Operational effectiveness in post-pandemic times: Examining the roles of digital technologies, talent management and employee engagement in manufacturing SMEs

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Abstract

This study investigates to what extent the use of digital technologies affects operational effectiveness of emerging market manufacturing small and medium-sized enterprises (SMEs) via talent management and employee engagement in pandemic time. It also examines whether these SMEs' strategic decision-making speed strengthens the impact of use of digital technologies of ISAs on talent management. Based on human resource and operations management literature, the conceptual model is developed and the mediation and moderation effects are empirically tested between use of digital technologies, talent management, employee engagement, operational effectiveness, and strategic decision-making speed. The model is tested using a sample of manufacturing SMEs operating in Pakistan. The findings suggest that talent management mediates the relationship between the use of digital technologies and employee engagement, thereby leading to operational effectiveness. We also found that strategic decision-making speed moderates the relationship between use of digital technologies and talent management.

Keywords: Digital technologies; talent management; employee engagement; operational effectiveness; strategic decision-making speed; SMEs.

Introduction

Contemporary technological advances (e.g., additive manufacturing, artificial intelligence, big data, and analytics, blockchain, cloud, and simulation) has increasingly provided manufacturing SMEs managers with alternatives to workforce management and afforded an avenue for tremendous innovation and competitiveness growth (Frank, Dalenogare, and Ayala 2019; Bai et al. 2020). These technologies offer a smart and autonomous manufacturing operations system (Rosin et al. 2020; Dalenogare et al. 2018). Recently, intensified competition and the Covid-19 pandemic environmental conditions has pushed manufacturing SMEs to adopt digital technologies in workforce management for operational effectiveness (Zhong et al. 2017). These digital technologies (e.g., internet of things, mobile computing, electronic commerce, social media) combine manufacturing operation systems with communication, information, and intelligence technologies (e.g., Tortorella and Fettermann 2018; Kamble, Gunasekaran, and Dhone 2020). In turn, Kamble, Gunasekaran, and Dhone (2020) posits that the integration of technologies in workforce management in operations makes the manufacturing process to be more open, digital, automated, flexible, intelligent, agile, and well equipped to meet the challenges of a dynamic and global market—especially in the post-Covid operations era. In the workforce context of operations, it empowers employees, strengthens retention of talents, removes silos, and ensures efficiency and effectiveness (Bai et al. 2020; Claus 2019). Nevertheless, these effects are only possible through collaborative integrative effects across organizational units, both within manufacturing SMEs and in their external environments (Bai et al. 2020).

To this end, previous studies (e.g., Koh, Orzes, and Jia 2019; Carnevale and Hatak 2020; Ballestar et al. 2020; Vrontis et al. 2021) call for more research to examine the mechanisms and associated boundary conditions through which the integration of digital technologies enhances operational effectiveness within manufacturing SMEs—especially those in the emerging market setting. Subsequently, our study answers to this call. Importantly, the emerging market setting is peculiar as they suffer from institutional voids and are characterized by low-income earners—who are mostly daily wage earners (Nwoba, Boso, and Robson 2021; Zahoor et al. 2021). Daily wage earners demand basic, functional, and long-lasting products and services as against short-term ones (Thukral 2021). As daily wage earners who do not have a stock of money but rather a flow, these consumers show distaste for short-term products that evolve too rapidly, making their recent purchases obsolete (Nwoba, Boso, and Robson 2021). Instead, they prefer products that are basic and will last for a long time due to uncertain income flows (Dawar and Chattopadhyay 2002; Amankwah-Amoah and Hinson 2019; De Beule, Klein, and Verwaal 2020). Hence, it is paramount to investigate the mechanisms and associated collaborative integrative effects through which integration of digital technologies enhances operational effectiveness within emerging markets manufacturing SMEs. In sum, we attempt answer the question: *how does the use of digital technologies lead to operational effectiveness of emerging market manufacturing SMEs?*

Furthermore, in light of the unique institutional setting and distinctive consumer demands in emerging markets, it is surprising that there is a dearth of research on how the use of digital technologies enhances manufacturing SMEs operational effectiveness in these contexts (Tortorella and Fettermann 2018; Kamble, Gunasekaran, and Dhone 2020). For example, manufacturing SMEs in Pakistan—an emerging market characterized with institutional voids—play a major role in economic growth, advancement of technological innovation, promoting economic renewal and in the production of essential goods and services in the country (Trading Economics, 2021). As a result, these SMEs have contributed to the increase of Pakistan's GDP, which has been projected as 4% in 2020-2021 by IMF (Geo 2021). Consequently, our study attempts to bridge this gap in the extant literature by investigating the mechanisms and associated boundary conditions through which the use of digital technologies promotes operational effectiveness among manufacturing SMEs operating in emerging markets—especially in the post-Covid operations era.

Standing on the premise of social construction of technology (SOCT) theory, we argue that talent management mediates the positive relationship between use of digital technologies and employee engagement and that the relationship between use of digital technologies and talent management is moderated by strategic decision-making speed. Furthermore, we argue that employee engagement has a positive relationship with operational effectiveness. With these arguments, we present the mechanisms and associated boundary conditions through which the use of digital technologies leads to operational effectiveness, among emerging market manufacturing SMEs. To test our arguments, we collected survey data from 129 manufacturing SMEs in Pakistan. The emerging market setting of Pakistan was chosen due to a number of reasons. First, Pakistan is one of the fastest growing emerging economies in South Asia, given the structural reforms introduced by the government (CEPEC 2021). Second, the growth rate of Pakistan's gross domestic product (GDP) has been projected as 4% in 2020-2021 by IMF (Geo 2021). Third, the Pakistani economy is adopting free economy system that is giving rise to SMEs in the country (Trading Economics, 2021). Importantly, SMEs lays the foundations of Pakistan's GDP increase, economic growth, and job creation (CEPEC 2021). There are about 3.3 million SMEs in Pakistan that account for 90% of all the country's businesses, employing 80% of the labour force and contributing 40% of the annual GDP (SMEDA 2021). With this background, Pakistan provides an ideal setting to investigate the mechanisms and associated boundary conditions through which the use of digital technologies leads to operational effectiveness, which in turn, can be extended to other emerging markets and beyond. Accordingly, our study findings contribute to the extant digital technology and operations management literature in three ways.

First, in line with the social construction of technology (SOCT) theory, our study findings show that the use of digital technologies has a positive relationship with employee engagement. These findings reveal that the use of digital technologies increases the energy and mental resilience of

employees, their sense of significance, enthusiasm and inspiration while making employees to be fully concentrated and deeply engrossed in their work (Carnevale and Hatak 2020; Bai et al. 2020). Furthermore, our findings reveal that the positive relationship between use of digital technologies and employee engagement is mediated by talent management. Thus, the use of digital technologies enables manufacturing SMEs managers to identify, develop, and fill key positions with right talents, in turn, ensuring employee engagement (Claus 2019). This finding departs from previous findings in the extant literature (Rosin et al. 2020; Dalenogare et al. 2018) as we show that talent management is the mediating mechanism through which use of digital technologies leads to employee engagement in manufacturing SMEs

Second, the current study is novel in scrutinizing the contingent role of strategic decision-making speed in the relationship between the use of digital technologies and talent management. Specifically, the results show that the speed and velocity at which SMEs managers decide on which digital technology to use in their manufacturing operations, strengthens the path between the use of digital technologies and talent management. Importantly, this finding reveals that at higher levels of strategic decision-making speed, emerging market manufacturing SMEs quickly make use of relevant digital technologies, which enables them to identify, develop, and fill key positions within the organization—with the right talents. With this finding, we depart from previous findings in the extant literature (e.g., Son et al. 2020; Kamble, Gunasekaran, and Dhone 2020) as our findings reveal that strategic decision-making speed strengthens the path between the use of digital technologies and talent management among emerging market manufacturing SMEs

Third, our findings show that employee engagement has a positive relationship with operational effectiveness. Operational effectiveness entails delivering exceptionally long lasting and high-quality value-adding products or services (Chowdhury, Lau, and Pittayachawan 2019). Hence, this finding shows that when employees are engaged, dedicated, exhibit high energy, mental resilience and are fully concentrated in their assigned task, they will deliver high quality and long-lasting products and services, which meets and exceeds customers' expectations. In sum, through these findings, we answer to the call for more research studies to investigate the mechanism and associated boundary condition through which the use of digital technologies enhances operational effectiveness, among emerging market manufacturing SMEs

The rest of the paper is organized as follows: the next section presents the theoretical background and hypothesis development. This is followed by the research methodology and analysis. Furthermore, the discussion and theoretical implications of the research findings are presented as well as the practical implications, study limitations and future research avenues. In conclusion, the study ends with a summary of the research findings and its importance to the extant literature.

Theoretical Background and Hypotheses Development

The use of digital technologies by emerging market manufacturing SMEs is a new phenomenon, in response to the COVID-19 pandemic (Dalenogare et al. 2018; Akpan, Udoh, and Adebisi 2020). Scholars contend that digital technologies not only enables workforce management (Nachmias and Hubschmid-Vierheilig 2021; Vrontis et al. 2021) but these are also effective in manufacturing operations (Dalenogare et al. 2018; Tortorella et al. 2021) and for driving open innovations within IT industries (Bhatti, Santoro, Khan, et al. 2021). However, these studies remained largely conceptual or with empirical focus on large enterprises, thereby disregarding the context of emerging market manufacturing SMEs. To this end, this study focuses on how the use of digital technologies can enhance the operational effectiveness of manufacturing SMEs within emerging economies. Specifically, we argue that the use of digital technologies through talent management leads to employee engagement, which in turn promotes operational effectiveness. Further, we argue that strategic decision-making speed moderates the impact of use of digital technologies on talent management. Using the social construction of technology (SOCT) theory, we provide arguments for the study's hypotheses in the sections that follow.

The social construction of technology theory

This study relies on the tenets of the social construction technology theory to further explain the proposed framework and develop the study's hypotheses. The social construction of technology (SOCT) theory envisages users as technological change agents and concerns with the shaping of new artifacts, structures, and contexts through interactions with various technologies (Jackson, Poole, and Kuhn 2002; Olsen and Engen 2007). This means that the design and use of technology has social and cultural ramifications – as maybe the case in workplaces (Jackson, Poole, and Kuhn 2002). Specifically, the SOCT theory argues that technology is shaped by social interactions and human behavior and are integrated within social contexts. The SOCT theory is made up of four components (Klein and Kleinman 2002; Pinch and Wiebe 1987) – namely, (1) interpretive flexibility, where technological designs can produce different outcomes (2) the concept of relevant social group such as members of organizations, (3) closure and stabilization and (4) the wider context such as social-cultural and political environment where the development of artifact occurs. Each of these elements become relevant depending on how and when the SOCT theory is applied. For example, the interpretative flexibility elements help us to understand how people think of artifacts and the flexibility involved in the design of artifacts, while the relevant social group are people who act based on some technological artifacts to impact innovation process (Olsen &. Engen, 2007) (Olsen and Engen 2007), such as workplace innovations. With the environment of most organizations being technological, various technologies have been added to organizational processes and work patterns to make organizations and employees

more efficient and productive (Jackson, Poole, and Kuhn 2002). Relative to our current framework, employees can be classified as relevant social group that perceive similar problem within their work environment – using technologies during disruptions to ensure operational efficiency. Thus, based on the components of the SOCT theory, we posit that employees can be regarded as technological change agents who engage in new digital technologies to cause changes within their work environment.

Use of digital technologies and employee engagement

The COVID-19 pandemic severely disrupted the regularity of business operations (Pedauga, Sáez, and Delgado-Márquez 2021; Akpan, Udoh, and Adebisi 2020). To deal with the aftermaths of these external disruption, SMEs use digital technologies including internet, social media, big data analytics, artificial intelligence, among others (Papadopoulos, Baltas, and Balta 2020). The use of digital technologies enables manufacturing SMEs to stay connected and facilitate working remotely to adapt to new realities of the COVID-19 environment (Herath and Herath 2020). In this sense, it can be argued that the use of digital technologies promotes employee engagement in manufacturing SMEs. The social construction of technology theory suggests (Pinch and Bijker 1984; Pinch and Bijker 1986) that employees can be regarded as technological change agents who adopt, use, and share the meanings of the technology. Employees often describe the technological development trajectory and understand its artifact to lead debate on its designs (Kwok and Koh 2021). When digital technologies are available in SMEs, the workplace becomes a connected value steam for the management of complex manufacturing business processes (Müller, Kiel, and Voigt 2018; Bordeleau, Mosconi, and de Santa-Eulalia 2020). SMEs with digital technologies and automation benefit from this, especially during the COVID-19 outbreak by keeping the employees connected and engaged in their work (Acioli, Scavarda, and Reis 2021).

Based on social construction of technology theory, employees use technologies such as internet of things, artificial intelligence, cloud computing, big data analytics, 3D printing, and virtual reality, to effectively manage COVID-19 interventions and remain engaged in their work (Narayanamurthy and Tortorella 2021). Also, the use of digital technologies provides greater flexibility to employees that enable them to better manage their deliverables (Tortorella et al. 2021). Moreover, the use of information technology offers precise data collection that facilitates better and informed decision-making. The availability of information reinforces the trust of employees, which in turn, creates greater openness in SMEs that is conducive to increased employee engagement (Mrugalska and Wyrwicka 2017; El Sawy et al. 2016). Thus, we argue that when emerging market SMEs use digital technologies, employees are better able to engage in their job duties. Thus, we posit that:

> **Hypothesis 1:** The use of digital technologies will be positively related to employee engagement in SMEs.

We present our hypothesized relationships in the following conceptual framework (as shown by Figure 1).

---- Insert Figure 1 About Here ----

The mediating role of talent management

Beyond the direct relationship between the use of digital technologies and employee engagement, we argue that talent management acts as an intervening mechanism between these variables. The use of digital technologies might promote employee engagement; however, the external disruptions often requires effective talent management to keep skilled workforce motivated and increase their involvement in work. As such, talent management can mediate the relationship between the use of digital technologies and work engagement in manufacturing SMEs.

The new digital technologies like artificial intelligence, big data analytics, and social media are revolutionizing the ways SMEs manage talent (Nachmias and Hubschmid-Vierheilig 2021). Although SMEs are considered autonomous in exploiting external events (like COVID-19) (Hayek 1945), they are also recognized as adaptive in knowledge-intensive economy and characterized as being innovative, agile, and flexible (Del Giudice et al. 2021). By using the digital technologies, SMEs can take rapid action when a new challenge occurs for effective talent management (Wang et al. 2016). This scenario is particularly true for emerging market SMEs that lack financial resources and legitimacy (Burhan et al. 2021; Zahoor et al. 2021). The use of electronic information systems and other novel technologies by emerging market SMEs can reduce the cost of human resource functions like evaluating job applications and identifying talented employees, particularly during and post-COVID times (Vrontis et al. 2021). Further, emerging market SMEs can identify the needs of talented employees through using digital technologies (Ballestar et al. 2020) and thus offer training and continuous professional development opportunities to improve the match between skills and job requirements (Balsmeier and Woerter 2019).

The extant literature shows that technological adoption has led to work reorganization including changing working conditions and employee training (Seeck and Diehl 2017). Particularly, during external disruptions like COVID-19, the use of technologies enable the effective design of jobs that facilitates entrepreneurial qualities of talented employees (Carnevale and Hatak 2020). By doing this, emerging market SMEs not only remain responsive and adaptive but also organize their talent workforce (Chawla et al. 2020). Novel information technologies enable emerging market SMEs to quickly solve the problems of talented employees by understanding their needs and offering appropriate training for development and seeking opportunities (Admiraal and Lockhorst 2009). Further, research suggests that access to communication-enhancing technologies attracts diverse workforce that is

talented with creative and social intelligence (Kolbjørnsrud, Amico, and Thomas 2016). This diverse workforce brings new knowledge to meet the needs of organizations. As such, the use of digital technologies allows emerging market SMEs to not only hire dynamic and talented employees but also manage and develop such employees to create humanized workplace (El Sawy et al. 2016). Thus, when emerging market manufacturing SMEs use digital technologies, they are better able to manage talented employees.

Further, Bakker, Albrecht, and Leiter (2011) suggests that to "*facilitate work engagement and to prevent burnout, employers should create an organizational context where employees feel enthusiastic, energized and motivated because their jobs are both 'active' and 'pleasurable'*" (p. 76-77). In this regard, talent management represents an effective means through which employers indicate their intention to support talent employees and such signals are perceived as precondition for employee engagement. When SMEs invest in talent management, the relationship between the organization and employees shift from short-term, economic-based employee contributions and monetary rewards to more long-term, open-ended relationship wherein organizations and employees invest in each other's future and growth (Barrick et al. 2014; Ajayi, Odusanya, and Morton 2017). Therefore, we suggest that talent management acts as a balanced mutually beneficial organization-employee relationship that increases psychological safety and promotes employee engagement. Specifically, provision of development opportunities and rewards to talented employees gives them signals that the organization is committed to them and value their well-being (Hooi 2021). This talent management practice increases trust, reduces uncertainty, decreases unpredictability among SMEs and their employees (Mustafa et al. 2018). Moreover, when talent management in place within SMEs, employees perceive that their organization is investing in them and offer rewards that can reinforce engagement in their jobs. Hence, though effective talent management, socialization, and development, SMEs can make employees engross and engage in their job roles.

Accordingly, we posit that talent management mediates the use of digital technologies and employee engagement nexuses. When manufacturing SMEs in emerging markets adopt smart technologies, they can effectively manage talented employees. This in turn send positive signal talented employees and increase their trust on SMEs, which is conducive to their enhanced engagement in job role. Thus, the following hypothesis is proposed:

> **Hypothesis 2:** Talent management will mediate the relationship between the use of digital technologies and employee engagement in SMEs.

The moderating role of strategic decision-making speed

Strategic decision-making speed denotes "*how quickly organizations execute all aspects of the decision-making process, spanning from the initial consideration of alternative courses of action to the time at which a commitment to act is made*" (Forbes 2005, 355). In a situation like the COVID-19 pandemic, resource constrained SMEs are required to develop potential solutions to meet the situational demands (Pedauga, Sáez, and Delgado-Márquez 2021; Cowling, Brown, and Rocha 2020). As such, the strategic decision-making speed is vital to align an SME's positioning to align with prevailing environmental conditions so not to fall behind competitors (Shepherd et al. 2021). Further, strategic decision-making speed enables SMEs to make appropriate strategic choices to keep pace with the environmental changes by retaining and managing talented workforce (Adomako et al. 2021). The strategic decision-making speed can enable SMEs in the event of external disruption to take appropriate initiatives to exploit opportunities before they disappear by using dedicated employees (Chan et al. 2019). This suggests that strategic decision-making speed can moderate the relationship between the use of digital technologies and talent management. Below we explained further of why the strategic decision-making speed is vital for the use of digital technologies and talent management relationship.

First, with greater strategic decision-making speed, SMEs can invest in costly digital technologies in a rapid and effective manner. This enables them to save cost and time which SMEs could have spent to look for alternative strategic response to deal with external disruptions. Consequently, strategic decision speed enhances the ability of SMEs to adopt digital technologies to recruit, develop, and retain talented employees to succeed in disruptive environments (Robert and Wally 2003; Del Giudice et al. 2021). The strategic decision-making theory suggests that cognitions of decision-makers are motivated by their business environment and organization structure (Wally and Baum 1994). As SMEs face external crises, they tend to exploit their strategic decision-making speed to make better use of digital technologies to develop human resource practices and offer development opportunities to talented employees (Khoreva and Vaiman 2021; Claus 2019).

Second, strategic decision speed is germane to talent management of emerging market SMEs because they face institutional challenges (Vaiman, Scullion, and Collings 2012). With a high level of strategic decision speed, SMEs can increase the use of digital technologies to effectively manage their workforce as well as diversify the talented employees with greater skills and knowledge. This is more likely to occur because SMEs are aspiring to remain competitive by having talented workforce as compared to their competitors and be successful. Therefore, the use of digital technologies enable can enable SMEs to increase their efforts for effective talent management. Stating differently, without strategic decision-making speed to identify opportunities/threats and invest in costly resources, it is reasonable to expect that SMEs become stagnant and may not develop appropriate practices for talent management. Consequently, we put forward that high levels of strategic decision-making speed propel

SMEs to deploy their digital technologies to effectively and efficiently manage talented employees. Accordingly, we posit that:

> **Hypothesis 3.** Strategic decision-making speed will moderate the relationship between the use of digital technologies and talent management in SMEs such that higher strategic decision-making speed will strengthen the relationship between the use of digital technologies and talent management.

Employee engagement and operational effectiveness

Employee engagement is a "*a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption*" (Schaufeli et al. 2002, 74). The engaged employees are more enthusiastic and invest energy into their jobs, which in turn can improve operational effectiveness of SMEs. First, increased employee engagement suggests more focus work-related goals and emotional and social connectedness to work (Kahn 1990). As engaged employees feel more spirited, they can invest efforts and resources to seek novel ways of delivering their work and improving operational effectiveness of SMEs. Second, previous studies suggest that employee engagement enact proactive behavior, initiative taking, and pursuit of learning goals (Alfes et al. 2013; Ajayi, Odusanya, and Morton 2017). Through social comparison process, individuals compare their performance with those of others and accordingly adjust their inputs. When an employee engages in the work, others will also increase their engagement given the peers' normative influence. Indeed, scholars suggest that when an individual employee perceives that others are engaged in their work, this will enact the employee engagement behavior (Barrick et al. 2014), which can benefit operational performance of emerging market SMEs (Bayraktar et al. 2009; Kumar et al. 2019). Third, the engagement of employees in their job tasks enables better control over operations according to varying demands (Chowdhury, Lau, and Pittayachawan 2019). The engaged employees can optimize the industrial management process of SMEs like forecasting, using resources, controlling production, and evaluating operational efficiency in real time (Moeuf et al. 2018). Further, the dedicates employees understand the production requirements of their organization and takes individual responsibility of reducing waste, minimizing miscommunication, increasing ergonomics, and identifying novel business opportunities (Mittal et al. 2020). Therefore, it can be argued that when employees are actively engaged in their job duties, they can identify uncertainties and opportunities and accordingly engage in operational effectiveness of SMEs in emerging markets. thus, we posit that:

> **Hypothesis 4.** Employee engagement will be positively related to operational effectiveness of SMEs.

Methodology

Study context

The study hypotheses were tested using the data from SMEs based in Pakistan. Our choice of this context was based on two reasons. First, Pakistan is becoming one of the fastest growing economy in South Asia, given the structural reforms introduced by the government (CEPEC 2021). The growth rate of Pakistan's gross domestic product (GDP) has been projected as 4% in 2020-2021 by IMF (Geo 2021). This provides a rich context to understand the adoption of digital technologies for operational efficiency of manufacturing firms. Second, the Pakistani economy is adopting free economy system that is giving rise to SMEs in the country. Particularly, SMEs lays the foundations of Pakistan's GDP increase, economic growth, and job creation. There are about 3.3 million SMEs in Pakistan that account for 90% of all the country's businesses, employing 80% of the labor force and contributing 40% of the annual GDP (SMEDA 2021). This suggests that SMEs can make a significant contribution to progress of Pakistan's economy. Therefore, the entrepreneurship and operations literature will benefit from studies investigating how SMEs — with profound impact on job creation and wealth generation — can enhance talent management and operational performance in post-COVID times.

Sampling and data collection

Developing countries, like Pakistan, have issues of identifying any single relevant database (Mahmood and Mubarik 2020). Therefore, we relied on multiple databases to draw our sample including the Business Directories and Pakistan Chamber of Commerce databases. The following criteria was used to select the sample: 1) independent firms that were not part of any business group; 2) firms that were privately owned and controlled by individual; 3) firms that employed less than 250 employees; and 4) firms operating in manufacturing industry. Based on this sampling criteria, we identified 326 SMEs to participate in our study.

Following on from recent studies (e.g., Bhatti, Santoro, Sarwar, et al. 2021; Bhatti, Santoro, Khan, et al. 2021) within the context, we conducted the survey across major cities with top managers (e.g., owners, CEOs, and senior managers) and employees (e.g., production, human resource, marketing) of the 378 selected SMEs. The survey was administered in English as it is the most common business language in Pakistani organizations (Khan and Lew 2018). The drop-off & collection technique was used to distribute the questionnaire. Despite being costly and time-consuming, this technique is popular in developing countries due to declining response rate in mail and online surveys (Khan, Lew, and Marinova 2019; Boso et al. 2019). We designed two surveys: 1) for senior managers to collect the data on the adoption of digital technologies, strategic decision-making speed, and talent management, and 2) for employees to provide information on employee engagement and operational effectiveness. From each firm, one senior manager was invited to complete the manager-based questionnaire and one employee was invited to complete the employee-based questionnaire. In total, we received a total of 131 matching responses. After deleting 2 incomplete responses, we finally had

129 completed questionnaires, yielding an effective response rate of 57.40. Table 1 provides the demographic characteristics of the respondents.

Measurements

We adopted measurement of variables from the existing literature. All the multi-item constructs were measured using 7-point Likert scale. Table 1 provides the description of measures and results of validity and reliability tests.

---- Insert Table 1 About Here ----

The adoption of digital technologies was measured using seven items adopted from previous studies (e.g., Tortorella and Fettermann 2018; Kamble, Gunasekaran, and Dhone 2020). The respondents were asked to rate the degree to which the technologies (i.e., internet of things, mobile computing, electronic commerce, business intelligence, cloud computing, big data analytics, social media, and digital platforms) were adopted by the firm. *Talent management* was captured using six items adopted from Latukha and Veselova (2019) and Son et al. (2020). The scale assessed the approaches used by SMEs to manage the talented workforce. The *employee engagement* was measured using nine items based on the Utrecht Work Engagement Scale (Schaufeli et al. 2002). This scale reflected the dimensions of work engagement including vigor, dedication, and absorption (Harju, Kaltiainen, and Hakanen 2021). The *operational effectiveness* was measured using six items adopted from Zhu, Sarkis, and Lai (2008). The respondents rated the extent to which operational efficiency is achieved in terms of goods delivery speed, decrease in inventory and scrap rates, and increase in product quality, line, and capacity utilization. *Strategic decision speed* was measured using three items adopted from Souitaris and Maestro (2010).

We also used *control variables* in our study including firm size, firm age, and tenure of managers and employees. Firm size was measured using the number of full-time employees and firm age by the number of years since the firm was founded. We used natural logarithm of both firm size and firm age to correct for skewness. Tenure of managers was measured by number of years the manager had been in organization and tenue of employees by number of years an employee had been in organization.

Analyses

Bias assessment

We assessed the non-response bias by comparing two group of responses — early responses and late responses (Armstrong and Overton 1977). The results of t-test suggest no significant difference ($p > 0.10$) between two groups in terms of demographic characteristics and main variables. This suggests that non-response bias is not an issue in this study.

To assess the common method bias, we followed procedural and statistical remedies (Podsakoff et al. 2003). The procedural remedies included (1) the assurance of confidentiality to respondents, (2) instructing participants that there are no right or wrong answers, (3) providing definitions of key terms, and (4) collecting data from multi-respondents. In terms of statistical remedies, we estimated three competing confirmatory factor analysis (CFA) models. The model 1 estimated a method-only model where all items were loaded on a single latent construct: $\chi 2/DF = 4.35$; RMSEA = 0.17; TLI = 0.46; CFI = 0.55; SRMR = 0.19. The model 2 examined a trait-only model where each item was loaded on its respective latent construct: $\chi 2/DF = 1.23$; RMSEA = 0.04; TLI = 0.96; CFI = 0.97; SRMR = 0.05. The model 3 evaluated the method-trait model where a common factor was linked with all the items in model 2: $\chi 2/DF = 1.18$; RMSEA = 0.04; TLI = 0.97; CFI = 0.98; SRMR = 0.04. A comparison of three CFA models suggests that model 2 and model 3 are superior to model 1, and model 3 is not substantially better than model 2. Thus, we concluded that common method bias does not explain our dataset.

Reliability and validity tests

We performed CFA using AMOS 28.0 software package to assess the reliability and validity of study constructs. The results of CFA suggest the adequate measurement model fit: $\chi 2/DF = 1.23$; RMSEA = 0.04; TLI = 0.96; CFI = 0.97; SRMR = 0.05. The composite reliability was established because values of Cronbach alpha and composite reliability exceeded the threshold of 0.70 (Bagozzi and Yi 2012). Further, all the standardized factor loadings were positive and significant at 1%, thus confirming convergent validity of the measures. The convergent validity of the scales was confirmed due to the factor loading exceeding the cut-off point of 0.40 (Kline 2015). The average variance extracted (AVE) values were also greater than the threshold of 0.50 (Bagozzi and Yi 2012). The discriminant validity was assessed by using Fornell and Larker (1981) method of comparing the square root of AVE with the correlation between constructs. The results in Table 2 suggest that square root of AVE for each construct was greater than the correlation between each pair of constructs, thus confirming the discriminant validity. The means and standard deviations for the study variables are reported in Table 2.

---- Insert Table 2 About Here ----

Estimation and results

The hypotheses of the study were analyzed using SEM and maximum likelihood estimation using path analyses in AMOS 28.0 software package. We mean-centered the constructs involved in the interaction term to avoid the issue of multicollinearity. Accordingly, we created the interaction term: use of digital technologies x strategic decision speed. We also tested for multicollinearity issue using variance inflation factors (VIFs). Our results highlighted that VIFs values ranged between 1.17 and 1.34, which are well below the threshold of 10. This confirms that multicollinearity is not an issue in this study.

Subsequently, six models were estimated with talent management as the dependent variable in models 1-2, employee engagement as the dependent variable in models 3-5, and operational effectiveness as the dependent variable in model 6. Model 1 estimated the effect of use of digital technologies on talent management. Model 2 included the moderator (strategic decision speed) and the interaction effect variable (use of digital technologies x strategic decision speed). Model 3 examined the impact of use of digital technologies on employee engagement. In model 4, the direct effect of talent management on employee engagement was estimated. Model 5 estimated the direct effect of both use of digital technologies and talent management on employee engagement. Finally, we estimated model 6 to test the impact of employee engagement on operational effectiveness.

The path estimates and the significance levels for the six models are presented in Table 3. Hypothesis 1 argues that the use of digital technologies is positively related to employee engagement. The results in Model 3 support hypothesis 1, suggesting that the use of digital technologies is positively and significantly related to employee engagement ($\beta = 0.19$; $p < 0.05$).

The study in hypothesis 2 argues that talent management mediates the impact of use of digital technologies on employee engagement. To test this hypothesis, we followed Baron and Kenny (1986) four-steps method. First, the impact of use of digital technologies on talent management was estimated. As model 1 in Table 3 shows, the effect of use of digital technologies on talent management is positive and significant ($\beta = 0.27$; $p < 0.01$). Second, the relationship between talent management and employee engagement was examined. Model 3 in Table 3 suggests a positive and significant relationship between use of digital technologies and employee engagement ($\beta = 0.19$; $p < 0.05$). Third, we examined the effect of talent management on employee engagement. The results of Model 4 confirm the third condition by providing positive and significant relationship between talent management and employee engagement ($\beta = 0.34$; $p < 0.01$). Finally, the impact of both use of digital technologies and talent management on employee engagement was estimated. As shown in Model 5, the relationship between use of digital technologies and employee engagement becomes insignificant ($\beta = 0.11$; $p > 0.10$) when talent management was added in the model, but the impact of talent management on employee engagement remained positive and significant ($\beta = 0.29$; $p < 0.01$). Together, these results provide support for hypothesis 2, suggesting that the relationship between use of digital technologies and employee engagement is channeled via talent management.

---- Insert Table 3 About Here ----

We further confirmed the mediation effect using bootstrapping technique. The results of PROCESS macro at 95% confidence intervals using 5,000 bootstrapping sample suggest that the indirect effect of use of digital technologies on employee engagement is mediated by talent management (Effect = 0.06; lower limit = 0.01 – upper limit – 0.14). Thus, hypothesis 2 is formally supported.

The study in hypothesis 3 argues that strategic decision speed moderates the indirect impact of use of digital technologies on employee engagement via talent management. As we show in model 2, the path coefficient for the interaction term (use of digital technologies x strategic decision speed) is positive and significant ($\beta = 0.24$; $p < 0.01$). This suggests that at high levels of strategic decision speed, SMEs are better able to exploit higher use of digital technologies for talent management. Hence, hypothesis 3 is supported. To further explore the hypothesis 3, we created the interaction plot at one standard deviation below and above the mean values. Figure 2 suggests that talent management increases at high level of use of digital technologies and high levels of strategic decision speed. This finding suggests that the extent to which use of digital technologies impact on talent management is dependent upon increasing levels of strategic decision speed, essentially providing support for hypothesis 3.

---- Insert Figure 2 About Here ----

Hypothesis 4 posits that employee engagement is positively related to operational effectiveness. The findings of model 6 in Table 3 provide support for hypothesis 4 as relationship between employee engagement and operational effectiveness is positive and significant ($\beta = 0.22$; $p < 0.01$).

Endogeneity bias

The proposed structural relationship results may be bias due to the presence of endogeneity issue. We checked for the endogeneity issue by following Gaussian copula approach introduced by Park and Gupta (2012) and procedure suggested by Hult et al. (2018). First, we confirmed that independent variables are not normally distributed using the Kolmogorov–Smirnov test with Lilliefors correction (Sarstedt and Mooi 2014). The results confirm the non-normal distribution scores ($p = 0.0003$). Second, the Gaussian copula analysis was conducted using the R code written by (Hult et al. 2018). We found that none of copulas are significant (p-vale ranged from 0.28 to 0.69), thus confirming that endogeneity is not an issue in this study.

Discussion and implication

Our study examines the mechanisms and associated boundary condition through which the use of digital technologies leads to operational effectiveness among emerging market manufacturing SMEs. In this vein, we tested our hypotheses on 129 manufacturing SMEs in Pakistan. Findings from our study show that: (1) the positive relationship between use of digital technologies and employee engagement is mediated by talent management; (2) strategic decision-making speed strengthens the path between use of digital technologies and talent management; and (3) employee engagement has a positive relationship with operational effectiveness. These findings have significant implications for emerging market manufacturing SMEs and digital technologies and operations management literature.

Theoretical implications

Our findings make several contributions to the extant digital technology and SME operations management literature by drawing on empirical insights from Pakistani manufacturing SMEs. First, we find that the positive relationship between the use of digital technologies and employee engagement is mediated by talent management. Importantly, this finding reveal that the use of digital technologies increases the energy and mental resilience of employees, their sense of significance, enthusiasm and inspiration while making employees to be fully concentrated and deeply engrossed in their work (Carnevale and Hatak 2020; Bai et al. 2020). However, the use of digital technologies alone is not sufficient to ensure employee engagement. Hence, our findings further reveal that talent management mediates the positive relationship between use of digital technologies and employee engagement. Thus, the use of digital technologies enables manufacturing SMEs managers to identify, develop, and fill key positions with the right talents, in turn, ensuring employee engagement. Filling key positions with the right talent ensures that the selected employee i.e., talent is fully dedicated to the job, in turn, leading to employee engagement (Claus 2019). This finding is of a great relevance to the extant digital technology and SMEs operations management literature as we show that talent management is the mechanism through which the use of digital technologies leads to employee engagement in manufacturing SMEs, operating in emerging markets (Kamble, Gunasekaran, and Dhone 2020; Burhan et al. 2021).

Second, the results show that strategic decision-making speed strengthens the path between the use of digital technologies and talent management. Tortorella and Fettermann (2018) and Dalenogare et al. (2018) posit that there are collaborative integrative effects across organizational units that work together—both internal and external—to enhance the effects of the use of digital technologies in workforce management in operations. In turn, our findings show that at higher levels of strategic decision-making speed, emerging market manufacturing SMEs quickly use relevant digital technologies, which enables them to identify, develop, and fill key positions within the organization—with the right talents. In sum, our study finding is novel in examining associated boundary condition—strategic decision-making speed—that strengthens the relationship between the use of digital technologies and employee engagement.

Third, our findings show that employee engagement has a positive relationship with operational effectiveness. Hence, this finding shows that when employees are engaged, dedicated, exhibit high energy, mental resilience and are fully concentrated in their assigned task, they will deliver high quality and long-lasting products and services (Kumar et al. 2019; Chowdhury, Lau, and Pittayachawan 2019). Our finding extends and contributes to the extant digital technology and SMEs operations management literature as we present how the use of digital technologies leads to talent management and employee

engagement, which and in turn strengthens operational effectiveness (Frank, Dalenogare, and Ayala 2019; Rosin et al. 2020; Tortorella et al. 2021).

Finally, building on the social construction theory, we answer the call by for more research studies to examine the use of digital technologies for operational effectiveness of manufacturing SMEs operating in emerging markets (Kolbjørnsrud, Amico, and Thomas 2016; Vrontis et al. 2021; Seeck and Diehl 2017) by carrying out our study on a rarely studied sample of manufacturing SMEs in Pakistan. Manufacturing SMEs in Pakistan play a major part in economic growth, advancement of technological innovation, promoting economic renewal and production of essential goods and services (Trading Economics, 2021). However, these manufacturing SMEs operate under institutional adversity, with consumers who show distaste for short-term products that evolve too rapidly but instead whom prefer products that are basic and will last for a long time due to uncertain income flows (Zahoor et al. 2021). As such, our study presents the mechanisms and associated boundary conditions through which emerging market manufacturing SMEs can adopt digital technologies to enhance their operational effectiveness, to produce long-lasting and value-adding goods and services to meet consumer demands. The findings from this unique institutional setting can be extended to other emerging markets.

Practical implications

Our study findings have several practical implications. First, our findings show that the use of digital technologies has a positive relationship with employee engagement among emerging market manufacturing SMEs. To this end, managers of emerging market manufacturing SMEs should invest, adopt, and integrate relevant digital technologies into their manufacturing operation systems to strengthen employee engagement, which in turn enhances operational effectiveness.

Second, our study findings posit that talent management mediates the positive relationship between the use of digital technologies and employee engagement. Thus, managers of emerging market manufacturing SMEs should invest in adequate talent management systems, as proper management of talents in the firm (filling key positions with highly qualified personnel) would enable the use of digital technologies to strengthen employee engagement.

Third, the findings show that the velocity and speed at which emerging market manufacturing SME managers decide on which digital technology to adopt and use in their manufacturing operation systems, the stronger the path between the use of the digital technologies and employee engagement. As a result, manufacturing SME managers should ensure that they are constantly in the know-how of recent and relevant digital technologies, to quickly implement in their manufacturing operations.

Finally, as our study findings posit that employee engagement has a positive relationship with operational effectiveness, manufacturing SMEs managers should design mechanisms—using digital technologies—that would keep employee dedicated and motivated in putting in their best, which ensures operational effectiveness—both in emerging markets and beyond.

Limitations and further research avenues

Like with most research studies, there are several limitations associated with these current findings, which provide an avenue for future research directions. First, our study only examined the effect of the use of digital technologies on operational effectiveness of emerging market manufacturing SMEs. Going forward, it is important for future studies to examine other internal and external firm related consequences of the use of digital technologies in workforce management in operations. For instance, will the use of digital technologies in manufacturing SMEs workforce management in operations improve market and commercial performance or employee well-being. Second, our study only examined the contingent role of strategic decision marking speed on the relationship between the use of digital technologies and talent management. Extant research in the literature (e.g., Nwoba, Boso, and Robson 2021; Boso, Oghazi, and Hultman 2017) has established that the availability of financial resource slack enables SMEs to effectively implement their workforce operating strategies. Thus, it will be useful for future research studies to examine the contingent role of financial resource slack in the use of digital technologies in manufacturing SMEs in emerging markets. Third, our study posits that the use of digital technologies alone is not sufficient to ensure employee engagement. Thus, we argue that talent management mediates this relationship. Notwithstanding, organizational culture plays a role in workforce management in operations. To this end, it is useful for future research studies to examine the contingent role of organizational culture in the relationship between the use of digital technologies and employee engagement. Finally, our study collected data at a one-time point. Consequently, future research studies should carry out a longitudinal study to examine the long-term effect of the use of digital technologies on operational effectiveness.

Conclusion

The study investigates how the use of digital technologies enhances operational effectiveness of emerging market manufacturing SMEs. Our findings based on a sample of 129 Pakistani SMEs show that the use of digital technologies has a positive relationship with employee engagement. More importantly, this positive relationship is mediated by talent management. In addition, our findings reveal that strategic decision-making speed strengthens the path between the of digital technologies and talent management. We further found that employee engagement has a positive relationship with operational effectiveness. With these findings, we account for the mechanisms and associated boundary conditions, under which the use of digital technologies strengthens operational effectiveness among emerging

market manufacturing SMEs operating under conditions of institutional adversity. Thus, this study sets the stage for further empirical research relating to the use of digital technologies in workforce management in operations in different research settings.

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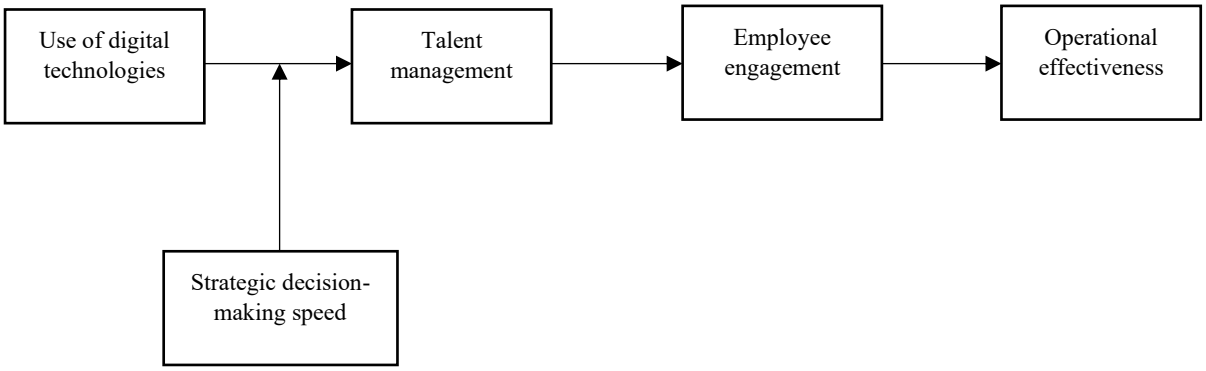

Figure 1. The conceptual framework of the study.

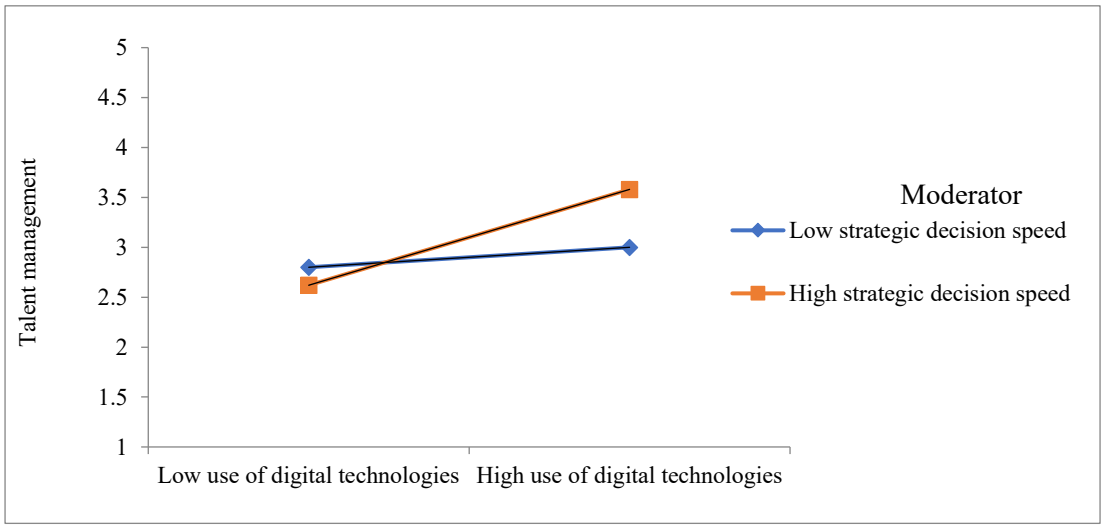

Figure 2. The interaction effect of use of digital technologies and strategic decision speed on talent management.

Table 1. Results of validity and reliability assessment.

Description of items	Standardized factor loadings
Use of digital technologies (CA = 0.94; CR = 0.94; AVE = 0.67)	
1. Internet of things	0.77
2. Mobile computing	0.88
3. Electronic commerce	0.85
4. Business intelligence	0.87
5. Cloud computing	0.81
6. Big data analytics	0.78
7. Social media	0.83
8. Digital platforms	0.75
Talent management (CA = 0.93; CR = 0.93; AVE = 0.68)	
1. We have HR policies to internally develop talent.	0.85
2. We have the ability to predict short- and long-term needs in talented employees.	0.81
3. We have an HR team that is specifically designed to manage talented employees.	0.78
4. We provide learning and development opportunities to talented employees.	0.86
5. We provide monetary and nonmonetary rewards that are specifically designed for talented employees.	0.82
6. Our firm maintain diversity in the work place for talented employees.	0.83
Employee engagement (CA = 0.90; CR = 0.89; AVE = 0.68)	
1. At my work, I feel bursting with energy	0.71
2. At my job I feel strong and vigorous	0.73
3. When I get up in the morning, I feel like going to work.	0.71
4. I am enthusiastic about my job.	0.72
5. I am proud on the work that I do.	0.78
6. My job inspires me	0.76
7. I get carried away when I am working.	0.68
8. I feel content when I am working intensely.	0.72
9. I am immersed in my work.	0.73
Operational effectiveness (CA = 0.93; CR = 0.92; AVE = 0.)	
1. Increase in the amount of goods delivered on time	0.77
2. Decrease in inventory levels	0.82
3. Decrease in scrap rate	0.84
4. Increase in product quality	0.86
5. Increase in product line	0.83
6. Improved capacity utilization	0.71
Strategic decision speed (CA = 0.88; CR = 0.87; AVE = 0.70)	
1. We prefer and tend to take our time when making decisions (r).	0.84
2. We generally believe in making quick strategic decisions.	0.87
3. We prioritize speed when planning or thinking about strategies.	0.80

Table 2. Correlation and descriptive statistics.

Variables	Mean	S.D.	1	2	3	4	5	6	7	8
1. Firm size‡	1.88	0.38	1.00							
2. Firm age‡	0.98	0.20	-0.02	1.00						
3. Managerial tenure	9.45	5.79	0.09	0.08	1.00					
4. Use of digital technologies	5.01	1.42	-0.02	0.08	0.18*	**0.83**				
5. Talent management	5.21	1.43	0.19*	-0.01	0.21*	0.28***	**0.82**			
6. Employee engagement	5.42	1.01	0.17	0.15	0.25**	0.22*	0.34***	**0.82**		
7. Strategic decision speed	4.90	1.49	0.05	0.03	0.08	0.40***	0.18*	0.27***	**0.83**	
8. Operational effectiveness	4.86	1.21	-0.04	0.04	0.18*	0.29***	0.25**	0.23**	0.23**	**0.81**

Note. S.D. = standard deviation; ‡ = natural logarithm transformation of the original values; square root of AVE in the diagonal; correlations above 0.10 and 0.17 are significant at $p < 0.05$ and $p < 0.01$ respectively.

Table 3. Results of structural equation modeling.

Independent variables	**Dependent variables**					
	Talent management		***Employee engagement***			***Operational effectiveness***
	Model 1	***Model 2***	***Model 3***	***Model 4***	***Model 5***	***Model 6***
Control paths						
Firm size‡	0.19* (2.23)	0.17* (1.99)	0.21* (2.38)	0.12 (1.48)	0.15+ (1.86)	-0.11 (-1.20)
Firm age‡	-0.06 (-0.65)	-0.04 (-0.52)	0.03 (0.41)	0.01 (0.09)	0.03 (0.43)	-0.02 (-0.25)
Managerial tenure	0.17+ (1.94)	0.16+ (1.90)	0.24** (2.66)	0.16 (1.83)	0.19* (2.25)	0.14 (1.53)
Direct paths						
Use of digital technologies (UDT)	0.27** (3.08)	0.29** (3.06)	0.19* (2.19)		0.11 (1.37)	
Strategic decision speed (SDS)		0.10 (1.07)				
Employee engagement						0.22* (2.29)
Mediation paths						
Talent management				0.34** (2.76)	0.29** (3.11)	
Moderation paths						
UDT x SDS		0.24** (2.72)				
Goodness-of-fit indices						
$\chi 2$/DF	1.45	1.29	1.32	1.28	1.21	1.23
RMSEA	0.05	0.04	0.05	0.04	0.04	0.04
TLI	0.96	0.97	0.97	0.97	0.98	0.98
CFI	0.98	0.98	0.98	0.98	0.99	0.99
SRMR	0.03	0.03	0.05	0.04	0.04	0.04

Note. ‡ = natural logarithm transformation of the original values; T-values are reported in parentheses; significance levels: ***p < 0.001, **p < 0.01, *p < 0.05, +p < 0.10.