Interlinking networking capabilities, knowledge worker productivity, and digital innovation: a critical nexus for sustainable performance in small and medium enterprises

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Abstract

Purpose – *As sustainable performance has a central role in the small and medium enterprises (SMEs) performance literature, this study aims to examine the influence of networking capabilities in enhancing sustainable performance through knowledge workers' productivity and digital innovation. It also examines the sequential mediating role of knowledge workers' productivity and digital innovation on networking capabilities and SMEs' sustainable performance relationship.*

Design/methodology/approach – *Data were collected from 308 knowledge workers in the information technology sector and analyzed using the Hayes Process Macro bootstrapping method to test the proposed hypotheses.*

Findings – *Results indicate that knowledge workers' productivity and digital innovation individually and sequentially mediate the relationship between networking capabilities and SME's sustainable (economic and environmental) performance, surprisingly, they do not act as a mediator between networking capability and SME's social performance. SMEs should prioritize investments in the professional development of their knowledge workers through training and skill enhancement programs. This investment equips knowledge workers with the tools to effectively use the knowledge and resources acquired through networking. Thus, knowledge workers may improve performance by using these resources to tackle challenges.*

Research limitations/implications – *Although this research focused on this specific context, it is prudent to acknowledge that additional factors may also exert influence on sustainable performance within SMEs, factors that managers may consider when making decisions. Methodologically, the cross-sectional design of this research poses a potential limitation, as it does not allow for the complete elimination of endogeneity concerns. However, it is worth noting that scholars have endorsed the use of cross-sectional data in cases where management researchers aim to expand beyond well-documented and longitudinal data sets.*

Practical implications – *This research offers practical recommendations for SMEs to improve their sustainable performance through networking. SMEs should seek partnerships with complementary knowledge to improve operations and for other performance-oriented benefits.*

Originality/value – *This study adds significantly to the literature on sustainable SME performance by studying the interdependent effects of networking capabilities. It also represents the individual and sequential mediation mechanism that links networking capabilities to SME success through knowledge worker productivity and digital innovation.*

Keywords *Digital innovation, Sustainable performance, SMEs performance, Networking capabilities, Knowledge workers productivity*

Paper type *Research paper*

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1. Introduction

The concept of sustainable development has gained central attention in the management literature (Figge and Hahn, 2004) and small and medium enterprises (SMEs) level innovation strategies for generating sustainable (economic, social and environmental) performance are becoming more popular (Gupta *et al.*, 2014). Owing to its increased importance, scholars have examined the influence of different firm-level factors such as institutional quality (Rahi *et al.*, 2023), leadership styles (Piwowar-Sulej and Iqbal, 2022), knowledge management processes (Shahzad *et al.*, 2020) and environmental taxes on sustainable performance (Zhao *et al.*, 2023). Sustainable performance is defined as "the aggregate negative or positive bottom line of economic, environmental, and social impacts of an entity against a defined baseline" (Büyüközkan and Karabulut, 2018, p. 253).

In line with this, a relevant research stream has emerged that has highlighted the significance of networking in facilitating shared utilization of the necessary resources and capabilities for improved sustainability-related practices (de Almeida *et al.*, 2021; Ben Amara and Chen, 2020; Inigo *et al.*, 2020). These studies have supported the claim that networking influences firm's sustainability-oriented initiatives and performance (de Almeida *et al.*, 2021; Ben Amara and Chen, 2020; Inigo *et al.*, 2020) by providing enterprise access to resources, simplifying internal mechanisms and knowledge to inspire innovation (Ben Amara and Chen, 2020; Brass *et al.*, 2004). For instance, General Electric closely worked with Google to advance the use of renewable energy in the USA (Albino *et al.*, 2012) and a number of SMEs around the globe collaborate with partners to achieve their innovation and sustainable performance goals.

Existing studies' efforts to explain the linkages between networking capabilities and sustainability-related practices are certainly valuable (de Almeida *et al.*, 2021; Ben Amara and Chen, 2020; Inigo *et al.*, 2020), particularly, there remains a limited understanding of how the interplay between networking capabilities and different dimensions of sustainable performance unfolds within the context of SMEs. This question is legitimate and merits more research, as SMEs operate in complex ecosystems where networking goes beyond social relationships. This study's findings can help scholars grasp sustainability challenges' interconnectedness and networking's role in tackling them. Thus, this study examines the following: *Do networking capabilities influence all dimensions of sustainable (economic, environmental and social) performance of SMEs?*

Moreover, there is a need for deeper exploration into the mechanisms through which networking capabilities translate into enhanced sustainable performance for SMEs (Musteen, 2010; Zeng *et al.*, 2010; Soto-Soto-Acosta *et al.*, 2018). Knowledge workers are essential to SMEs' success (Drucker, 1999) hence their important role must be recognized (Shujahat *et al.*, 2019). They also play a pivotal role in fostering substantial contributions to the overall success and advancement of sustainable performance of the organization. Moreover, scholars contend that knowledge workers may create and implement new value-creation methods (Ali *et al.*, 2022). Furthermore, digitization presents potential, especially in developing digital and environmentally friendly solutions, which they can identify (Arias-Pérez and Vélez-Jaramillo, 2022). Consequently, it would be intriguing to explore whether knowledge worker productivity serves as the missing link, potentially mediating the intricate relationship between networking capabilities and the sustainable performance of SMEs. Specifically, the research question is as follows:

RQ1. Does knowledge worker productivity mediate the relationship between networking skills and the sustainable performance of SMEs?

In the same vein, networking capabilities are likely to enhance SME's innovation performance because of co-learning, co-innovation and upgradation of the firm's capabilities (Knoppen *et al.*, 2011; Mokhtarzadeh *et al.*, 2020; Tsai, 2001). Because networking shares information, resources and best practices, it dramatically impacts SMEs' digital adoption. In the current uncertain environment, the incorporation of digital innovation has become a key factor in SMEs' long-term success (Khin and Ho, 2018; Omrani *et al.*, 2022; Ramdani *et al.*, 2022). In

turn, digital innovation can reshape operational effectiveness, improve market responsiveness and create new growth opportunities. Thus, this led us to examine, *does digital innovation mediate the relationship between networking capabilities and SMEs' sustainable performance?* Moreover, the sequential linkages between networking skills, productivity of knowledge workers and digital innovation, as well as their impact on sustainable performance have not been adequately investigated in the current body of literature. To bridge this gap, *do the productivity of knowledge workers and digital innovation sequentially mediate the relationship between networking capabilities and sustainable performance?*

Keeping into consideration the above research gaps, first, this study advances the literature by examining the interconnected networking capabilities that influence SMEs' sustainable performance in the economic, environmental and social spheres. In this way, this research adds a more comprehensive understanding of the literature on SMEs' contribution to sustainable development. Second, this research contributes by examining the mediating role of knowledge worker productivity. By examining whether networking capabilities influence SME sustainable performance by increasing knowledge worker productivity, this study contributes to a better understanding of the fundamental processes that underlie the association between sustainable performance and networking. Thirdly, this study extends the networking capabilities and performance literature by including a mediating component of digital innovation. This theoretical development fills gaps in our knowledge of how networking might boost SMEs' digital innovation-focused sustainable performance. Finally, the study establishes a sequential mediation mechanism between knowledge worker productivity, digital innovation and networking capabilities. This pioneering endeavor offers a new perspective on the complicated network of interactions that governs these important factors (Ben Amara and Chen, 2020; Mokhtarzadeh *et al.*, 2020).

This study is arranged as follows. In Section 1, the introduction, the research's relevance and importance are described. Section 2 explains the research's theory and hypotheses. Section 3 covers context, data collection and variable measurement. Section 4 presents the study findings, while Section 5 discusses their significance to existing literature. Section 6 details the research's theoretical and practical implications. Section 7 discusses limitations and further research, and this study concludes in Section 8.

2. Theory and hypotheses development

This research focuses on economic, environmental and social value creation for sustainable performance (Inigo *et al.*, 2020; Gupta *et al.*, 2014). To achieve social environmental goals and sustainable performance, researchers have recommended partnerships and resource integration (Ben Amara and Chen, 2020; Inigo *et al.*, 2020). SMEs need to develop a dynamic capability perspective (Teece *et al.*, 1997) and use the existing resources as well as look for new resources to remain competitive and innovative (de Almeida *et al.*, 2021). Thus, SMEs with limited resources can collaborate with several partners to acquire the necessary capabilities and resources required to achieve a competitive advantage. We have provided the most relevant study in this regard in Table 1, and it highlights the need to understand the integrated effect of networking capabilities on different dimensions of sustainable performance and explains the mechanism by which networking capabilities influence SMEs' sustainable performance.

Our study, thus, builds on dynamic capability theory and a knowledge-based view of the firm (Grant, 1996) in which the knowledge is created by the knowledge workers within the organizations and their capability to create share and apply knowledge for innovation depends on the utilization of resources such as networking capabilities as well as the ability to understand the environment and create new knowledge. The

Table 1 Networking capabilities and performance

Authors	*Source title*	*Findings*
Inigo *et al.* (2020)	Networking for sustainability: Alliance capabilities and sustainability-oriented innovation	According to research findings, proactive alliance behavior is favorably correlated with radical SOI, whereas proactive alliance portfolio management is positively correlated with incremental SOI
Adomako *et al.* (2021)	Chief executive officers' sustainability orientation and firm environmental performance: Networking and resource contingencies	Result reveals that sustainability-oriented is positively related to environmental performance. In addition, our results show that the effect of SO on FEP is negative when firms have stronger financial slack and when firms are highly politically connected
Rho and Han (2021)	Relative Managerial Networking and Performance: The Moderating Role of Environmental Context	When a company complies with institutional standards and operates in a less complex environment, the benefits of relative networking are more effectively tapped
Alkahtani *et al.* (2020)	Does government support enhance the relation between networking structure and sustainable competitive performance among SMEs?	Network density has a favorable and considerable impact on sustained competitive advantage compared to network centrality. This relation is further strengthened and heavily supported by government financial support
Ben Amara and Chen (2020)	Investigating the effect of multidimensional network capability and eco-innovation orientation for sustainable performance	Findings show that the finalized network capability design can include the additional dimension of sustainable development as a significant component

Source: Authors' own creation

networking capability is a key resource that helps knowledge to flow between various actors (Inigo *et al.*, 2020) resulting in enhanced knowledge management capability of the workers for value creation and sustainable performance (Ben Amara and Chen, 2020). In this way, the SMEs try to adopt a dynamic ability perspective by continuously looking for new opportunities and alliances which increases their networking capabilities thereby raising the productivity of knowledge workers through enhanced knowledge sharing, knowledge creation and knowledge application capability (Ahmed *et al.*, 2021). Thus, the flow of knowledge becomes the key source of innovation and sustainable performance falling in line with the knowledge-based view of the SMEs. We thus implicate the importance of "human/knowledge workers" (e.g. IT managers, engineers, consultants, etc. in our study), as they are crucial sources to create and mobilize networking capabilities to perform knowledge-intensive work which requires creative thinking skills and capabilities (Drucker, 1999) for developing innovative products to contribute towards sustainable performance. Based on this perspective, we will further develop our hypothesis in the following sections.

2.1 Networking capabilities and sustainable performance

Every modern organization strives to achieve business sustainability to remain competitive and mitigate risks within the scope of their businesses (Gupta *et al.*, 2014; Tonelli *et al.*, 2013). To achieve this, organizations need to consider various factors that can bring this kind of sustainability for a favorable impact on operational performance (Inigo *et al.*, 2020; Ratnayake, 2012) as well as on the environment. For this, the organizations need to work collectively and maintain professional networks and strong social relations with each other (Collins and Clark, 2023).

The networking capabilities of the organizations play a key role, as they give strength to the organizations to access resources that are otherwise difficult to acquire (Ben Amara and Chen, 2020). The networking capability refers to "a firm's ability to establish formal or informal relationships with at least two independent organizations seeking to leverage each other's competencies" (Yang *et al.*, 2018, p. 145). Walter *et al.* (2006) explained networking capability as concept with multiple dimensions involving:

- coordination activities among enterprises;
- skills such as communication ability, conflict management, self-reflection, etc.; and
- effective knowledge transfer at all levels among the partner enterprises (Ben Amara and Chen, 2020).

In this regard, de Almeida *et al.* (2021) develop an integrative framework based on the systematic literature review to elaborate on how organizations can use collaborative capabilities for implementation of different green practices and achieve higher sustainable performance. In addition, they have identified ten essential characteristics that contribute to collaborative competence and its correlation with sustainability. They also identified ten key attributes of collaborative capability and their relationship with sustainability. Khatami *et al.* (2021) document that collaborative networks such as entrepreneurial ecosystems are important contributors to sustainable innovation. Managers can use networking capabilities to interact and communicate with SMEs to enhance their work-related capabilities (Inigo *et al.*, 2020; Gupta *et al.*, 2014) with a greater understanding of various tools and techniques to create value (product innovation) and achieve sustainable performance (de Almeida *et al.*, 2021; Hagel and Brown, 2011). Networking enhances the knowledge of partners across various domains which thus helps in sustaining high performance (Tolstoy and Agndal, 2010). This sustainable performance could span across the three main domains, i.e. social, economic and environmental aspects as the requirements for sustainable performance involve care for the environment, social consciousness and economic stability (Gupta *et al.*, 2014). Thus, we propose as follows:

H1. Networking capabilities are positively related to SMEs' sustainable performance (environmental, economic and social performance).

2.2 Mediating role of knowledge workers productivity

We are living in an era of a knowledge economy where human capital is considered the main knowledge asset for organizations (Ahmed *et al.*, 2021) commonly termed knowledge workers (Shujahat *et al.*, 2019). Knowledge workers are a major proportion of various occupations of the diverse occupations within today's global workforce. (Sahibzada *et al.*, 2020; Kianto *et al.*, 2019; Ahmed *et al.*, 2021) knowledge workers in organizations are the key source of knowledge related to building and maintaining relationships within the organizations as well as across the organizations (Joe *et al.*, 2013). This knowledge of relationships involves understanding the customers and their priorities annoying who to contact when in need of certain competencies, the networking capabilities of these employees' aka knowledge workers then play a pivotal role in not only helping them to sort out the different issues and enhance their productivity regarding organizational processes and routines but also helping the organizations in their productivity and performance enhancement (Sumbal *et al.*, 2018). The literature on knowledge worker productivity is linked to how the workers can use the various sources of the organization to enhance their productivity (Shujahat *et al.*, 2019; Sahibzada *et al.*, 2020). The productivity of knowledge workers is crucial for sustainable SME performance and innovation (Drucker, 1999; Shujahat *et al.*, 2019). If an organization has a better networking capability, it means the knowledge workers of that organization have more access to various resources not only within the organization but also outside the organization which can be used for the benefit of the organization. These networking capabilities help the employees to perform their tasks in a much more coordinated way which can not only impact the working environment and the social interaction of the knowledge workers but also contribute towards economic benefits for the organizations, thus paving the way for the overall sustainable performance covering all these different aspects. Thus, we argue that, through better organizational networking

capabilities, the productivity of the knowledge workers increases which in turn contributes towards the sustainable performance of the SMEs. Thus, we hypothesize as follows:

H2. Knowledge workers' productivity mediates the positive relationship between networking capabilities and SME sustainable performance (environmental, economic and social performance).

2.3 Mediating role of digital innovation

The networking capabilities help the organizations to create value through knowledge transfer between the partners (Ju *et al.*, 2023). Knowledge is the key source of competitive advantage, and it leads to the development of unique innovative capabilities through which organizations can develop products and services which are not imitable (Crupi *et al.*, 2020; Dabić *et al.*, 2019). This knowledge is shared and used by the knowledge workers if they are networked well within and across organizations. Thus, networking is considered an organizational capability as well as a strategic instrument using which organizations promote efficient knowledge transfer which is the basis for innovation (Bao *et al.*, 2021; Ben Amara and Chen, 2020; Ju *et al.*, 2023). Digital innovation is the capability of organizations to use IT technologies for enhancing operational performance for the development of unique products. The survival of modern organizations is, thus, based on innovation associated with the creation of unique products, new idea development and implementation for the organization's well-being as well as a better socio-economic system of the respective country (Dabić *et al.*, 2023; Gaglio *et al.*, 2022). Thus, the eventual outcome of digital innovation is sustainable performance helping organizations to stay in the market, produce environment-friendly products and also generate revenue. In this connection, thus, we argue that the networking capability helps organizations to have higher digital innovation capability which in turn leads to sustainable performance. Thus, we hypothesize as follows:

H3. Digital innovation mediates the relationship between networking capabilities and an SME's sustainable performance (environmental, economic and social performance).

2.4 Serial mediation of knowledge workers and digital innovation

The knowledge worker's productivity theory coined by Peter Drucker (Drucker, 1999) states that knowledge management processes – knowledge creation, knowledge sharing and knowledge application – contribute to the productivity of knowledge workers (Shujahat *et al.*, 2019; Kianto *et al.*, 2019). The job of knowledge workers is not repetitive but about creating innovative solutions, such as engineers solving societal and industrial issues, IT experts providing innovative IT solutions and doctors diagnosing solutions to novel medical diseases such as COVID-19. Thus, as organizational operations are mainly pivoted around the use of IT tools to create new ideas and products (digital innovation), the knowledge workers can contribute positively to digital innovation which eventually leads to sustainable performance. Thus, based on this, we further hypothesize as follows:

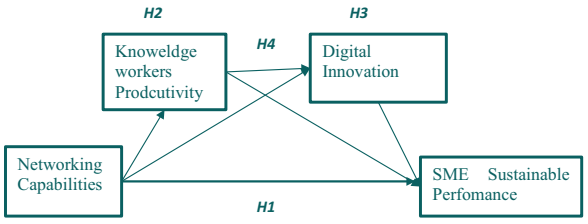
H4. Relationship between networking capabilities and SME sustainable performance (environmental, economic and social performance) is serially mediated by networking capabilities and digital innovation.

Figure 1 displays the hypothesized framework of this research to examine the relationship between networking capabilities and SMEs' sustainable performance through knowledge workers productivity and digital innovation.

3. Methods

The context of this research is the Pakistani software and IT industries, Pakistan's IT industry has expanded significantly in recent years, making it an important case study for our study.

Figure 1 Conceptual Framework for the hypothesized relationship between Networking capabilities, knowledge workers' productivity, digital innovation, and SME Sustainable Performance



Source: Authors' own creation

Many global companies have opened up business in Pakistan to take advantage of the country's burgeoning software and IT industry, which boosts exports and creates jobs (Jahan *et al.*, 2019). IT organizations are partnering and building networks to train their employees for a competitive market. These trainings boost knowledge worker efficiency and digital innovation for SMEs. Sustainable operations are gaining prominence among Pakistani SMEs, especially IT firms, because of global sustainability efforts. IT companies must also meet customer needs globally related to sustainability (Safdar *et al.*, 2019). Knowledge workers' efficiency and digital innovation are important to meet customer needs in this sector. A Pakistani IT sample is suitable for this research to assess how knowledge worker productivity, digital innovation and networking affect SMEs.

Academics and subject-matter experts were surveyed about the questionnaire to see whether adjustments were needed. Based on their recommendations, necessary adjustments in the wording were made to all measures. To assess the accuracy of all scales, a pilot survey was conducted among 35 IT sector professionals and their responses were gathered. We started a large-scale survey once we discovered that the reliability of each scale from the pilot scales was higher than the cutoff point.

Data was gathered using two methods from senior managers in the IT sector throughout the period spanning from January to March 2022. First, we gathered the data by distributing an online survey to managers in the IT sector, but we only got a few replies. The study's participants were made aware of the confidentiality and anonymity of their replies and their right to withdraw at any time. To get the desired outcome, researchers manually gathered the data by going to the workplaces of these IT-based SMEs. After three months, 308 out of 315 valid replies were eventually gathered for the study. All the variables used in this study were derived from previously published research, and they were all graded on a five-point Likert scale, with 1 representing poor agreement and 5 representing great agreement. A list of the entries for each variable may be found in Appendix. The scales used for measuring each variable are listed in Appendix.

3.1 Networking capabilities ($\alpha = 0.945$)

The scale is adapted from the previous studies of Parida *et al.* (2016), Walter *et al.* (2006). Networking capability is measured through coordination, relationship skills and partner knowledge as suggested in the research.

3.2 Knowledge worker productivity ($\alpha = 0.851$)

The five-item Palvalin *et al.* (2015) scale, "I can use the majority of my working time for doing important tasks connected to my goals," is modified to evaluate knowledge worker

productivity. We used a five-point Likert scale, with 1 denoting strongly disagree and 5 denoting strongly agree.

3.3 Digital innovation ($\alpha = 0.879$)

On a five-point Likert scale, this study measures digital innovation following Khin and Ho (2018) and Paladino (2007). The metric was modified in light of the research's context.

3.4 Small and medium enterprises sustainable performance

SMEs' sustainable performance has three dimensions, namely, economic performance, environmental performance and social performance.

3.4.1 Economic performance ($\alpha = 0.824$). For economic performance, Mitra and Datta's (2014) four four-item measure of economic performance is used in this research where an organization needs to compare its performance with other close competitors, such as profit and sales.

3.4.2 Social performance ($\alpha = 0.882$). For social performance, this research relied on Shang *et al.*'s (2010) and Paulraj's (2011) three items of social performance. These three items include relationships with customers, suppliers and stakeholders.

3.4.3 Environmental performance ($\alpha = 0.935$). Zailani *et al.*'s (2012) items of environmental performance are adopted for this research which includes items such as reduced resource consumption.

4. Results

Composite reliability, measures of validity (discriminant and convergent), descriptive statistics and correlations were calculated as part of the preliminary analysis using SPSS and AMOS software. To establish the mediating effect of knowledge worker productivity and digital innovation, this research followed the Macro Hayes Process Model 6 which used 5,000 reiterations at a 95% confidence interval to establish the indirect path. Moreover, Hayes model 6 is used by a large number of scholars to measure the indirect effect (George *et al.*, 2022).

4.1 Measurement model

To determine whether all observed variables are different from others, we first conducted a confirmatory factor analysis. A model is considered fit if certain indices such as (RMSEA, CFI and TLI) meet the threshold value level. Results of the measurement model indicate that the proposed model has a better fit with the data ($\chi^2 = 567.77$ df $= 302$, GFI $= 0.883$, CFI $= 0.955$, IFI $= 0.956$ and RMSEA $= 0.054$). This research compared the proposed model with indices of other measurement models, three-factor models where we combined all sustainable performance factors as one and networking capabilities with digital innovation ($\chi^2 = 2486.35$ df $= 314$, GFI $= 0.636$, CFI $= 0.635$, IFI $= 0.637$ and RMSEA $= 0.150$), a two-factor model where networking capabilities combined with knowledge workers productivity and digital innovation ($\chi^2 = 2672$ df $= 316$, GFI $= 0.609$, CFI $= 0.604$, IFI $= 0.607$ and RMSEA $= 0.156$). This research also compared proposed model fit indices with one single factor model ($\chi^2 = 2914.48$ df $= 317$, GFI $= 0.582$, CFI $= 0.564$, IFI $= 0.566$ and RMSEA $= 0.163$). A poor fit was found from other alternative models when we compared them with the proposed model, this also shows that common method bias was not an issue in the data set. Factor loadings, composite reliability, average variance extracted of the proposed model variables and items are provided in Table 2: Value of composite reliability of latent variables is above 0.7 and AVE values are above 0.5, which shows that this research data set does not suffer from convergent validity issues (Tariq *et al.*, 2023).

Table 2 Factors loading and convergent validity from confirmatory factor analysis

Constructs	*Items*	*Standardized factor loading*	*CR*	*AVE*
Networking capabilities	NC1	0.81	0.942	0.672
	NC2	0.78		
	NC3	0.86		
	NC4	0.85		
	NC5	0.85		
	NC6	0.84		
	NC7	0.78		
	NC8	0.77		
Digital innovation	DI	0.9	0.879	0.591
	D2	0.89		
	D3	0.71		
	D4	0.64		
	D5	0.65		
Knowledge workers productivity	KWP1	0.69	0.851	0.523
	KWP2	0.7		
	KWP3	0.77		
	KWP4	0.74		
	KWP5	0.65		
Environmental performance	ENP1	0.96	0.935	0.828
	ENP2	0.91		
	ENP3	0.86		
Economic performance	ECP1	0.59	0.824	0.615
	ECP2	0.89		
	ECP3	0.97		
Social performance	SCP1	0.65	0.882	0.719
	SCP2	0.89		
	SCP3	0.97		

Source: Authors' own creation

4.2 Descriptive statistics

Descriptive statistics (mean and standard deviation), intercorrelation among latent variables and discriminant validity values are given in Table 3. Results of the correlation analysis show support for the proposed hypotheses where networking capabilities are significantly linked with all variables and all the values are below the threshold level which shows that there are no collinearity issues (Mehmood *et al.*, 2021). Similarly, knowledge workers' productivity and digital innovation are also positively associated with all three dimensions of sustainable performance. Moreover, this study also checks if there is a multicollinearity issue, however, this research did not find this problem as all the variables values are between 1.026 and 1.485 (Dost *et al.*, 2016).

Table 3 Descriptive statistics and correlations

Variable	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. Age	24.481	11.642								
2. Size	5.720	1.295	0.533***							
3. Networking capability	4.317	0.615	−0.222***	−0.170***	*0.819*					
4. Knowledge workers productivity	4.465	0.489	−0.254***	−0.185***	0.530***	*0.715*				
5. Digital innovation	4.172	0.682	−0.173**	−0.249***	0.400***	0.402***	*0.769*			
6. Env. Performance	3.778	0.995	−0.064	−0.037	0.123**	0.103*	0.179**	*0.91*		
7. Economic performance	4.302	0.646	−0.219***	−0.140**	0.477***	0.504***	0.432***	0.183***	*0.784*	
8. Social performance	2.394	0.845	−0.017	−0.021	0.121*	0.098*	0.138**	0.063	0.113**	*0.848*

Notes: ENV = environmental performance; ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$
Source: Authors' own creation

4.3 Hypotheses testing

To test the proposed relationship, we followed an analytical strategy described by Hayes (2017) where we tested the three-path mediated effect for all sustainable performance measures (environment, economics and social performances), hence all the coefficients and significance values were determined using Hayes' PROCESS SPSS plug-in (Hayes, 2017). According to Hayes (2017), this method is superior to other analyses of mediating effects. Compared to the Sobel test, Hayes' mediation technique "directly evaluates the indirect influence between the predictor and the criterion variables through the mediator using a bootstrapping procedure" (Van Jaarsveld *et al.*, 2010, p. 1497).

Furthermore, according to Huertas-Valdivia *et al.* (2018), this approach has the advantage of enabling the isolation of each mediator's indirect effect and allows examination of the indirect effect that sequentially passes through both mediators.

While concurrently adjusting for SME age, size and education, this study estimated all route coefficients, however, both control variables were not found to be significant in most of the models as provided in Table 4. Research findings based on a sample size of 308, given in the Table 4, support that networking capabilities positively influence SME economic performance (B = 0.240, SE = 0.059, $p < 0.001$), which supports *H1*, however, we did not find support for the networking capabilities' positive influence on environmental and social performance. *H2* supports the mediating role of knowledge workers' productivity on the relationship between networking capabilities and SME performance.

The estimates of knowledge workers' productivity (B = 0.368, SE = 0.075, $p < 0.001$) support *H2* for the SME economic performance, however, we did not find that knowledge workers' productivity mediates the relationship between networking capabilities and SME environmental and social performance. Similarly, Digital innovation estimates are (B = 0.216, SE = 0.050, $p < 0.001$) and (B = 0.229, SE = 0.094, $p < 0.1$) which support *H3* that digital innovation mediates the relationship between networking capabilities and SME economic and environmental performance, respectively, supporting *H3*, however, we did not find sufficient evidence to support digital innovation mediation relationship for networking capabilities and SME social performance.

Finally, as shown in Table 5, indirect path coefficient effects and standard error along with upper and lower bound limits support that knowledge workers' productivity and digital innovation mediate the relationship between networking capabilities and SME performance

Table 4 Regression coefficients, standard errors and model summary information for the serial multiple mediator model

	Dependent variables B *(SE)*				
	KWP	*DI*	*ECP*	*ENP*	*SCP*
Constant	2.959 (0.215)***	1.944 (0.393)***	0.686 (0.361)**	2.316 (0.681)***	1.160 (0.581)*
Age	−0.005 (0.039)**	0.003 (0.004)	−0.005 (0.003)	−0.004 (0.006)	0.001 (0.241)
Size	−0.012 (0.021)	−0.097 (0.031)**	0.027 (0.028)	0.027 (0.052)	0.009 (0.045)
Independent variable					
Networking capabilities	0.396 (0.039)***	0.274 (0.066)***	0.240 (0.059)***	0.084 (0.112)	0.098 (0.095)
Mediators					
KWP		0.345 (0.084)***	0.368 (0.075)***	0.018 (0.124)	0.041 (0.121)
DI			0.216 (0.050)***	0.229 (0.094)*	0.132 (0.081)
F	43.790***	23.486***	33.830***	2.305*	1.552
R^2	0.549	0.487	0.56	0.192	0.174

Notes: KWP = knowledge worker productivity; DI = digital innovation; ECP = economic performance, ENP = environmental performance; SCP = social performance; ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$; size is log of number of employees where $n = 308$
Source: Authors' own creation

Table 5 Indirect effects

Indirect effects	*Effect*	*Boot SE*	*95% confidence interval*
ECP			
NC → KWP → ECP	0.146	0.0384	(0.073, 0.224)
NC → DI → ECP	0.059	0.026	(0.016, 0.115)
NC → KWP → DI → ECP	0.029	0.0141	(0.008, 0.063)
Total effect	0.234	0.046	(0.147, 0.327)
Direct effect (NC → ECP)	0.24	0.059	(0.124, 0.357)
ENP			
NC → KWP → ENP	0.007	0.056	(−0.096, 0.125)
NC → DI → ENP	0.063	0.0284	(0.015, 0.123)
NC → KWP → DI → ENP	0.031	0.017	(0.006, 0.070)
Total effect	0.101	0.064	(−0.014, 0.236)
Direct effect (NC → ENP)	0.084	0.112	(−0.136, 0.304)
SCP			
NC → KWP → SCP	0.016	0.052	(−0.084, 0.119)
NC → DI → SCP	0.036	0.026	(−0.011, 0.094)
NC → KWP → DI → SCP	0.018	0.014	(−0.005, 0.051)
Total effect	0.07	0.054	(−0.030, 0.180)
Direct effect (NC → SCP)	0.098	0.095	(−0.090, 0.286)

Notes: NC = networking capabilities; KWP = knowledge worker productivity; DI = digital innovation; ECP = economic performance; ENP = environmental performance; SCP = social performance
Source: Authors' own creation

(economic and environmental) as the lower and upper bound for economic performance (0.008, 0.063) and environmental performance (0.006, 0.070) does not contain 0, supporting *H4*. However, we did not find support for serial mediation of knowledge workers' productivity and digital innovation on the relationship between networking capabilities and SME social performance.

5. Discussions and conclusion

This study's findings emphasized the profound significance of networking as a vital component in achieving higher level of sustainable performance (economic, environmental and social performance). In the context of sustainable performance, networking is critical in facilitating the transfer of knowledge and expertise to complement SME's existing knowledge and activities for sustainable practices (Dittrich and Duysters, 2007), as sustainable performance necessitates a collaborative approach involving diverse and active stakeholders such as suppliers, customers, employees and regulators. Networking provides an opportunity for SMEs or entrepreneurial SMEs to establish a platform for various stakeholders to share ideas and best practices, which may lead to the implementation of sustainable practices, and companies that value networking are more likely to achieve higher sustainable performance than those that do not. Our findings are in line with previous researchers who have supported the influence of networking on organizational sustainable practices (de Almeida *et al.*, 2021; Ben Amara and Chen, 2020; Inigo *et al.*, 2020).

Regarding knowledge workers' productivity, as expected, they have great importance in devising and implementing new ways to create value from networking capabilities. Networking capabilities are important, however, this alone may not be sufficient, as SMEs need to focus on developing their internal capabilities, particularly those related to knowledge workers' productivity, to fully leverage the benefits of networking (Shujahat *et al.*, 2019). Knowledge workers may seek out engaged partners, combine new data and assets and build unique products and services to ensure long-term success. If knowledge workers are not productive and do not enlarge their network, the company's long-term success may

suffer. SMEs must improve networking and knowledge worker productivity to attain sustainability. This will maximize their internal and external strengths (Shujahat *et al.*, 2019).

The findings also suggest that networking might transform SMEs' digital innovation. SMEs obtain knowledge from their partners, which helps them achieve their goals. SMEs can increase communication and cooperation across networks and produce more unique products and services with digital innovation. According to Khin and Ho (2018), this helps SMEs create networks and access new knowledge and resources, improving their long-term success. SMEs might also use digital technologies to examine their economic, social and environmental impacts. This helps SMEs assess their long-term performance, improve and make better decisions.

Finally, sequential mediation shows that networking capabilities boost SMEs' performance through knowledge worker productivity and digital innovation. Larger networks may provide superior resources, expertise and data to SMEs. Knowledge workers may readily learn new skills, update their existing ones and keep up with industry advances. Making information sharing simpler between employees and outsiders can increase performance. This may boost creativity and productivity, both of which are necessary for enhanced performance. Another justification for this result is that networking capabilities allow cooperation and teamwork among knowledge workers within and outside the organization. It introduces cutting-edge procedures and technologies that boost efficiency and create new ideas. Effective networking may help organizations get grants, venture funding and partnerships to develop, produce and market innovative goods and services while increasing performance. SMEs with access to cash and resources may also invest in knowledge workers, providing them with training and development opportunities that can boost creativity and performance.

6. Implications

6.1 Theoretical implications

This research builds on dynamic capability theory to advance knowledge of networking capabilities and SME performance literature. By doing so, first, this research has contributed to the understanding by confirming that interconnected networking capabilities influence SMEs' sustainable (economic, environmental and social) performance. These research findings shed light on how networking capabilities go beyond simple social and corporate connections and facilitate SMEs in attaining their performance-oriented goals. These findings can give academics a thorough understanding of how networking activities contribute to various sustainability-related issues, allowing them to understand the intricate relationships.

Second, our research results provide valuable insights by explaining the significant role of knowledge workers as key sources to build and maintain the knowledge network. Knowledge workers play a pivotal role in using network resources, coordinating relevant activities and contributing to the sustainable performance of the organization. Thus, we contributed by establishing the mediating role of knowledge workers' productivity in explaining the relationship between interconnected networking capabilities and SMEs' sustainable performance (Moussa *et al.*, 2017; Shujahat *et al.*, 2019). Thirdly, we advanced the existing body of knowledge by understanding the significance of digital innovation where SMEs can co-learn from the networks and create digital products and solutions that contribute to performance. Research findings emphasize the significant role of digital innovation as a crucial component to achieving higher sustainable performance (Dabić *et al.*, 2023; Khin and Ho, 2018) and confirmed its role as a mediator in networking and performance relationships. Finally, our research findings confirmed the sequential mediating role of knowledge workers' productivity and digital innovation. Both mediators work as an important component to channel networking capabilities for enhancing the

SME's performance as the knowledge workers can contribute positively to digital innovation which eventually leads to sustainable performance. These findings contribute by highlighting the causal connections that define the interplay between these crucial elements (Ben Amara and Chen, 2020; Mokhtarzadeh *et al.*, 2020).

6.2 Practical implications

Regarding the practical implications of this research, SMEs should prioritize the development of successful networks by discovering and interacting with active partners or partners who can supplement their current knowledge bases and add value to the SME. SMEs should frequently assess their internal talents and networking to succeed in the long term. This will enable them to spot areas for improvement and alter their approach for efficient network expansion (Papastamatelou *et al.*, 2016). Small- and medium-sized firms should prioritize worker training and development. These trainings are likely to enable them to effectively use the knowledge and resources they have obtained through networking. This would allow knowledge workers to use knowledge resources to solve problems and improve performance.

SMEs may leverage knowledge workers' pooled experience by fostering collaboration. Rewarding knowledge holders for sharing their knowledge will foster learning and innovation. These and other benefits, such as adding data and resources and offering new goods and services, improve long-term success. Particularly, in the era of generative AIs, policyholders shall dwell on the knowledge workers' capabilities to make better judgments based on the predictions generated from multiple sources. It shall also encourage knowledge workers to be flexible in their approach to dealing with challenges emanating from technological advancements and other challenges.

Furthermore, policymakers can promote initiatives that enable and help SME employees to use digital resources of the network. It will encourage SMEs to explore their potential for digital innovation and to adopt modern technologies that can improve cooperation and communication. It will assist them in achieving their goals and introducing new goods and services. SMEs can also design mechanisms that how trained knowledge workers can assimilate necessary knowledge to design products and solutions for higher sustainable performance. Thus, SMEs should prioritize knowledge workers, as they will leverage networking capabilities to assimilate and use knowledge to boost productivity, innovation and, consequently, sustainable performance.

7. Limitations and future research

We acknowledge a few limitations that could provide avenues for future research. Our findings should be viewed in the context of knowledge-intensive industries where the role of knowledge workers is highly significant; although we specifically focused on the context, we acknowledge that other factors could also play a role in the SMEs' sustainable performance that managers consider in their decisions. Methodologically, the cross-sectional nature of the research is problematic, as it cannot rule out endogeneity. However, researchers have also recommended their utility if management scholars do not wish to be limited to well-documented and longitudinal data, and we have also addressed this limitation by taking different measures as recommended by the researchers (Opper and Burt, 2021). Future research can further explore this research by integrating the role of longitudinal data to provide the most effective method to confirm the casualty networking capabilities, knowledge workers productivity and sustainable performance. We also encourage future workers to use samples of major businesses and businesses run by expert knowledge workers. This research respondents' SMEs are mostly run by the founders and owners who act as knowledge workers to use benefits from networking capabilities. Finally, looking for replication in various cultural and institutional contexts is necessary, as this study relied on a

single-country design. Competitive designs integrating different sample sets in various cultural contexts might provide insightful information on this problem. In conclusion, we hope to encourage related research that will support and explore this research framework further.

8. Conclusion

This research has explored several overarching questions related to when networking capabilities enhance SMEs' sustainable performance. For this purpose, this research examined the influence of networking capabilities on SME's sustainable (social, economic and environmental) performance. It also examined the individual and sequential influence of knowledge workers' productivity and digital innovation on the networking and performance relationship. To test the proposed hypotheses, data were gathered from 308 knowledge workers in the IT industry and analyzed using the Hayes Process Macro bootstrapping technique. Research results showed that networking capabilities have a direct positive impact on the SMEs' sustainability (economic and environmental). This relationship is individually and sequentially mediated by the productivity of knowledge workers and the level of digital innovation. However, it is interesting to note that these mediating factors do not play a role in the relationship between networking capabilities and the social performance of SMEs. These research findings contribute to the literature on the networking and performance relationship and emphasize the significant role of knowledge workers' productivity and digital innovation in achieving higher sustainable performance. Our findings are relevant to networks and ecosystems that are formed to attain mutual benefits. SMEs while embarking on such relationships shall invest in their knowledge workers' professional development to equip them with the tools and skills to effectively use the knowledge and resources acquired through networking. Consequently, knowledge workers may use these resources to provide innovations and address diverse challenges, thereby making a substantial impact on overall performance.

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Appendix

Table A1 Constructs and items

	Networking capabilities	*Strongly agree*				*Strongly disagree*
1	In our company we have regular meetings for every project	5	4	3	2	1
2	In our company managers and employees often give feedback to each other	5	4	3	2	1
3	In our company we analyze what we would like and desire to achieve with which partner	5	4	3	2	1
4	In our company we develop relations with each partner based on what they can contribute	5	4	3	2	1
5	In our company, we discuss regularly with our partners how we can support each other	5	4	3	2	1
6	In our company we almost always solve problems constructively with partners	5	4	3	2	1
7	In our company, we know our partners' markets	5	4	3	2	1
8	In our company, we know our partners' products/ services/procedures	5	4	3	2	1
	Knowledge worker productivity					
1	I achieve satisfactory results in relation to my goals	5	4	3	2	1
2	I am usually able to carry out my work tasks efficiently (smoothly, without problems)	5	4	3	2	1
3	My job mainly includes tasks in which I am able to exploit my knowledge and skills efficiently	5	4	3	2	1
4	The quality of my work outputs is high	5	4	3	2	1
5	The work group I work in works efficiently as a whole	5	4	3	2	1
	Digital innovation performance					
1	The quality and features of our digital solutions are superior compared to our competitors'	5	4	3	2	1
2	The applications of our digital solutions are totally different from our competitors'	5	4	3	2	1
3	Our digital solutions are different from our competitors in terms of product platform (Product platform is a collection of common technology elements that are used across multiple products to achieve competitive advantage)	5	4	3	2	1
4	Our new digital solutions are improvements of existing products	5	4	3	2	1
5	Some of our digital solutions are new to the market at the time of launching	5	4	3	2	1
	Sustainable performance Please compare your firm performance with your close competitors in your industry					
1	Our customers are highly satisfied	5	4	3	2	1
2	We have well managed relationship with suppliers	5	4	3	2	1
3	We strongly consider stakeholders welfare	5	4	3	2	1
4	We tried to minimize energy consumption	5	4	3	2	1
5	We tried to reduce the waste	5	4	3	2	1
6	We tried to reduce emission of air pollutants	5	4	3	2	1
7	Sales	5	4	3	2	1
8	Net profit	5	4	3	2	1
9	Market Share	5	4	3	2	1

Source: Authors' own creation

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