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Linking Knowledge Application, Digital Marketing, and Manufacturing SMEs' Sustainable Performance: The Mediating Role of Innovation

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Abstract

This study examines the impact of knowledge application and digital marketing on innovation and sustainable performance of small and medium-sized enterprises (SMEs) in the manufacturing sector in an emerging market. It also examines the role of innovation as a mediating factor in the relationship between knowledge application and digital marketing on the sustainable performance of manufacturing SMEs. The Partial Least Squares - Structural Equation Modelling (PLS-SEM) approach was used to analyse the data from 428 Malaysian manufacturing SMEs. The results show that knowledge application indirectly affects the sustainable performance of manufacturing SMEs through innovation in partial mediation. In contrast, digital marketing indirectly affects the sustainable performance of manufacturing SMEs through innovation in full mediation. Manufacturing SMEs fulfil their responsibility to sustainably improve the safety and health of their employees in the course of their business while focusing on innovation in new product development and new business creation. They also promote awareness and protection of community entitlements and rights and reduce environmental impacts and risks to the community. This empirical study is unique in that it highlights the significant mediating role of innovation on the sustainable performance of manufacturing SMEs, which was examined in the empirical context of Malaysia's emerging market economy. The finding complements previous research conducted mainly in developed (Western) economies. In terms of practical contributions, this study helps SMEs realise the importance of innovation through frequent experimentation with new ideas to maintain consistent innovation and competitive advantage in a challenging business environment. Directions for future research are also provided.

Extended author information available on the last page of the article

Keywords Knowledge Application · Digital Marketing · Innovation · Sustainable Performance · SMEs · Manufacturing

Introduction

The unique characteristics of small and medium-sized enterprises (SMEs) mean that their responses to crises are very different from those of large companies. This is due to the scarcity of human resources, lack of administrative skills (procedures, processes, and tools), lack of money, and inadequate knowledge management of SMEs (Umar, 2022). Crises change customer behaviour and market balance, and the lack of financial resources and knowledge makes it difficult for SMEs to respond to challenges (Carvalho et al., 2020; Zhang et al., 2023). In the knowledge economy, it is believed that the resources, knowledge, and competencies of companies are critical factors for their survival in a dynamic and competitive market, as they bring organisational success (Castrogiovanni et al., 2016; Zhang et al., 2022). At the same time, it is accepted that knowledge management is a continuous process within organisations, as projects can fail at any time without the necessary knowledge (Abualloush et al., 2017; Al Koliby et al., 2022; Hussinki et al., 2017).

SMEs need help in adopting new technologies because they need more resources and expertise (Rahman et al., 2016a,b). Moreover, they need to catch up in innovation and diffusion because they have limited understanding of business difficulties such as poor knowledge management, lack of financial capabilities, etc. (Ipinnaiye et al., 2017). As a result, the failure rate is relatively high in the first five years of a company's life (Rahman et al., 2016a,b; Yusoff et al., 2018). However, if they want to remain visible to customers and investors, they must recognise that digital marketing is crucial and indispensable (Palma-Ruiz & Gómez-Martínez, 2019; Wang et al., 2023). Although digital marketing has several advantages, few studies have examined its use in developing countries (Melović et al., 2020; Çizmeci & Ercan, 2015). In addition, Baka (2016) emphasised that more empirical work is needed on digital marketing in terms of its relationship to improved SME performance. However, despite various government initiatives to provide training, financial support, and public awareness, experts have noted that SMEs have low or slow technological adoption rates (Abd Hamid et al., 2019; Idris, 2019; Ismail et al., 2018). In addition, environmental and societal concerns such as rising energy prices, resource scarcity, and climate change have been highlighted. These factors, along with increasing globalisation and aggressive competition, can pose a major challenge to SMEs (Graafland & Smid, 2016). SMEs also have a poor environmental reputation, with up to 70% of global pollution attributed to them (Khana et al., 2020).

Previous studies have acknowledged that manufacturing is the most important sector for the growth of economies worldwide, including Malaysia (Al Koliby et al., 2022; Kinkel et al., 2022; Ullah et al., 2022), where manufacturing SMEs have contributed significantly to the country's gross domestic product (GDP). They account for 98.5% of the country's total output and are the largest

contributors to national economic growth (SME Corporation Malaysia, 2018). Innovation is considered a critical means of achieving competitive advantage and sustainable success for a company (Lin & Lai, 2021; Srisathan et al., 2020). Lack of understanding of the essence of innovation and failure to harness the potential of new digital tools (digital marketing, techniques, use of online technology, lack of knowledge management) automatically has a negative impact on business sustainability and success (Jia-Qi & Chelliah, 2020; Yahya & Sugiyanto, 2020). Many SME owners have overlooked the benefits of digital marketing for their businesses and are lagging behind their competitors (Amornkitvikai & Lee, 2020; Sheikh et al., 2018). The application of knowledge is a fundamental success factor for new product development and a key driver of innovation and performance (Mardani et al., 2018). Similarly, innovation has become necessary for all modern companies that want to survive in a world characterised by competition, technological change, and recurrent crises (Adam & Alarifi, 2021; Chursin et al., 2022; Rêgo et al., 2022). Consequently, this study aims to investigate the impact of knowledge application and digital marketing on innovation and sustainable performance of manufacturing SMEs in an emerging market. In addition, the role of innovation as a mediating factor in the relationship between knowledge application and digital marketing on the sustainable performance of manufacturing SMEs is investigated.

The present quantitative research is original and useful in making a significant contribution to theory by investigating the impact of knowledge application and digital marketing on the innovation and sustainable performance of manufacturing SMEs in an emerging market, and the role of innovation as a mediating factor in the relationship between knowledge application and digital marketing on the sustainable performance of manufacturing SMEs by exploring how resource-based view theory (RBV), knowledge-based view theory (KBV), and the triple bottom line (TBL) framework can be integrated into a single framework. Among the seven hypotheses formulated, the innovation of manufacturing SMEs in an emerging market was strongly influenced by digital marketing, followed by knowledge application. Additionally, the sustainable performance of manufacturing SMEs was significantly influenced by knowledge application and insignificantly influenced by digital marketing. Further advanced testing revealed that innovation plays a significant mediating role, as knowledge application indirectly influenced the sustainable performance of manufacturing SMEs through innovation in partial mediation. In contrast, digital marketing indirectly affected the sustainable performance of manufacturing SMEs through innovation in full mediation. Since the empirical context of the present study focuses on Malaysia's emerging market economy, it strengthens previous research conducted mainly in the context of developed (Western) economies. The research findings would help manufacturing SMEs to consider the aspects of innovation, digital marketing, and knowledge application in their business strategies, thereby improving their business performance and sustainability in a competitive business environment.

In the following section, the literature review is presented; in the third section, the methodology used is explained, in section 4, the results are detailed; and in

section 5, a discussion of the results is given. The concluding section highlights the contributions of the study and directions for future research.

Literature Review

The RBV theory states that if a firm's resources are valuable, scarce, difficult to replicate, and cannot be replaced by other resources, they can be a source of competition. KBV theory considers knowledge as the most valuable resource to maintain a competitive advantage and achieve exceptional results (Martinez-Conesa et al., 2017; Grant, 1996; Naqshbandi & Jasimuddin, 2018). The TBL framework enables the implementation of sustainable business practices that can contribute to sustainable performance (Sousa Jabbour et al., 2020; Rashid et al., 2015). Sustainable performance is a combination of environmental, economic, and social performance that benefits the natural environment and culture while providing economic benefits and a competitive advantage for a company (Adebambo et al., 2015; Gong et al., 2018). These three dimensions, considered the essential pillars of the TBL framework, must be balanced for companies to strengthen their competitive advantages (Nguyen, 2019). Companies are expected to achieve a mix of environmental, economic, and social goals through effective sustainable performance (Abdul-Rashid et al., 2017; Afum et al., 2020; Akanmu et al., 2020; Meseguer-Sánchez et al., 2021). Accordingly, this study argued that RBV theory is appropriate for considering the role of digital marketing, digital technologies, and capabilities in creating a sustainable competitive advantage and growth in a competitive business climate. The KBV theory reflects the application of knowledge, while the TBL framework reflects the sustainable performance of manufacturing SMEs.

A systematic review of the literature using the keywords sustainable performance and SMEs in the Scopus database found that green training and green performance appraisal (Alraja et al., 2022), green manufacturing practices (Al-Hakimi et al., 2022), innovation capability (Wang & Huang, 2022), organisational leadership (Chowdhury et al., 2022), and sustainable leadership (Iqbal & Ahmad, 2021) all have a significant impact on sustainable performance (see Table 1). These scholars have used theories such as technology organisation environment (TOE), RBV theory, ecological modernisation theory (EMT), social exchange theory (SET), social identity theory (SIT), natural resource-based view (NRBV), dynamic capability theory (DCT), and sustainable supply chain management (SSCM) framework in their research.

However, the studies mentioned above focus on developing countries such as Oman (see Alraja et al., 2022), Saudi Arabia (see Al-Hakimi et al., 2022), Colombia (see Acosta-Prado & Tafur-Mendoza, 2022), China (see Lin et al., 2022; Wang & Huang, 2022; Wang et al., 2018), Vietnam (see Chowdhury et al., 2022), and Pakistan (see Iqbal & Ahmad, 2021). Moreover, none of these studies examined the linkages between knowledge application, digital marketing, and sustainable performance of manufacturing SMEs considering the mediating role of innovation, while simultaneously applying RBV theory, KBV theory, and

Table 1 Previous studies on sustainable performance and SMEs

Authors	Sampling	Statistical Technique	Theory	Key Findings
Alraja et al. (2022)	SMEs from different sectors in Oman	SEM	TOE, RBV	Technology organisation environment (TOE) factors represent crucial inputs for green practices such as green training, and green performance appraisal, which, in turn, mean critical processes lead to sustainable performance (output).
Al-Hakimi et al. (2022)	Manufacturing SMEs in Saudi Arabia	Hierarchical Regression Analysis	RBV, EMT	The effect of green manufacturing practices (GMP) on green innovation (GI), in turn, has an effect on corporate sustainable performance (CSP). The positive effect of GMP on CSP through GI is enhanced by the presence of green organisational culture (GOC).
Acosta-Prado and Tafur-Mendoza (2022)	New technology-based firms in Colombia	PLS-SEM	DCT	All the direct effects were supported, as well as the mediating effect of dynamic capability in the relationship between ICT and sustainable performance, this being a complementary mediation.
Lin et al. (2022)	Manufacturing firm representatives in China	PLS-SEM	SET, SIT	Green transformational leadership (GTL) is positively related to sustainable performance, and organisational citizenship behavior towards the environment (OCBE) mediates the relationship between GTL and sustainable performance.
Wang and Huang (2022)	SMEs in China	PLS-SEM	RBV	Flexibility and control culture are positively and negatively related to innovation capability, respectively, and the latter mediates their influence on sustainable performance.

Table 1 (continued)

Authors	Sampling	Statistical Technique	Theory	Key Findings
Chowdhurry et al. (2022)	SMEs employees in Vietnam	SEM	DCT	Organisational leadership will facilitate developing the culture and innovation capability to adopt circular economy (CE) practices through a 'hub and spoke' strategy for enhancing sustainable performance among the SMEs in Vietnam.
Iqbal and Ahmad (2021)	SMEs in Pakistan	PLS-SEM	NRBV, DCT	A significant positive effect of sustainable leadership on organisational learning; organisational learning significantly influences sustainable performance, and organisational learning partially mediates the relationship between sustainable leadership and sustainable performance.
Wang et al. (2018)	Firms in China	Hierarchical Regression Analysis	SSCM Framework	Supply chain management (SSCM) practices and firm size are positively related to the firm's environmental and social performance. Firm size moderates the effect of SSCM practices on economic performance.

Resource-Based View (RBV) Theory; Triple Bottom Line (TBL); Technology Organisation Environment (TOE); Ecological Modernisation Theory (EMT); Social Exchange Theory (SET); Social Identity Theory (SIT); Natural Resource-Based View (NRBV); Dynamic Capability Theory (DCT); Sustainable Supply Chain Management (SSCM) Framework

the TBL framework in a single conceptual framework. Therefore, this study fills these gaps and reviews the related literature as described below.

Studies by Abbas and Sagsan (2019) and Albort-Morant et al. (2018) show that the application of knowledge, training, and learning contributes significantly to an organisation's sustainable development, competitive advantage, and ability to meet customer needs. These findings show that organisations place a high value on the application of knowledge to achieve sustainability. Abusweilem and Abualous (2019), Bhatt (2001), and Shujahat et al. (2019) also emphasise that knowledge in practical, realistic, and applicable forms is critical. Indeed, knowledge is irrelevant if it is not used. Therefore, the application of knowledge is of greater importance than the other practices of knowledge creation and sharing. Previous studies have considered the application of knowledge as a characteristic of innovation performance. Kun (2022) investigated the relationships between knowledge management process and sustainability performance of Chinese SMEs using frugal innovation as a mediator, and found that knowledge application has a significant impact on sustainability performance of manufacturing enterprises. The results also show that frugal innovation partially mediates the relationship between knowledge application and sustainable enterprise performance. Moreover, innovation is necessary for achieving sustainability in business to improve performance and gain competitive advantage (Yavarzadeh et al., 2015). Knowledge management involves the acquisition, creation, and use of data that can lead to innovation (Mafabi et al., 2012; Sindakis et al., 2019). Indeed, knowledge management has a significant impact on the sustainable performance of innovative organisations (Costa & Monteiro, 2016). Moreover, previous scholars such as Aliyu and Ahmad (2019), Li et al. (2022), and Pouresmaeili et al. (2018) have noted that including innovation as a mediator in a study would contribute to a better understanding of its impact on organisational performance. However, little research has been conducted on the role of innovation as a mediator in the relationship between knowledge management and firm performance (Alrubaiee et al., 2015; Nawab et al., 2015). Similar considerations have also been made by Cardoni et al. (2020), Delshab et al. (2020), and Mohamad et al. (2020). As a result, there is a lack of understanding about the application of knowledge and sustainable performance, with innovation acting as a mediator (Abbas & Sağsan, 2019; Jia-Qi & Chelliah, 2020; Shahzad et al., 2020).

In addition, digital marketing and the ability to leverage technology online have a major impact on a company's sustainability and success (Budi & Maksum, 2020; Centobelli et al., 2016; Chursin et al., 2022; Purba et al., 2021; Rêgo et al., 2022; Yahya & Sugiyanto, 2020). However, SMEs have limited resources and are vulnerable to the current dynamic climate (Awan et al., 2019; Javed et al., 2018). They also struggle to develop and lag far behind in sustainability and e-marketing (Amornkitvikai & Lee, 2020; Sheikh et al., 2018).

Considering these facts, it is necessary to pay more attention to the potential of digital marketing in developing and maintaining a company's competitiveness (Aggarwal & Aakash, 2020; Melović et al., 2020) and focus more on developing innovative capabilities and strengthening its competitive dominance to meet the challenges of other competing organisations and environmental uncertainty (Maughan, 2012; Mitrega et al., 2017). Indeed, Carayannis et al. (2022) and Ejaz

(2023) highlighted that digital technologies have proven to be a source of competitiveness for the manufacturing sector. Similarly, Wang and Huang (2022) found that innovation capability has an impact on the sustainable performance of Chinese SMEs. Other researchers (Schiederig et al., 2012; Varadarajan, 2017) pointed out that sustainable innovation is an important source of enterprise competitiveness. The above shows that none of them can explain the linkages between knowledge application, digital marketing, and the sustainable performance of manufacturing SMEs in an emerging market, including the role of innovation as a mediator, which apply RBV theory, KBV theory, and TBL framework simultaneously in a single framework. Therefore, the following hypotheses are formulated, which are also shown in Fig. 1.

H1: Knowledge application positively affects the innovation of manufacturing SMEs in an emerging market.
H2: Knowledge application positively affects the sustainable performance of manufacturing SMEs in an emerging market.
H3: Digital marketing positively affects the innovation of manufacturing SMEs in an emerging market.
H4: Digital marketing positively affects the sustainable performance of SMEs in the manufacturing sector in an emerging market.
H5: Innovation positively affects the sustainable performance of manufacturing SMEs in an emerging market.
H6: Knowledge application indirectly affects the sustainable performance of manufacturing SMEs in an emerging market via innovation.
H7: Digital marketing indirectly affects the sustainable performance of manufacturing SMEs in an emerging market via innovation.

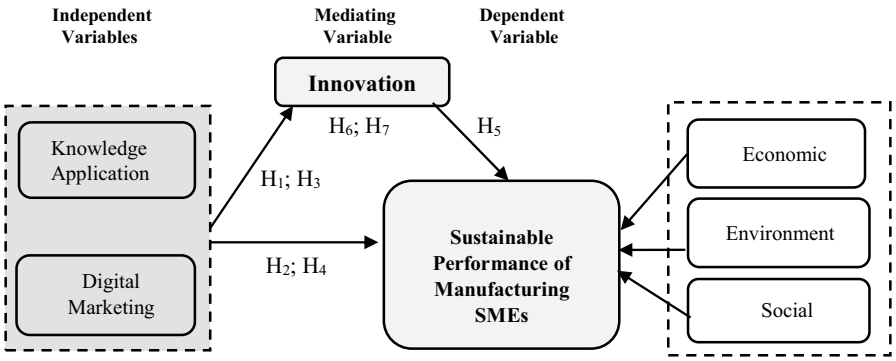

Fig. 1 Proposed theoretical framework

Method

Participants and Procedure

This study is based on the positivist research philosophy that uses quantitative and deductive research approaches. This is because this study tests multiple hypotheses and finds logical evidence derived from statistical analysis (Collis & Hussey, 2014, p. 44). Of the 1,538 manufacturing SMEs in Malaysia, an emerging economy, 428 top managers of manufacturing SMEs responded to a self-administered questionnaire. The data were based on the list of manufacturing SMEs registered with SME Corporation Malaysia (2018) and Federation of Malaysian Manufacturers (2019, 2020). They were selected based on the criteria of having less than 200 full-time employees and a turnover of less than RM50 million, which meets the requirements of SME Corporation Malaysia (2018). The data collection took place in September 2021 using disproportionate stratified random sampling, where each unit in the population has an equal chance of being selected (Sekaran & Bougie, 2016). The respondents included owners, directors, senior managers, and managers, all of whom were well-versed in the business and its business modalities. Indeed, Durst and Runar Edvardsson (2012) highlighted the importance of studying SMEs, which differ from larger, resource-rich firms due to resource constraints and SME heterogeneity. Of the 428 questionnaires distributed, a total of 122 were usable, representing a valid response rate of 29%. Considering that SMEs typically have a response rate of about 10% according to Ho et al. (2016), this is more than adequate. In addition, the response rate for social science studies, which ranges from 5% to 35% (Sekaran et al., 2016), was also considered when selecting the sample size.

Questionnaire Development and Instrument

The self-administered questionnaire consisted of three elements: demographic profiles of respondents, profiles of business performance, and perceptions of innovation, knowledge application, digital marketing, and sustainable performance of manufacturing SMEs. Appendix 1 provides a detailed description of the measurement of instruments employed. A unidimensional construct operationalised knowledge management with four measurement items covering one component, 'knowledge application', adopted from Lee and Choi (2003) and Gold et al. (2001). Digital marketing was measured using seven items from Low et al. (2020), Song et al. (2007), and Wang (2020). Innovation was measured using six items from Bamfo and Kraa (2019) and Imran et al. (2019). Sustainable performance was operationalised by a multidimensional construct consisting of 13 items covering three aspects: environment (following Laosirihongthong et al., 2013), economic (following Eltayeb et al., 2011; Smith, 2015), and social (following Abdul-Rashid et al., 2017; Paulraj, 2011). These items were designed on a five-point Likert scale, with 1 indicating strongly disagree and 5 indicating strongly agree.

Statistical Technique

Data were analysed using the Partial Least Squares-Structural Equation Modelling (PLS-SEM) approach via Smart-PLS 3.0 software. The PLS-SEM approach is an appropriate analysis technique for this study because it promotes analytical rigour and more consistent estimates (Henseler & Schuberth, 2020; Sarstedt et al., 2016). In addition, the approach was chosen for its model specification, simplicity, and lack of complex distributional assumptions (Sarstedt et al., 2016).

Results

Demographic Profile of Respondents

Table 2 shows that 62.3% of all respondents were male and 37.7% female. In terms of job titles in manufacturing SMEs, 39.3% were managers, 29% owners, 16% senior managers, and 15% CEOs. More than half (60%) of the manufacturing SMEs were private limited companies, 25% were sole proprietorships and 15% were partnerships. They were mainly from the food industry, followed by electrical products and components. 72% employ less than 75 employees and 28% between 76 and 200 employees. Half of the manufacturing SMEs (50.1%) have been in operation for 16 to 25 years.

Common Method Bias and Multicollinearity Test

Harman's single-factor test (Harman, 1976) was used to test for common method bias (CMB) using principal component analysis. In this study, the total variance explained by the first component was 34.21%, well below the 50% threshold recommended by Podsakoff et al. (2003). In addition, the variance inflation factors (VIF) were also examined. In this study, the VIF values ranged from 1.638 to 2.257, which is below the threshold of 3.3 (Kock, 2015). Consequently, there is no multicollinearity problem or CMB threat in this study.

Partial Least Squares-Structural Equation Modelling

The PLS-SEM approach was executed to predict the relationships between variables and was performed through a two-stage evaluation: the measurement model and the structural model. In this study, knowledge application and digital marketing are treated as independent variables, and sustainable performance of manufacturing SMEs is treated as the dependent variable. In addition, innovation is considered a mediating variable for the sustainable performance of manufacturing SMEs.

Measurement Model Assessment

The measurement model was tested using several tests: internal reliability, consistency, convergent validity, and discriminant validity. Internal consistency reliability

Table 2 Profile of respondents and manufacturing SMEs

Characteristics	Frequency	Percentage
Gender		
Male	76	62.3
Female	46	37.7
Highest Education Level		
Secondary school	12	9.8
Diploma	20	16.4
Degree	72	59.0
Master	13	10.7
PhD	5	4.1
Job Position		
Owner	35	28.7
CEO	19	15.6
Senior Manager	20	16.4
Manager	48	39.3
Period of Firm Establishment		
< 5 years	17	13.9
5 – 10 years	14	11.5
11 – 15 years	30	24.6
16-20 years	14	11.5
21-25 years	28	23
> 25 years	19	15.6
Ownership Structure of the Firm		
Sole Proprietorship	31	25.4
Partnership	18	14.8
Private Limited Company	73	59.8
Number of Employees in the Firm		
5-30 people	56	45.9
31-75 people	32	26.2
76-200 people	34	27.9
Sub-Sector Industry of the Firm		
Food	26	21.3
Beverages	11	9.0
Textiles & clothing	12	9.8
Wood products	4	3.3
Electrical products & components	24	19.7
Machinery and equipment	16	13.1
Spare parts & accessories	5	4.1
Others	24	19.7

was measured using composite reliability. Table 3 shows that the tests yielded a satisfactory result. The composite reliability values were above 0.700 (range between 0.889 and 0.931), meeting the requirements set by Hair et al. (2019). Convergent

Table 3 Construct reliability and validity

Constructs	Items	Loading	Composite Reliability	Average Variance Extracted
Knowledge application	KAP1	0.821	0.889	0.668
	KAP2	0.804		
	KAP3	0.864		
	KAP4	0.779		
Digital marketing	DM1	0.792	0.917	0.690
	DM3	0.856		
	DM4	0.869		
	DM5	0.822		
	DM6	0.812		
Innovation	IN1	0.882	0.915	0.730
	IN2	0.909		
	IN3	0.835		
	IN4	0.786		
Sustainable Performance				
Economic	SE1	0.841	0.931	0.772
	SE2	0.911		
	SE3	0.890		
	SE4	0.871		
Environment	SEN1	0.764	0.924	0.710
	SEN2	0.849		
	SEN3	0.875		
	SEN4	0.871		
	SEN5	0.847		
Social	SS1	0.849	0.917	0.734
	SS2	0.842		
	SS3	0.884		
	SS4	0.851		

validity was assessed using three criteria: (i) factor loading greater than 0.700, (ii) composite reliability greater than 0.700, and (iii) average variance extracted (AVE) greater than 0.500 (Hair et al., 2019). The standardised factor loadings for this study range from 0.7641 to 0.911, and the AVE ranges from 0.668 to 0.772. Thus, the model has acceptable convergent validity.

Discriminant validity was assessed to measure the uniqueness of each construct (Hair et al., 2019). The heterotrait-monotrait ratio of correlations (HTMT)

Table 4 Discriminant validity by HTMT (1st order)

Variable	1	2	3
(1) Economic			
(2) Environment	0.778		
(3) Social	0.583	0.848	

Table 5 Discriminant validity by HTMT (2^{nd})

Variable	1	2	3	4
(1) Digital marketing				
(2) Innovation	0.697			
(3) Knowledge application	0.580	0.623		
(4) Sustainable performance	0.574	0.745	0.675	

parameters of 0.85 were used to assess discriminant validity, and the coefficient values should be less than 0.85 for this to be satisfactory (Henseler et al., 2015). This criterion was met, as shown in Tables 4 and 5.

Structural Model Assessment

The structural model was evaluated using bootstrapping to test the relationship between the constructs. The results of the PLS-SEM approach presented in Table 6 show that the application of knowledge has a positive effect on the innovation of manufacturing SMEs in an emerging market ($\beta_1 = 0.300$, t-value = 3.691, $p<0.05$). Therefore, H1 is supported. In addition, the sustainable performance of manufacturing SMEs in an emerging market is significantly and positively influenced by the application of knowledge ($\beta_2 = 0.298$, t-value = 4.007, $p<0.05$), maintaining H2. Moreover, innovation of manufacturing SMEs in an emerging market is significantly influenced by digital marketing ($\beta_3 = 0.468$, t-value = 5.004, $p<0.05$). Consequently, H3 is confirmed. Furthermore, H4 shows that digital marketing does not have a significant impact on the sustainable performance of manufacturing SMEs in an emerging market, as $p>0.05$ with $\beta_4 = 0.089$, thus contrary to expectations, H4 is not upheld. Finally, examining the impact of innovation on the sustainable performance of manufacturing SMEs in an emerging market, as presented in H5, yields results of $\beta_5 = 0.433$ with a t-value = 4.306 at $p<0.05$, indicating that the relationship is positive and significant, inferring that H5 is accepted.

Mediating Effect of Innovation

The mediating effect of innovation on the relationship between knowledge application, digital marketing, and sustainable performance of manufacturing SMEs in an emerging market, as hypothesised in H6 and H7, was conducted according to the bootstrapping indirect effects method of Preacher and Hayes (2008). Indeed, Hair et al. (2014) have suggested the use of PLS-SEM bootstrapping procedures for mediation analyses and indicated that when testing mediating effects, researchers should instead follow Preacher and Hayes (2004, 2008) and bootstrap the sampling distribution of the indirect effect, which works for simple and multiple mediator models. This method is superior to the so-called 'causal process' popularised by Baron and Kenny (1986) because SEM can evaluate multiple variables simultaneously (Hair et al., 2012; Preacher & Hayes, 2008). Table 7 shows the indirect impact of knowledge application

Table 6 Hypothesis testing

	Relationships	Standardised Beta	Standard error	*t*-value	Confidence interval		f^2	Results
					BCI LL	BCI UL		
H1	Knowledge application ---> Innovation	0.300 *	0.081	3.691	0.149	0.423	0.123	Supported
H2	Knowledge application ---> Sustainable performance	0.298 *	0.074	4.007	0.179	0.425	0.119	Supported
H3	Digital marketing ---> Innovation	0.468 *	0.094	5.004	0.327	0.630	0.299	Supported
H4	Digital marketing---> Sustainable performance	0.089	0.102	0.876	-0.074	0.265	0.008	Not supported
H5	Innovation ---> Sustainable Performance	0.433 *	0.101	4.306	0.241	0.578	0.208	Supported

* Significant at $p<0.05$

Table 7 Mediating effect of innovation

	Relationships	Standardised Beta	Standard error	*t*-value	Confidence interval		Results
					BCI LL	BCI UL	
H6	Knowledge application ---> Innovation ---> Sustainable Performance	0.130 *	0.046	2.796	0.053	0.204	Supported
H7	Digital marketing ---> Innovation ---> Sustainable Performance	0.203 *	0.055	3.705	0.114	0.294	Supported

* Significant at $p<0.05$

on the sustainable performance of manufacturing SMEs in an emerging market via innovation, showing a significant relationship with β_6=0.130 and *t*-value=2.796. With 0.130, 95% Boot CI: [LL=0.053, UL=0.204], the trend between the values does not overlap with zero, suggesting the presence of mediation. Therefore, innovation was found to partially mediate the relationship between knowledge application and sustainable performance of manufacturing SMEs in an emerging market, thus H6 is confirmed. The final hypothesis, H7, tests whether digital marketing indirectly influences the sustainable performance of manufacturing SMEs in an emerging market through innovation. The indirect influence of digital marketing on the sustainable performance of manufacturing SMEs in an emerging market through innovation is significant with β_7=0.203 and *t*-value=3.705. At 0.203, 95% Boot CI: [LL =0.114, UL=0.294], the trend between the values does not overlap with zero, suggesting the existence of mediation. Thus, innovation was found to fully mediate the relationship between digital marketing and the sustainable performance of manufacturing SMEs in an emerging market. Consequently, H7 is also established.

Discussion

This study examined the impact of knowledge application and digital marketing on innovation and sustainable performance of manufacturing SMEs in an emerging market. The role of innovation as a mediating factor in the relationship between knowledge application and digital marketing on the sustainable performance of manufacturing SMEs was also investigated. Seven hypotheses were tested in this research. The PLS-SEM approach showed that knowledge application had a positive impact on the innovation of manufacturing SMEs. Similarly, knowledge application had a significant impact on the sustainable performance of manufacturing SMEs in an emerging market. An additional test of PLS-SEM bootstrapping indirect effects regarding the mediating role of innovation in the link between knowledge application and the sustainable performance of manufacturing SMEs in an emerging market found significant results with partially mediated effects. These compelling results suggest that manufacturing SMEs are able to quickly

apply knowledge to critical competitive needs and leverage knowledge gained from experience. They are also able to leverage new knowledge and match knowledge sources to problems and challenges. Advanced knowledge is critical to a holistic understanding of all issues, including financial issues, personal skill development, and customer preferences. Bhatt (2001) affirmed that the application of knowledge in business is critical because it helps to increase business engagement and create better market-driven value. Moreover, the accumulated knowledge can be applied in the organisation to solve problems (Abusweilem & Abualous, 2019; Jia-Qi & Chelliah, 2020). These positive results are consistent with previous studies (see Abbas & Sagsan, 2019; Jia-Qi & Chelliah, 2020; Mohamad et al., 2020; Shahzad et al., 2020).

Further examination of the quantitative results confirmed that the direct effect between digital marketing and manufacturing SME innovation in an emerging market was significant. The results indicate that manufacturing SMEs effectively use digital marketing tools to manage customer relationships, acquire leads, and discover new marketing opportunities that can then be used to improve product and process innovation. For these reasons, they use digital marketing tools such as social media marketing tools, SEO (search engine optimisation), email marketing tools, etc. In this way, they can meet critical competitive needs and match knowledge sources to address new problems and challenges. Chursin et al. (2022) and Rêgo et al. (2022) found that technology platforms, including analytics, databases, data management, and digital marketing tools, drive innovation in organisations to build stronger relationships with customers, increase revenue, and improve customer experience and engagement. The findings are consistent with academic work by Budi and Maksum (2020) and Purba et al. (2021). In addition, this research found that innovation has a significant impact on the sustainable performance of manufacturing SMEs. The significant result states that manufacturing SMEs that support innovation in their business operations, sustainably experiment with new ideas, and fulfill their environmental, economic, and social responsibilities benefit from higher profits and return on investment, as well as a better position in the market. Innovation often allows SMEs to try out new ideas and look for new ways of doing things. They are also creative in their business methods, which benefits them because they are often the first to market new products and services. They also continually improve environmental compliance by reducing energy consumption, CO^2 emissions, and hazardous materials. The results of the current study are comparable to those identified by previous researchers (see Schiederig et al., 2012; Varadarajan, 2017; Wang & Huang (2022).

In contrast, digital marketing had no significant impact on the sustainable performance of manufacturing SMEs in an emerging market. A plausible explanation for this insignificant result is that SMEs typically do not have the resources to focus on expanding digital markets and have difficulty keeping up with the fast-moving technological environment (Centobelli et al., 2016). Previous studies avowed that marketing strategies and digital marketing implementation often do not exist due to lack of resources, skills, and other barriers specific to SMEs (Darga, 2018; Mokhtar, 2015; Stankovska et al., 2016). They respond to rapid technological changes due to lack of skills, low awareness, and organisational readiness (Centobelli et al., 2016). Despite this non-significant result, the PLS-SEM bootstrapping indirect effects related to the mediating role of innovation in the relationship between digital marketing and the sustainable performance of manufacturing SMEs in an emerging market yielded significant results with fully

mediated effects. The results conjecture that digital marketing combined with innovation is critical to the sustainable performance of manufacturing SMEs. Digital marketing enables them to provide useful information about their product innovations and business offerings, and to track online discussions about the company, products, and services with existing and potential customers, vendors, and suppliers. Chursin et al. (2022) and Rêgo et al. (2022) recognised that technology platforms and digital marketing tools drive business innovation by fostering stronger customer relationships, increasing sales, and improving customer experience and retention. Manufacturing SMEs are focused on new product development and business creation, and stand by their responsibility to continuously improve employee health and safety in their operations. They also pay attention to the demands and rights of the community they serve and reduce environmental impacts and risks to the community at large. Li et al. (2022) found that employees' green initiatives ensure the sustainable performance of the company by using environmentally friendly products.

Overall, this quantitative study supports the applicability of the RBV theory, KBV theory, and TBL framework as guiding principles by examining the direct impact of knowledge application and digital marketing on innovation and sustainable performance of manufacturing SMEs, as well as highlighting the significant mediating role of innovation in the relationship between knowledge application and digital marketing on the sustainable performance of manufacturing SMEs simultaneously in a parsimony framework.

Conclusions

Theoretical Implications

The contribution to theory comes from linking knowledge application, digital marketing, and sustainable performance of manufacturing SMEs, considering the mediating role of innovation in this relationship by using RBV theory, KBV theory, and the TBL framework in a single conceptual framework. The RBV theory is reflected in the role of digital marketing, the KBV theory is reflected in knowledge application, and the TBL framework is reflected in the sustainable performance of manufacturing SMEs. This empirical study extended existing research by confirming a significant direct effect of factors such as knowledge application and digital marketing on the innovation performance of manufacturing SMEs in an emerging market. The latter, in particular, was more pronounced than the other hypotheses. Moreover, knowledge application has a significant impact on the sustainable performance of manufacturing SMEs, while digital marketing has an insignificant impact. In addition, innovation plays a significant mediating role in the sustainable performance of manufacturing SMEs. More specifically, knowledge application indirectly affects the sustainable performance of manufacturing SMEs through innovation in the form of partial mediation. In contrast, digital marketing indirectly affects the sustainable performance of manufacturing SMEs through innovation in the form of full mediation. These significant findings were examined in the empirical context of Malaysia's emerging market economy, thus complementing

previous research conducted mainly in developed (Western) economies. Overall, this quantitative study provided answers to the following research questions:

RQ1. What is the impact of knowledge application and digital marketing on innovation and the sustainable performance of manufacturing SMEs in an emerging market?
RQ2. To what extent does innovation mediate the relationship between knowledge application and digital marketing on manufacturing SMEs' sustainable performance?

Managerial Implications

This study makes several important contributions to information, economics, and management practices. Regarding information and management practices, the sustainable performance of manufacturing SMEs should be strengthened by incorporating aspects of knowledge application, digital marketing, and innovation into their business operations and strategies, as well as new business creation, while protecting the environment and increasing social welfare. Manufacturing SMEs should prioritise these aspects to foster creativity among their employees and generate new ideas for research and development (R&D) of new products and improvement of existing products.

In addition, manufacturing SMEs should motivate their employees to leverage their knowledge to promote the company's ability to manage multiple sources of knowledge and turn knowledge into a competitive advantage. In the knowledge economy, knowledge is a valuable resource that helps companies reduce costs, launch innovative new ventures, secure sustainable competitive advantages, elaborate on their unique strengths, and increase productivity. With excellent knowledge applications, managers and owners can elevate their innovation and productivity to the level they need. Improved productivity and efficiency make work more meaningful as less time is spent on low-value tasks. Moraes et al. (2022, p. 28) noted that "investments in information and new technologies enable profits and better planning, while issues related to privacy, security, and ethical aspects were considered fundamental to minimise user resistance".

Furthermore, digital marketing should be widely used by manufacturing SMEs as it is timely and considered necessary to help them effectively market and promote their products and services to improve business performance and sustainability. The use of digital marketing and knowledge applications could help manufacturing SMEs innovate products and processes, develop new business opportunities, and reach new markets. By using these elements effectively, small and medium-sized manufacturing companies can address environmental challenges that affect their operations. They will outperform their competitors and be more profitable if they prioritise innovative strategies, digital marketing, and knowledge applications. At the same time, they are not ignoring the principles of sustainability in their strategic plans and business operations, not only to improve financial performance. Innovation and technological progress are thus crucial to reduce production costs and enable higher production.

Appendix

Ideas for Future Research

Appendix 1 Measurement of instruments

Label	Statements
Knowledge Application	
KA1	"My firm has the capability to apply knowledge learned from experiences".
KA2	"My firm has the capability to match sources of knowledge to problems and challenges."
KA3	"My firm has the capability to take advantage of new knowledge".
KA4	"My firm has the capability to quickly apply knowledge to critical competitive needs".
Digital Marketing	
DG1	"My firm has the capability to receive useful information from our website".
DG2	"My firm has the capability to utilise websites to acquire new customers".
DG3	"My firm has the capability to follow online discussions about our firm, our products, and services".
DG4	"My firm has the capability to use digital tools to retain customers".
DG5	"Our customer can buy our products through the websites".
DG6	"My firm has the capability to update our customer on our website regularly".
DG7	"My firm has the capability to be active on at least one social media platform".
Innovation	
IN1	"My firm perceives to be able to frequently try out new ideas."
IN2	"My firm perceives to be able to seek out new ways to do things."
IN3	"My firm perceives to be able to creative in its methods of operation."
IN4	"My firm perceives to be able to often the first to market with new products and services."
IN5	"Innovation in our firm is perceived as too risky and is resisted."
IN6	"Our new product introduction has increased over the last 5 years."
Sustainable Performance - Economically	
SE1	"My firm has improved its market share."
SE2	"My firm has improved its position in the marketplace."
SE3	"My firm has increased its profits."
SE4	"My firm has increased its return on investment."

Appendix 1 (continued)

Label	Statements
Sustainable Performance - Environmentally	
E1	"My firm has improved compliance with environmental standards."
E2	"My firm has reduced energy consumption."
E3	"My firm has reduced CO^2 emissions."
E4	"My firm has reduced the consumption of hazardous materials."
E5	"My firm has designed products and packaging to be reused, repaired or recycled."
Sustainable Performance - Socially	
S1	"My firm has improved/ enhanced the overall stakeholder welfare."
S2	"My firm has reduced environmental impacts and risks to the general public."
S3	"My firm has improved occupational safety and health of employees."
S4	"My firm has improved the awareness and protection of the claims and rights of the community served."

This study is limited to manufacturing SMEs in Malaysia. For future research, it is suggested that the sample size be expanded, regardless of the country's income status and the SMEs' industrial focus, to examine the impact of knowledge application, digital marketing, innovation, and sustainable performance. Since this study examined the mediating role of innovation, future studies should include all relevant moderating variables in the proposed framework, such as government support to drive existing research.

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