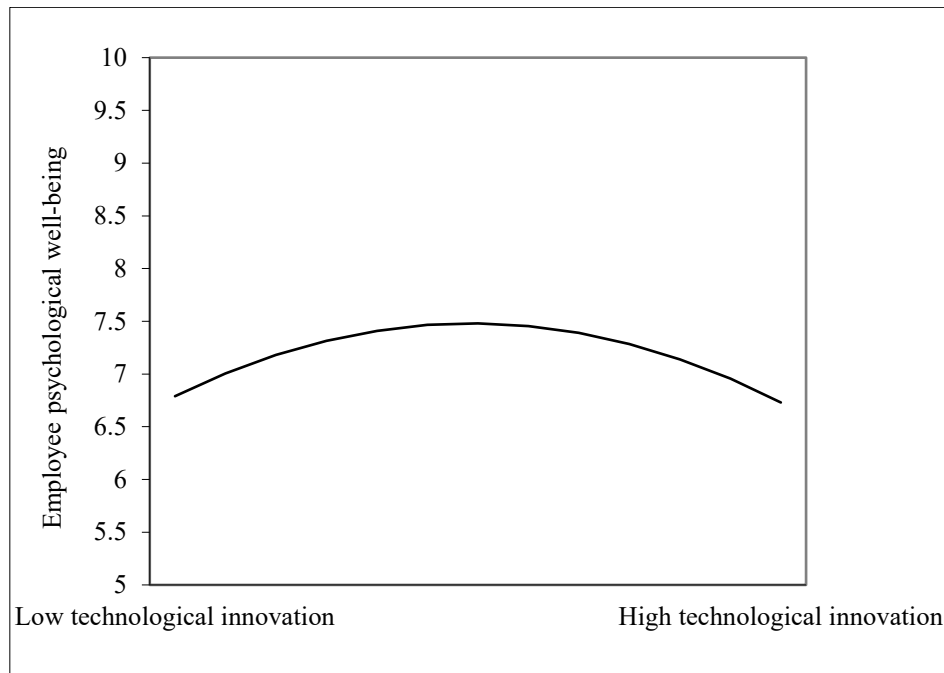
Independent variables	Employee psychological well-being				Result summary
	Model 1	Model 2	Model 3	Model 4	
<b>Control effect</b>					
Employee age	-0.18 (-2.31) *	-0.17 (-2.26) *	-0.16 (-2.20) *	-0.14 (-2.02) *	
Employee tenure	0.05 (0.63)	0.05 (0.62)	0.04 (0.47)	0.03 (0.40)	
Educational level	0.04 (0.48)	0.07 (0.92)	0.07 (1.03)	0.06 (1.01)	
Employee gender	0.12 (1.68)	0.10 (1.58)	0.10 (1.52)	0.07 (1.11)	
Technological innovation	0.18 (2.49) *	-0.02 (-0.16)	0.03 (0.38)	0.02 (0.17)	
<b>Quadratic effect</b>					
Technological innovation (TECINNV) <sup>2</sup>		-0.32 (-3.64) **	-0.29 (-3.52) **	-0.27 (-3.33) **	<b>H1: supported</b>
<b>Moderating effect</b>					
Perceived organizational support (POS)			-0.11 (-1.68)	-0.10 (-1.50)	
TECINNV * POS			0.11 (1.53)	0.13 (1.78)	
TECINNV <sup>2</sup> * POS			0.36 (4.60) **	0.31 (3.95) **	<b>H2: supported</b>
Learning orientation (LO)				-0.16 (-1.91)	
TECINNV * LO				0.02 (0.25)	
TECINNV <sup>2</sup> * LO				0.31 (3.51) **	<b>H3: supported</b>
<b>Model fit indices</b>					
R <sup>2</sup>	0.07	0.13	0.21	0.26	
ΔR <sup>2</sup>	---	0.06	0.08	0.05	
F-value	2.80*	4.700**	5.82**	5.72**	
VIF	1.26	1.75	1.78	5.44	

Note: Critical values of the t distribution for  $\alpha = 0.05$  and  $\alpha = 0.01$  (two-tailed test) are \* = 1.96 and \*\* = 2.58, respectively (t-values are reported in parentheses).

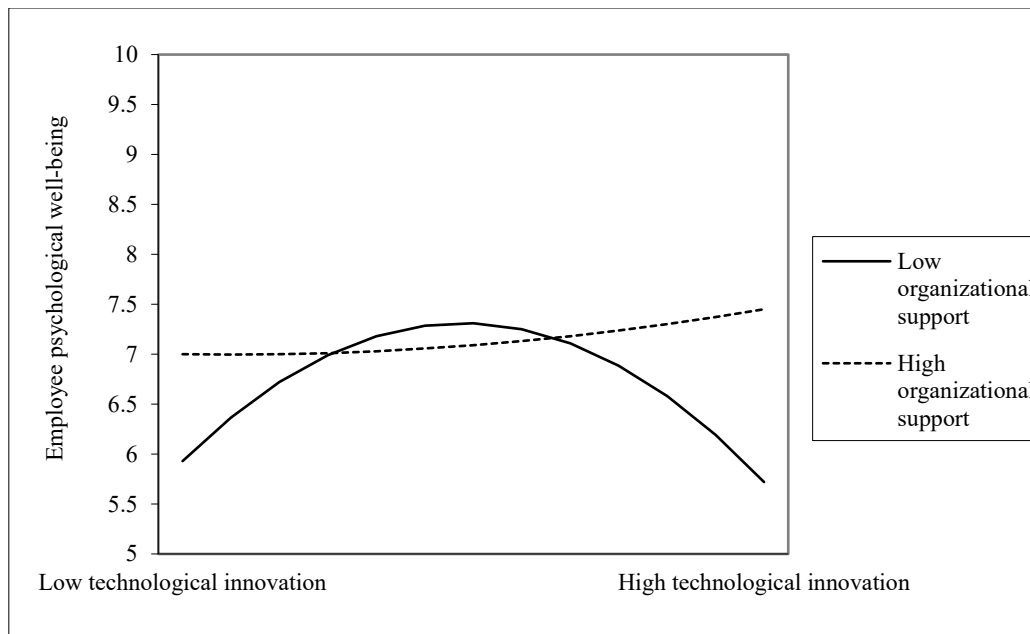
**Figure 1.** Conceptual framework of the study.



**Figure 2.** The effect of technological innovation on employee psychological well-being.



**Figure 3:** The moderating effect of perceived organizational support on the relationship between technological innovation and employee psychological well-being.



**Figure 4.** The moderating effect of learning orientation on the relationship between technological innovation and employee psychological well-being.

