

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

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This is a Author's accepted manuscript (AAM) version of a publication  
published by Emerald Publishing  
in Journal of Knowledge Management

**DOI:** 10.1108/JKM-09-2023-0788

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**Please cite the publication as follows:**

Tariq, A., Sumbal, M.S.U.K., Dabic, M., Raziq, M.M. and Torkkeli, M. (2024). Interlinking networking capabilities, knowledge worker productivity, and digital innovation: a critical nexus for sustainable performance in small and medium enterprises. Journal of Knowledge Management. DOI: <https://doi.org/10.1108/JKM-09-2023-0788>

**This is a parallel published version of an original publication.  
This version can differ from the original published article.**



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Journal:	<i>Journal of Knowledge Management</i>
Manuscript ID	JKM-09-2023-0788.R1
Manuscript Type:	Research Paper
Keywords:	Networking capabilities, knowledge workers productivity, digital innovation, sustainable performance, SMEs Performance

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## **Interlinking Networking Capabilities, Knowledge Worker Productivity, and Digital Innovation: A Critical Nexus for Sustainable Performance in Small and Medium Enterprises**

### **Abstract:**

**Purpose** As sustainable performance has a central role in the small and medium enterprises (SME) performance literature, this study aims to examine the influence of networking capabilities in enhancing sustainable performance via 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 utilize the knowledge and resources acquired through networking. Thus, knowledge workers may improve performance by using these resources to tackle challenges.

**Originality** 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.

**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.

**Plain Language Summary** This research makes substantial contributions to the SMEs' sustainable performance literature by investigating the interplay between networking capabilities and sustainable performance while elucidating the underlying mechanisms driving this relationship. Knowledge workers' productivity and digital innovation mediate the

relationship between networking capabilities and SMEs' sustainable performance (economic and environmental), sequentially and separately. Surprisingly, these factors do not mediate the connection between networking capability and SMEs' social performance. SMEs should prioritize investments in the professional development of their knowledge workers through training and skill enhancement programs.

**Keywords:** Networking capabilities; knowledge workers productivity; digital innovation; sustainable performance; SME performance

### **1. Introduction:**

The concept of sustainable development has gained central attention in the management literature (Figge and Hahn, 2004) and SMEs-level innovation strategies for generating sustainable (economic, social, and environmental) performance are becoming more popular (Gupta *et al.*, 2014). Due 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 United States (Albino *et al.*, 2012) and a number of small and medium enterprises (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

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3 the interplay between networking capabilities and different dimensions of sustainable  
4 performance unfolds within the context of SMEs. This question is legitimate and merits more  
5 research since SMEs operate in complex ecosystems where networking goes beyond social  
6 relationships. This study's findings can help scholars grasp sustainability challenges'  
7 interconnectedness and networking's role in tackling them. Thus, this study examines, *do*  
8 *networking capabilities influence all dimensions of sustainable (economic, environmental,*  
9 *and social) performance of SMEs?*

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16 Moreover, there is a need for deeper exploration into the mechanisms through which  
17 networking capabilities translate into enhanced sustainable performance for SMEs (Musteen,  
18 2010; Zeng et al., 2010; Acosta et al., 2018). Knowledge workers are essential to SMEs'  
19 success (Drucker, 1999) hence their important role must be recognized (Shujahat et al., 2019).  
20 They also play a pivotal role in fostering substantial contributions to the overall success and  
21 advancement of sustainable performance of the organization. Moreover, scholars contend that  
22 knowledge workers may create and implement new value-creation methods (Ali et al., 2022).  
23 Furthermore, digitization presents potential, especially in developing digital and  
24 environmentally friendly solutions, which they can identify (Arias-Pérez and Vélez-Jaramillo,  
25 2022). Consequently, it would be intriguing to explore whether knowledge worker  
26 productivity serves as the missing link, potentially mediating the intricate relationship  
27 between networking capabilities and the sustainable performance of SMEs. Specifically, the  
28 research question is: *Does knowledge worker productivity mediate the relationship between*  
29 *networking skills and the sustainable performance of SMEs?*

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41 In the same vein, networking capabilities are likely to enhance SME's innovation performance  
42 due to co-learning, co-innovation, and upgradation of the firm's capabilities (Knoppen *et al.*,  
43 2011; Mokhtarzadeh *et al.*, 2020; Tsai, 2001). Because networking shares information,  
44 resources, and best practices, it dramatically impacts SMEs' digital adoption. In the current  
45 uncertain environment, the incorporation of digital innovation has become a key factor in  
46 SMEs' long-term success (Khin and Ho, 2018; Omrani *et al.*, 2022; Ramdani *et al.*, 2022). In  
47 turn, digital innovation can reshape operational effectiveness, improve market responsiveness,  
48 and create new growth opportunities. Thus, this led us to examine, *does digital innovation*  
49 *mediate the relationship between networking capabilities and SMEs' sustainable*  
50 *performance?* Moreover, the sequential linkages between networking skills, productivity of  
51 knowledge workers, and digital innovation, as well as their impact on sustainable performance  
52 have not been adequately investigated in the current body of literature. To bridge this gap, *do*  
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3 *the productivity of knowledge workers and digital innovation sequentially mediate the*  
4 *relationship between networking capabilities and sustainable performance?*  
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7 Keeping into consideration the above research gaps, firstly, this study advances the  
8 literature by examining the interconnected networking capabilities that influence SMEs'  
9 sustainable performance in the economic, environmental, and social spheres. In this way, this  
10 research adds a more comprehensive understanding of the literature on SMEs' contribution to  
11 sustainable development. Secondly, this research contributes by examining the mediating role  
12 of knowledge worker productivity. By examining whether networking capabilities influence  
13 SME sustainable performance by increasing knowledge worker productivity, this study  
14 contributes to a better understanding of the fundamental processes that underlie the association  
15 between sustainable performance and networking. Thirdly, this study extends the networking  
16 capabilities and performance literature by including a mediating component of digital  
17 innovation. This theoretical development fills gaps in our knowledge of how networking  
18 might boost SMEs' digital innovation-focused sustainable performance. Finally, the study  
19 establishes a sequential mediation mechanism between knowledge worker productivity,  
20 digital innovation, and networking capabilities. This pioneering endeavor offers a new  
21 perspective on the complicated network of interactions that governs these important factors  
22 (Ben Amara and Chen, 2020; Mokhtarzadeh *et al.*, 2020).  
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35 This study is arranged as follows: In Section 1, the introduction, the research's relevance and  
36 importance are described. Section 2 explains the research's theory and hypotheses. Section 3  
37 covers context, data collection, and variable measurement. Section 4 presents the study  
38 findings, while Section 5 discusses their significance to existing literature. Section 6 details  
39 the research's theoretical and practical implications. Section 7 discusses limitations and further  
40 research, and this study concludes in Section 8.  
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## 46 **2. Theory and Hypotheses Development:**

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48 This research focuses on economic, environmental, and social value creation for sustainable  
49 performance (Inigo *et al.*, 2020; Gupta *et al.*, 2014). To achieve social environmental goals and  
50 sustainable performance, researchers have recommended partnerships and resource integration  
51 (Ben Amara and Chen, 2020; Inigo *et al.*, 2020). SMEs need to develop a dynamic capability  
52 perspective (Teece *et al.*, 1997) and utilize the existing resources as well as look for new  
53 resources to remain competitive and innovative (de Almeida *et al.*, 2021). Thus, SMEs with  
54 limited resources can collaborate with several partners to acquire the necessary capabilities and  
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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 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 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 & Clark, 2023).

**Insert table 1 about here**

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 i) coordination activities among enterprises, ii) skills such as communication ability, conflict management, self-reflection, etc., and iii) 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 utilize collaborative capabilities for implementation of different green practices and achieving 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 that:

*Hypothesis 1: 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 constitute a major proportion of various occupations of the current global workforce (Sahibzada et al., 2020; Kianto, 2019; Ahmed et al., 2021) knowledge workers in organizations are the key source of knowledge related to



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3 building and maintaining relationships within the organizations as well as across the  
4 organizations (Joe et al., 2013). This knowledge of relationships involves understanding the  
5 customers and their priorities annoying who to contact when in need of certain competencies,  
6 the networking capabilities of these employees' aka knowledge workers then play a pivotal  
7 role in not only helping them to sort out the different issues and enhance their productivity  
8 regarding organizational processes and routines but also helps the organizations in their  
9 productivity and performance enhancement (Sumbal et al., 2018). The literature on knowledge  
10 worker productivity is linked to how the workers can use the various sources of the organization  
11 to enhance their productivity (e.g., Shujahat et al., 2019; Sahibzada et al., 2020). The  
12 productivity of knowledge workers is crucial for sustainable SME performance and innovation  
13 (Drucker, 1999; Shujahat et al., 2019). If an organization has a better networking capability, it  
14 means the knowledge workers of that organization have more access to various resources not  
15 only within the organization but also outside the organization which can be utilized for the  
16 benefit of the organization. These networking capabilities help the employees to perform their  
17 tasks in a much more coordinated way which can not only impact the working environment  
18 and the social interaction of the knowledge workers but also contributes towards economic  
19 benefits for the organizations, thus, paving the way for the overall sustainable performance  
20 covering all these different aspects. Thus, we argue that, through better organizational  
21 networking capabilities, the productivity of the knowledge workers increases which in turn  
22 contributes towards the sustainable performance of the SMEs. Thus, we hypothesize that:

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38 *Hypothesis 2: Knowledge workers' productivity mediates the positive relationship between*  
39 *networking capabilities and SME sustainable performance (Environmental, Economic, and*  
40 *Social Performance).*

### 41 42 43 **2.3. Mediating Role of Digital Innovation**

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45 The networking capabilities help the organizations to create value through knowledge transfer  
46 between the partners (Ju et al., 2023). Knowledge is the key source of competitive advantage,  
47 and it leads to the development of unique innovative capabilities through which organizations  
48 can develop products and services which are not imitable (Crupi et al., 2020; Dabić et al.,  
49 2019). This knowledge is shared and utilized by the knowledge workers if they are networked  
50 well within and across organizations. Thus, networking is considered an organizational  
51 capability as well as a strategic instrument using which organizations promote efficient  
52 knowledge transfer which is the basis for innovation (Bao et al., 2021; Ben Amara and Chen,  
53 2020; Ju et al., 2023). Digital innovation is the capability of organizations to use IT  
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3 technologies for enhancing operational performance for the development of unique products.  
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5 The survival of modern organizations is, thus, based on innovation associated with the creation  
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7 of unique products, new idea development, and implementation for the organization's well-  
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9 being as well as a better socio-economic system of the respective country (Dabić *et al.*, 2023;  
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11 Gaglio *et al.*, 2022). Thus, the eventual outcome of digital innovation is sustainable  
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13 performance helping organizations to stay in the market, produce environment-friendly  
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15 products, and also generate revenue. In this connection, thus, we argue that the networking  
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17 capability helps organizations to have higher digital innovation capability which in turn leads  
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19 to sustainable performance. Thus, we hypothesize that:

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21 *Hypothesis 3: Digital Innovation mediates the relationship between networking capabilities*  
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23 *and an SME's sustainable performance (Environmental, Economic, and Social Performance).*

#### 24 25 **2.4. Serial Mediation of Knowledge Workers and Digital Innovation**

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27 The knowledge worker's productivity theory coined by Peter Drucker (Drucker, 1999) states  
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29 that knowledge management processes – knowledge creation, knowledge sharing, and  
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31 knowledge application – contribute to the productivity of knowledge workers (Shujahat *et al.*,  
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33 2019; Kianto *et al.*, 2019). The job of knowledge workers is not repetitive but about creating  
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35 innovative solutions, such as engineers solving societal and industrial issues, IT experts  
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37 providing innovative IT solutions, and doctors diagnosing solutions to novel medical diseases  
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39 such as COVID-19. Thus, as organizational operations are mainly pivoted around the use of IT  
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41 tools to create new ideas and products (digital innovation), the knowledge workers can  
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43 contribute positively to digital innovation which eventually leads to sustainable performance.  
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45 Thus, based on this, we further hypothesize that:

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47 *Hypothesis 4: Relationship between networking capabilities and SME sustainable performance*  
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49 *(Environmental, Economic, and Social Performance) is serially mediated by networking*  
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51 *capabilities and digital innovation.*

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**Insert figure 1 here**

### 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. 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, due to 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 5-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 1. The scales used for measuring each variable are listed in Appendix 1.

#### 3.1.

##### **Networking Capabilities ( $\alpha = 0.945$ )**

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3 The scale is adapted from the previous studies of (Parida *et al.*, 2016; Walter *et al.*, 2006).  
4 Networking capability is measured through coordination, relationship skills, and partner  
5 knowledge as suggested in the research.  
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### 9 **3.2. Knowledge worker Productivity** ( $\alpha = 0.851$ )

10 The five-item Palvalin *et al.*, (2015) scale, "I can use the majority of my working time for  
11 doing important tasks connected to my goals," is modified to evaluate knowledge worker  
12 productivity. We utilized a five-point Likert scale, with 1 denoting strongly disagree and 5  
13 denoting strongly agree.  
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### 18 **3.3. Digital Innovation** ( $\alpha = 0.879$ )

19 On a five-point Likert scale, this study measures digital innovation following Khin and Ho  
20 (2018) and Paladino (2007). The metric was modified in light of the research's context.  
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### 24 **3.4. SMEs Sustainable Performance**

25 SMEs' sustainable performance has three dimensions, namely economic performance,  
26 environmental performance, and social performance.  
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#### 30 **3.4.1. Economic Performance:** ( $\alpha = 0.824$ )

31 For economic performance, Mitra & Datta, (2014) four four-item measure of economic  
32 performance is used in this research where an organization needs to compare its performance  
33 with other close competitors, such as profit and sales.  
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#### 38 **3.4.2. Social Performance:** ( $\alpha = 0.882$ )

39 For social performance, this research relied on Shang *et al.* (2010) and Paulraj (2011) three  
40 items of social performance. These three items include relationships with customers, suppliers,  
41 and stakeholders.  
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#### 45 **3.4.3. Environmental Performance:** ( $\alpha = 0.935$ )

46 Zailani *et al.*, (2012) items of environmental performance are adopted for this research which  
47 includes items such as reduced resource consumption.  
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## 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 employed 5,000 reiterations at a 95% confidence interval to establish the indirect path. Moreover, Hayes model 6 is utilized 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), 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 below: 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).

### 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

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3 collinearity issues (Mehmood *et al.*, 2021). Similarly, knowledge workers' productivity and  
4 digital innovation are also positively associated with all three dimensions of sustainable  
5 performance. Moreover, this study also checks if there is a multicollinearity issue, however,  
6 this research did not find this problem as all the variables values are between 1.026 and 1.485  
7 (Dost *et al.*, 2016).  
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### 10 11 12 **4.3. Hypotheses Testing:**

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14 To test the proposed relationship, we followed an analytical strategy described by (Hayes,  
15 2017) where we tested the three-path mediated effect for all sustainable performance measures  
16 (environment, economics, and social performances), hence, all the coefficients and significance  
17 values were determined using Hayes' PROCESS SPSS plug-in (Hayes, 2017). According to  
18 Hayes, (2017), this method is superior to other analyses of mediating effects. Compared to the  
19 Sobel test, Hayes' mediation technique "directly evaluates the indirect influence between the  
20 predictor and the criterion variables through the mediator using a bootstrapping procedure"  
21 (Van Jaarsveld *et al.*, 2010, p. 1497).  
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3 Furthermore, according to Huertas-Valdivia et al., (2018), this approach has the advantage of  
4 enabling the isolation of each mediator's indirect effect and allows examination of the indirect  
5 effect that sequentially passes via both mediators.  
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9 **Insert table 4 here.**  
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11 While concurrently adjusting for SME age, size, and education, this study estimated all route  
12 coefficients, however, both control variables were not found to be significant in most of the  
13 models as provided in table 3. Research findings based on a sample size of 308 support that  
14 networking capabilities positively influence SME economic performance ( $B = 0.240$ ,  $SE =$   
15  $0.059$ ,  $p < 0.001$ ), which supports hypothesis 1, however, we did not find support for the  
16 networking capabilities' positive influence on environmental and social performance.  
17 Hypothesis 2 supports the mediating role of knowledge workers' productivity on the  
18 relationship between networking capabilities and SME performance.  
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25 The estimates of knowledge workers' productivity ( $B = 0.368$ ,  $SE = 0.075$ ,  $p < 0.001$ ) support  
26 hypothesis 2 for the SME economic performance, however, we did not find that knowledge  
27 workers' productivity mediates the relationship between networking capabilities and SME  
28 environmental and social performance. Similarly, Digital innovation estimates are ( $B= 0.216$ ,  
29  $SE = 0.050$ ,  $p < 0.001$ ) and ( $B= 0.229$ ,  $SE= 0.094$ ,  $p < 0.1$ ) which support hypothesis 3 that  
30 digital innovation mediates the relationship between networking capabilities and SME  
31 economic and environmental performance respectively supporting H3, however, we did not  
32 find sufficient evidence to support digital innovation mediation relationship for networking  
33 capabilities and SME social performance.  
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42 Lastly, as shown in table 5, indirect path coefficient effects and standard error along with upper  
43 and lower bound limits support that knowledge workers' productivity and digital innovation  
44 mediate the relationship between networking capabilities and SME performance (economic  
45 and environmental) as the lower and upper bound for economic performance (0.008, 0.063)  
46 and environmental performance (0.006, 0.070) does not contain zero, supporting hypothesis 4.  
47 However, we did not find support for serial mediation of knowledge workers' productivity and  
48 digital innovation on the relationship between networking capabilities and SME social  
49 performance.  
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57 **Insert table 5 here.**  
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## 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 aren't productive and don't 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.



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

### 29 **6.1. Theoretical Implications**

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32 This research builds on dynamic capability theory to advance knowledge of networking  
33 capabilities and SME performance literature. By doing so, firstly, this research has contributed  
34 to the understanding by confirming that interconnected networking capabilities influence  
35 SMEs' sustainable (economic, environmental, and social) performance. These research  
36 findings shed light on how networking capabilities go beyond simple social and corporate  
37 connections and facilitate SMEs in attaining their performance-oriented goals. These findings  
38 can give academics a thorough understanding of how networking activities contribute to  
39 various sustainability-related issues, allowing them to understand the intricate relationships.  
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46 Secondly, our research results provide valuable insights by explaining the significant role of  
47 knowledge workers as key sources to build and maintain the knowledge network. Knowledge  
48 workers play a pivotal role in utilizing network resources, coordinating relevant activities, and  
49 contributing to the sustainable performance of the organization. Thus, we contributed by  
50 establishing the mediating role of knowledge workers' productivity in explaining the  
51 relationship between interconnected networking capabilities and SMEs' sustainable  
52 performance (Moussa *et al.*, 2017; Shujahat *et al.*, 2019). Thirdly, we advanced the existing  
53 body of knowledge by understanding the significance of digital innovation where SMEs can  
54 co-learn from the networks and create digital products and solutions that contribute to  
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3 performance. Research findings emphasize the significant role of digital innovation as a  
4 crucial component to achieving higher sustainable performance (Dabić *et al.*, 2023; Khin and  
5 Ho, 2018) and confirmed its role as a mediator in networking and performance relationships.  
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7 Lastly, our research findings confirmed the sequential mediating role of knowledge workers'  
8 productivity and digital innovation. Both mediators work as an important component to  
9 channel networking capabilities for enhancing the SME's performance as the knowledge  
10 workers can contribute positively to digital innovation which eventually leads to sustainable  
11 performance. These findings contribute by highlighting the causal connections that define the  
12 interplay between these crucial elements (Ben Amara and Chen, 2020; Mokhtarzadeh *et al.*,  
13 2020).  
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## 20 21 **6.2. Practical Implications**

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23 Regarding the practical implications of this research, SMEs should prioritize the development  
24 of successful networks by discovering and interacting with active partners or partners who can  
25 supplement their current knowledge bases and add value to the SME. SMEs should frequently  
26 assess their internal talents and networking to succeed in the long term. This will enable them  
27 to spot areas for improvement and alter their approach for efficient network expansion  
28 (Papastamatelou *et al.*, 2016). Small and medium-sized firms should prioritize worker training  
29 and development. These trainings are likely to enable them to effectively use the knowledge  
30 and resources they have obtained through networking. This would allow knowledge workers  
31 to use knowledge resources to solve problems and improve performance.  
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39 SMEs may leverage into knowledge workers' pooled experience by fostering collaboration.  
40 Rewarding knowledge holders for sharing their knowledge will foster learning and innovation.  
41 These and other benefits, such as adding data and resources and offering new goods and  
42 services, improve long-term success. Particularly, in the era of generative AIs, policyholders  
43 shall dwell on the knowledge workers' capabilities to make better judgments based on the  
44 predictions generated from multiple sources. It shall also encourage knowledge workers to be  
45 flexible in their approach to dealing with challenges emanating from technological  
46 advancements and other challenges.  
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54 Furthermore, policymakers can promote initiatives that enable and help SME employees to use  
55 digital resources of the network. It will encourage SMEs to explore their potential for digital  
56 innovation and to adopt modern technologies that can improve cooperation and  
57 communication. It will assist them in achieving their goals and introducing new goods and  
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3 services. SMEs can also design mechanisms that how trained knowledge workers can  
4 assimilate necessary knowledge to design products and solutions for higher sustainable  
5 performance. Thus, SMEs should prioritize knowledge workers since they will leverage  
6 networking capabilities to assimilate and utilize knowledge to boost productivity, innovation,  
7 and consequently, sustainable performance.  
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## 12 **7. Limitations and Future Research:**

13 We acknowledge a few limitations that could provide avenues for future research. Our findings  
14 should be viewed in the context of knowledge-intensive industries where the role of knowledge  
15 workers is highly significant, though we specifically focused on the context, we acknowledge  
16 that other factors could also play a role in the SMEs' sustainable performance that managers  
17 consider in their decisions. Methodologically, the cross-sectional nature of the research is  
18 problematic as it cannot rule out endogeneity. However, researchers have also recommended  
19 their utility if management scholars do not wish to be limited to well-documented and  
20 longitudinal data and we have also addressed this limitation by taking different measures as  
21 recommended by the researchers (Oppen and Burt, 2021). Future research can further explore  
22 this research by integrating the role of longitudinal data to provide the most effective method  
23 to confirm the casualty networking capabilities, knowledge workers productivity, and  
24 sustainable performance. We also encourage future workers to employ samples of major  
25 businesses and businesses run by expert knowledge workers. This research respondents' SMEs  
26 are mostly run by the founders and owners who act as knowledge workers to utilize benefits  
27 from networking capabilities. Finally, looking for replication in various cultural and  
28 institutional contexts is necessary as this study relied on a single-country design. Competitive  
29 designs integrating different sample sets in various cultural contexts might provide insightful  
30 information on this problem. In conclusion, we hope to encourage related research that will  
31 support and explore this research framework further.  
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## 48 **8. Conclusion**

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50 This research has explored several overarching questions related to when networking  
51 capabilities enhance SMEs' sustainable performance. For this purpose, this research examined  
52 the influence of networking capabilities on SME's sustainable (social, economic, and  
53 environmental) performance. It also examined the individual and sequential influence of  
54 knowledge workers' productivity and digital innovation on the networking and performance  
55 relationship. To test the proposed hypotheses, data were gathered from 308 knowledge workers  
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3 in the IT industry and analyzed using the Hayes Process Macro bootstrapping technique.  
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5 Research results showed that networking capabilities have a direct positive impact on the  
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7 SMEs' sustainability (economic and environmental). This relationship is individually and  
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9 sequentially mediated by the productivity of knowledge workers and the level of digital  
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11 innovation. However, it is interesting to note that these mediating factors do not play a role in  
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13 the relationship between networking capabilities and the social performance of SMEs. These  
14  
15 research findings contribute to the literature on the networking and performance relationship  
16  
17 and emphasize the significant role of knowledge workers' productivity and digital innovation  
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19 in achieving higher sustainable performance. Our findings are relevant to networks and  
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21 ecosystems that are formed to attain mutual benefits. SMEs while embarking on such  
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23 relationships shall invest in their knowledge workers' professional development to equip them  
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25 with the tools and skills to effectively utilize the knowledge and resources acquired through  
26  
27 networking. Consequently, knowledge workers may utilize these resources to provide  
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29 innovations and address diverse challenges, thereby making a substantial impact on overall  
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31 performance.

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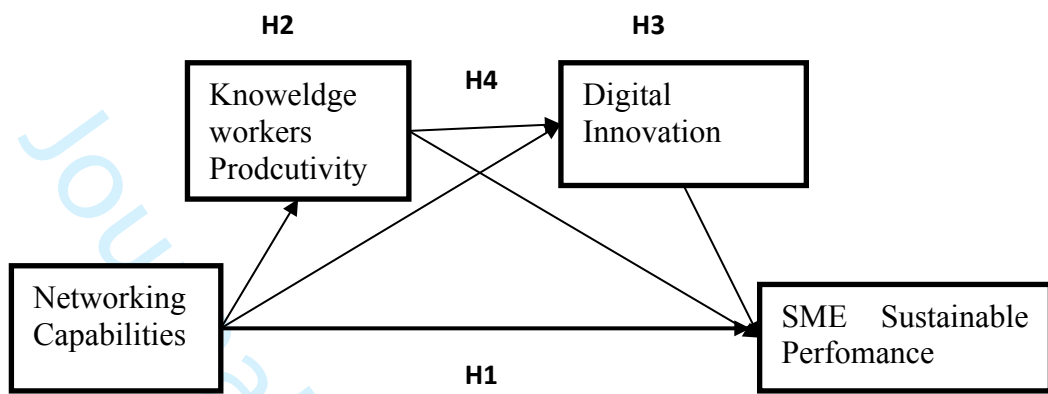


Figure 1: Hypothesized framework of the research

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Table 1: Networking capabilities and Performance

Authors	Source Title	Findings
Inigo <i>et al.</i> , (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 <i>et al.</i> , (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 <i>et al.</i> , (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.

**Table 2:** Factors Loading and Convergent Validity from confirmatory factor analysis.

Constructs	Items	Standardized Factor Loading	CR	AVE
Networking Capabilities			0.94	0.67
	NC1	0.81	2	2
	NC2	0.78		
	NC3	0.86		
	NC4	0.85		
	NC5	0.85		
	NC6	0.84		
	NC7	0.78		
Digital Innovation	D1	0.9	9	1
	D2	0.89		
	D3	0.71		
	D4	0.64		
	D5	0.65		
Knowledge Workers Productivity	KWP1	0.69	1	3
	KWP2	0.7		
	KWP3	0.77		
	KWP4	0.74		
	KWP5	0.65		
Environmental Performance	ENP1	0.96	5	8
	ENP2	0.91		
	ENP3	0.86		
Economic Performance	ECP1	0.59	4	5
	ECP2	0.89		
	ECP3	0.97		
Social Performance	SCP1	0.65	2	9
	SCP2	0.89		

SCP3

0.97

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(Van Jaarsveld *et al.*, 2010, p. 1497).

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**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	-.222***	-0.170***	<b>0.819</b>					
4. Knowledge Workers Productivity	4.465	0.489	-.254***	-.185***	.530***	<b>0.715</b>				
5. Digital Innovation	4.172	0.682	-.173**	-.249***	.400***	.402***	<b>0.769</b>			
6. Env. Performance	3.778	0.995	-.064	-.037	.123**	0.103*	.179**	<b>0.91</b>		
7. Economic Performance	4.302	0.646	-0.219***	-.140**	.477***	.504***	.432***	.183***	<b>0.784</b>	
8. Social Performance	2.394	0.845	-.017	-.021	.121*	0.098*	.138**	.063	.113**	<b>0.848</b>

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

	Dependent Variables				
	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)
<b>Independent Variable</b>					
Networking Capabilities	0.396(0.039)***	0.274(0.066)***	0.240(0.059)***	0.084(0.112)	0.098(0.095)
<b>Mediators</b>					
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
R2	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



**Table 5:** Indirect Effects

Indirect Effects	Effect	Boot SE	95% Confidence Interval
<b>ECP</b>			
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)
<b>ENP</b>			
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)
<b>SCP</b>			
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

## Appendix:

**Appendix 1: Constructs and Items**

	Stro ngly Agre e				Stro ngly Disag ree
<b>Networking Capabilities</b>					
1	5	4	3	2	1
2	5	4	3	2	1
3	5	4	3	2	1
4	5	4	3	2	1
5	5	4	3	2	1
6	5	4	3	2	1
7	5	4	3	2	1
8	5	4	3	2	1
<b>Knowledge Worker Productivity</b>					
1	5	4	3	2	1
2	5	4	3	2	1
3	5	4	3	2	1
4	5	4	3	2	1
5	5	4	3	2	1
<b>Digital Innovation Performance</b>					
1	5	4	3	2	1
2	5	4	3	2	1
3	5	4	3	2	1
4	5	4	3	2	1
5	5	4	3	2	1
<b>Sustainable Performance</b>					
Please compare your firm performance with your close competitors in your industry					
1	5	4	3	2	1
2	5	4	3	2	1
3	5	4	3	2	1

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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

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