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TOWARDS A SUSTAINABILITY PERFORMANCE OF SMES: THE ROLES OF ARTIFICIAL INTELLIGENCE (AI), SOCIAL MEDIA ADOPTION, & DIGITAL COMPETENCIES

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Abstract:

A sustainable business means creating the right conditions to ensure long-term business success. It is about the core operations of a business, and it means looking ahead and planning strategically for the future. Sustainability encompasses four aspects: social, environmental, economic, and governance. Understanding trends and the long-term implications of decisions will allow companies to manage risks better, seize new opportunities, and adapt quickly to change. Thus, this study examines the influence of artificial intelligence (AI), social media adoption, and digital competencies on SMEs' sustainable performance. This study involved 218 SME women entrepreneurs who were purposively selected as the study sample. The developed questionnaire was distributed to the respondents face to face to obtain more accurate data. The study data analysis was conducted using the Statistical Package for Social Sciences (SPSS) and Structural Equation Modeling (SEM) software. The study findings showed a significant direct relationship between artificial intelligence (AI), social media adoption, digital competencies, and sustainable performance. The study findings also showed that digital competencies mediate the relationship between artificial intelligence (AI), social media adoption, and sustainable performance. Thus, access to technology is crucial in strengthening the competitiveness of entrepreneurs in the digital era. Mastery of technology facilitates daily business management and opens opportunities for growth and innovation. Therefore, support and learning

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opportunities for entrepreneurs in technology are important to help them succeed in this increasingly digital market.

Keywords:

Artificial Intelligence (AI), Social Media Adoption, Digital Competencies, Sustainable Performance, Small and Medium-Sized Enterprises (SMEs)

Introduction

Entrepreneurship is increasingly important in stimulating economic development and reducing unemployment (Kalaivani et al., 2025). Small and Medium Enterprises (SMEs) are important sectors of the national economy. SMEs' contribution to the gross domestic product (GDP) grew by 5.0 percent, contributing 39.1 percent to Malaysia's economy in 2023. Accordingly, the contribution of SMEs' employment to Malaysia's employment in 2023 was 48.5 percent, which grew 0.3 percentage points from 48.2 percent in 2022 (SME Corporation Malaysia, 2024). Micro enterprises are defined as enterprises with annual sales of less than Ringgit Malaysia (RM) 300,000 or having full-time employees of less than five people in all sectors. In Malaysia, the definition of SMEs can be divided according to the manufacturing and service sectors. The manufacturing sector in the SMEs category refers to businesses with annual sales starting from RM300,000 to less than RM15 million or having full-time employees between 5 and 75 people (Tajudeen et al., 2025). In the service sector and other sectors, SMEs is when they have annual sales between RM300,000 and less than RM3 million or full-time employees between 5 and 30 people (SME Corporation Malaysia, 2025). If a business meets one of the criteria in different operating sizes, the smaller size will be used to classify the entity. For example, suppose the annual sales of a business fall under microenterprise, but the number of full-time employees falls under small enterprise. In that case, the business is considered a micro-enterprise (SME Corporation Malaysia, 2025). The Malaysian government is committed to investing in business entities to stimulate entrepreneurship, increase the number of new businesses, and promote an entrepreneurial culture. However, SMEs often face performance problems and higher failure rates than larger firms (Tajudeen et al., 2025; Weaven et al., 2021). SMEs are often associated with challenges due to their size and weaknesses in financial aspects, workforce, economic resources, and access to opportunities (Zighan et al., 2022).

SMEs face many obstacles that limit their long-term survival and expansion, potentially reducing their performance. Studies show that many small businesses do not survive beyond a five-year lifespan (Weaven et al., 2021). Business growth often involves risks, uncertainties, additional learning costs associated with new products and markets, and internal company changes (Mohd Noor et al., 2024a; Zighan et al., 2022). Despite the desire and willingness to grow, the challenges of growth and lack of capabilities have caused SMEs to need specific support to ensure their ability to grow (Epede & Wang, 2022). Shaikh et al. (2021) in their study reported that understanding digital technology among entrepreneurs is a big issue. Most entrepreneurs are reported not to have sufficient competencies related to digital technology. Having sufficient competencies related to digital technology is very important because there are specific challenges in that environment. Digital technology is important in many aspects of entrepreneurs' lives, including communication, business, education, entertainment, and social life. With digital technology, entrepreneurs can easily communicate and interact with others worldwide, access information and knowledge, conduct business transactions, and carry out many aspects of daily life (Shaikh et al., 2021).

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Based on the Resource-Based View (RBV) theory, the potential of intangible assets, especially intellectual capital, is expected to create new competitive advantages in the pursuit of good performance (Barney et al., 2021). This aligns with Shaw (2021), who stated that the key to a company's success in a competitive environment is the ownership and optimization of unique resources. Each company is expected to have different resources and levels of capability in the context of intangible assets (Chatterjee et al., 2023). One of the intangible assets that is expected to have an impact on the current business performance is intellectual capital. Technology is an important capital affecting businesses' growth rate and sustainability. Business entrepreneurs need technological skills to run their businesses effectively (Kumar et al., 2025). Lévesque et al. (2022) opines that running a business today is difficult without technology. Therefore, this study examines the direct relationship between artificial intelligence (AI), social media adoption, digital competencies, and sustainable performance. The second is to examine the mediating role of digital competencies towards the relationships between artificial intelligence (AI), social media adoption, and sustainable performance.

Businesses already use AI to automate tasks, make predictions, and deliver personalized experiences (Giuggioli & Pellegrini, 2023). As AI continues to evolve, it will likely have an even more significant impact on businesses (Chalmers et al., 2021). For example, AI can automate customer service tasks like answering questions and resolving issues. It can also be used to make predictions about customer behavior, which can help businesses target their marketing efforts more effectively (Upadhyay et al., 2023). A social media presence allows the business to connect directly with the customers, build brand awareness, and establish a positive reputation (Palalic et al., 2021; Troise et al., 2022). Social media gives businesses a platform to showcase their products or services, share news and updates, and engage with the target audience (Kumar et al., 2025). To enhance the usage of AI and social media, entrepreneurs are advised to master digital skills to face the increasingly competitive business competition and for the survival of their businesses (d'Ignazio et al., 2025; Simović & Domazet, 2021).

Entrepreneurs are encouraged to attend training and skills enhancement programs to ensure that the products they market attract customers' attention (Khoo et al., 2024). Although digital marketing is now the new norm in business, marketing products only on social media without strategy and skills may not have a practical impact (Bartolomé et al., 2022). In the economic sector, online business is becoming increasingly popular. Merchants can now market their products to customers worldwide through digital platforms. Technology plays a key role in improving the efficiency of business operations. Automated processes introduced through digital technology can save time and costs and increase productivity (Khoo et al., 2024). With digital competencies, individuals can exploit the vast opportunities in an increasingly connected global economy (d'Ignazio et al., 2025; Simović & Domazet, 2021). This study aims to deliver new insights and close research gaps due to inconsistencies and incompleteness from the previous research results. For example, past studies have limited their view in examining business performance by focusing on financial performance (e.g., Menne et al., 2022). Some have focused on aspects such as capital, business loans, social support, personality, training, and attitude (e.g., Mohd Noor et al., 2024b; Noor, 2025) as determinants of performance and, ignoring the current trends such as AI and digital technologies.

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Literature Review

Resource-Based View (RBV)

Intangible assets are often recognized as valuable elements for creating superior performance compared to tangible assets (Chatterjee et al., 2023). Many intangible resources are developed internally or nurtured to make them exclusive to their owners. Accordingly, the Resource-Based View (RBV) has received much attention as a fundamental theory to explain the relationship between unique intangible assets and organizational performance. Kariv et al. (2024) explained that the RBV emphasizes implementing strategies to improve performance by optimizing intangible assets. As shown in Figure 1, according to RBV, these intangible assets must include four essential qualities: valuable, rare, inimitable, and organized (VRIO) (Barney et al., 2021). The first question of the framework asks whether a resource adds value by enabling the firm to exploit opportunities or defend against threats. If the answer is yes, then the resource is considered valuable. Resources are also valuable if they help organizations increase perceived customer value. Second, resources that can only be obtained by one or a few companies are rare. Scarce and valuable resources provide a temporary competitive advantage (Barney et al., 2021). On the other hand, when more than a few companies have the same resources or use capabilities in the same way, it results in competitive parity. Third, a resource is difficult to imitate if other organizations that do not have it cannot imitate, buy, or replace it at a reasonable price, which could provide a competitive advantage (Barney et al., 2021). Imitation can occur in two ways: by directly imitating (duplication) resources or by providing comparable products/services (substitution). A company that has valuable, rare, and expensive imitate resources can (but not necessarily) achieve sustainable competitive advantage. A company must organize management systems, processes, policies, structures, and organizational culture to fully realize the valuable, rare, and expensive potential to replicate resources and capabilities (Barney et al., 2021). Only then can companies achieve sustainable competitive advantage. Shaw (2021) stated that potential organizational assets or resources include specialized knowledge, teamwork, and unique combinations of business experience that can help a firm maintain a competitive advantage.

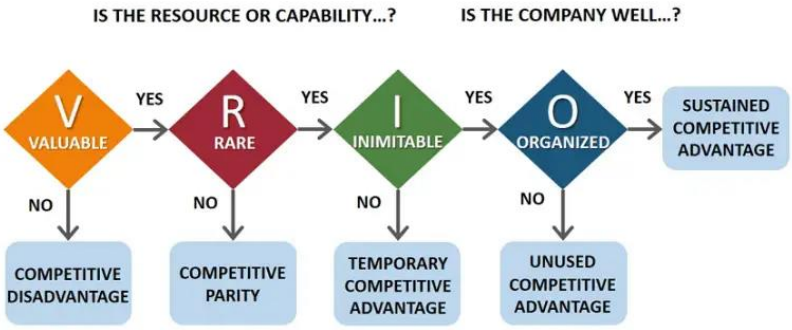

Figure 1: VRIO Elements

Therefore, based on the principles of RBV, intellectual capital is expected to be an intangible asset that has the potential to influence the performance of SMEs today. A quality workforce is the backbone of an organization's success. Hiring highly skilled professionals helps a company achieve its goals efficiently. The owner and employees who are highly

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knowledgeable in digital skills, such as operating operations such as using machines, packaging, and IT systems, are a crucial resource in helping achieve sustainable performance.

Business Performance

Business performance has become a core concept academics and management professionals use in business research, especially in strategic management studies (Atz et al., 2023). Business entities must respond to changing market situations and be able to adapt to changes professionally. Business performance can be measured by financial and non-financial indicators (Mio et al., 2022). Several commonly used business performance measures are profitability, productivity, growth, stakeholder satisfaction, market share, and competitive position (Mio et al., 2022). Financial elements are not the only indicators to measure a company's performance. Financial measurement needs to be combined with non-financial measurement related to the level of adaptation of the business organization to changes in its internal and external environment. In this regard, non-financial aspects involving development elements such as willingness and ability to learn, innovation and use of information, and improving relationships with customers and suppliers are also performance indicators (Maletič et al., 2021). Similarly, operational performance is assessed in the context of achievements related to research, operational efficiency, technological capabilities, product and asset management, and people in the company (Alves & Lourenço, 2022).

Kanzari et al. (2022) define financial performance as a process synonymous with interpreting a company's financial statements. Financial performance is an objective measure of how a business firm can use its assets to generate income and cash inflows to the entity. The performance reflects the enterprise's overall financial condition or situation over a certain period. It can be used to compare with other enterprises in the same industry to assess performance. There are many measures of the financial performance of SMEs in past studies, such as profit, sales and cash flow, and ability to access financial services, namely credit at affordable and lower costs (Atz et al., 2023). Non-financial performance is a qualitative measurement of aspects that can be measured in monetary units. Besides accessing quantitative information in monetary terms, businesses also need to evaluate qualitative evidence for performance. Therefore, the leading indicators of non-financial performance measurement, such as employee or customer satisfaction level, market expansion or growth, number of new products produced, and employee growth, are often used as non-financial performance indicators (Crous et al., 2022). The study's results by Maletič et al. (2021) show that financial aspects have a more significant influence than non-financial aspects. Non-financial aspects can bridge the gap between financial results and business activities by providing more comprehensive information on the performance of SMEs (Alves & Lourenço, 2022).

Artificial Intelligence (AI)

Artificial intelligence (AI) is always described as something we can see in fiction movies. However, AI has been widely used in business without realizing it. Big brands in the market are already using AI in projects or business transactions to make them more effective and productive (Giuggioli & Pellegrini, 2023). Large companies such as Google, IBM, Facebook, and many more already use AI daily. AI and machine learning significantly change how companies quickly connect or meet customer needs and are highly productive (Chalmers et al., 2021). AI technology is used in many industrial fields, including health, sales, HR, operations, factory and production, and marketing. AI brings several key advantages to social media

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marketing, making it an indispensable tool for businesses looking to streamline their marketing efforts (Upadhyay et al., 2022).

AI tools like Predis.ai help target the audience for the marketing campaigns more precisely and automate some of the tasks involved in social media marketing. Predis.ai can help identify the target audience with specific parameters like age, gender, interests, location, and others. Using AI for social media marketing reduces turnaround time for everything from strategy to content creation and uses fewer resources. It also requires minimal human oversight. This can lead to higher bandwidth so the business can focus on other aspects of the business. Social media marketing with AI can also help them to gain deeper insights into the analytics platform. By analyzing large amounts of data, AI can help businesses identify patterns and trends they might not have seen before (Lévesque et al., 2022). Another benefit of using AI in social media marketing is better customer service. AI-powered chatbots can help businesses respond quickly and efficiently to customer inquiries and complaints. This can help increase customer satisfaction and brand loyalty. AI can help businesses segment and target their audience with more personalized content (Lévesque et al., 2022). AI in social media marketing can also detect hate speech, spam, offensive comments, or anything that goes against the privacy policies of social media platforms (Upadhyay et al., 2023). It can also automatically hide such content to enforce these guidelines and maintain content quality. With AI handling many of the labor-intensive tasks associated with social media marketing, businesses can save on operational costs. It reduces the need for large teams to manage social media, allowing companies to do more with fewer resources (Roundy, 2022). Thus, based on the above reasoning, the following hypothesis is proposed:

H1: Artificial intelligence (AI) significantly predicts the sustainability performance of Malaysian SMEs.

Social Media Usage

Social media is an Internet-based application that allows users to share information and facilitate personal or work matters (Kumar et al., 2025). Social media networks are interactive and play an important role in conveying communication. They are considered effective mediums for delivering messages and information quickly to the community (Secundo et al., 2021). In Malaysia, Instagram, Facebook, and Twitter are the most popular social media platforms (Palalic et al., 2021). Apart from playing a role in conveying messages, social media is also an important platform for entrepreneurs in promoting and marketing business activities. Today, influencers can earn millions of dollars from posting on social media. Entrepreneurs can get ideas and feedback and manage customer service directly on social media, which is more effective than traditional media (Troise et al., 2022). Facebook, YouTube, Twitter, and others provide a space for browsers and customers to interact more quickly, efficiently, and effectively with digital entrepreneurs. The sophistication of social media communication in terms of conversations and video recording is very useful for users who want to see products and demonstrations live. In addition, live promotions can be uploaded easily, quickly, and cheaply. Businesses of all sizes can benefit from a social media presence (Palalic et al., 2021). Social media also has a vital role in connecting organizations and groups of individuals. An organization has three administration levels: strategic, intermediate, and operational. The role of social media makes the relationships between these levels of administration easier to administer and manage (Martín-Rojas et al., 2023). Viral content, or the potential to go viral, is a phrase that has now become a hot topic among marketers (Palalic et al., 2021). Every

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company wants to create viral content instantly. They want their ads or campaigns to become popular immediately and remain a topic of discussion. People will share, like, and comment if the content attracts people. The entrepreneurs need to have authentic and engaging content. A good social media site must have several characteristics that can attract visitors to visit the site. Among them are (1) the use of managed language, (2) multimedia information, (3) having gimmicks, (4) persuasiveness, (5) interactive, and (6) continuously updated. In addition, optimization of social media sites is also important and involves several activities, including (1) advertising, (2) mergers, (3) viral marketing, and (4) customer visits (Olsson & Bernhard, 2021). This optimization activity significantly impacts more dynamic interactions between customers and SME entrepreneurs. Thus, the following hypothesis is proposed:

H2: Social media usage significantly predicts the sustainability performance of Malaysian SMEs.

Mediating Role of Digital Competencies

In today's era, many entrepreneurs use online applications such as blogs, Facebook, Instagram, and e-business applications to increase their business and indirectly facilitate the buying and selling goods. Information technology is also seen to help obtain information resources efficiently in a state of availability regardless of place and time (d'Ignazio et al., 2025). Information technology is an important transaction and marketing platform to drive purchasing activities and obtain feedback related to business (Simović & Domazet, 2021). Thus, entrepreneurs must have a high level of digital skills. The results of a study conducted by Khoo et al. (2024 show that female entrepreneurs who can apply ICT are skilled in finding the latest information from various sources. They can also acquire various knowledge and skills regarding business through the ability to access information through mediums such as the Internet, magazines, and newspapers. Bartolomé et al. (2022) also emphasized that entrepreneurs need to take advantage of and seize business opportunities from various information channels, including mass media, radio, and television. Entrepreneurs must thoroughly prepare themselves, especially regarding information technology, strategic management, research, and development, to compete in business (d'Ignazio et al., 2025). If the skills or knowledge of information technology is weak, the opportunity to advance and expand the business will be wasted (Singh et al., 2024). Malaysia offers flexible learning options for digital business courses. Many institutions offer online courses and allow working professionals to study independently. Live classes are also available for those who prefer a hands-on approach. A variety of entrepreneurship courses to help local entrepreneurs run their businesses online has been provided by government agencies such as Malaysia Digital Economy Corporation (MDEC), Human Resources Development Fund (HRDF), and private ones such as AEON and Shopee. Each *Pusat Ekonomi Digital Keluarga Malaysia* (PEDi) conducts courses and training such as ICT training, entrepreneurship training, multimedia training, e-learning, and training in marketing, business development, packaging, and other modules essential for micro-entrepreneurs. Therefore, the following hypothesis is purported:

H3: Digital competencies mediate the relationship between (a) artificial intelligence (AI), (b) social media usage, and the sustainability performance of Malaysian SMEs.

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The framework designed is presented in the form of Figure 2.

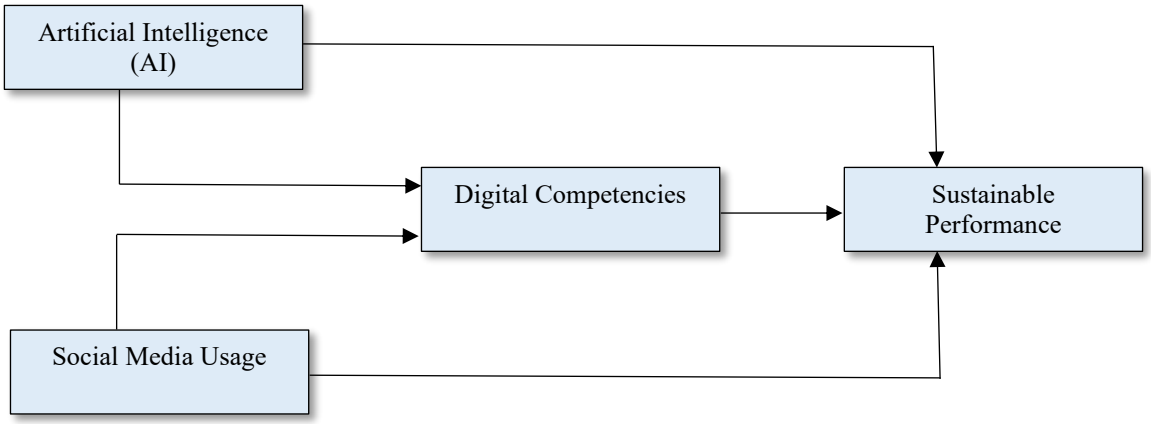

Figure 2: Research Framework

Methodology

This study was conducted using a survey method. The sample size is important in the Structural Equation Modeling (SEM) model because of the basic assumptions that must be met in the analysis rules. The Maximum Likelihood (ML) estimation technique requires samples ranging from 100-200 samples. According to Kline (2023), a typical sample size in SEM studies is 200 cases. Thus, the sample consisted of 300 SME entrepreneurs in Selangor and the Federal Territory of Kuala Lumpur who were selected by purposive sampling. These two areas are selected since it is one of the focus business areas in Malaysia. Selangor Darul Ehsan is on the central west coast of Peninsular Malaysia and borders Perak to the north, Pahang to the east, and Negeri Sembilan to the south. Selangor is divided into nine districts: Sabak Bernam, Hulu Selangor, Kuala Selangor, Gombak, Klang, Petaling, Hulu Langat, Kuala Langat, and Sepang. From a small tin mining town, Kuala Lumpur, the capital of Malaysia, continues to make a name and is known throughout the world. The rapid economic growth of Kuala Lumpur, which has become a source of livelihood, has attracted the interest of not only foreign investors but also the people of this country.

The criteria for selecting respondents include 1) SMEs female entrepreneurs, 2) operating businesses in Selangor and Kuala Lumpur, 3) operating businesses for more than 6 months, 4) registered businesses, and 5) Malaysian. Data for this study were obtained through a questionnaire adapted from past studies. Artificial intelligence (AI) measures used five-item scales modified from Hoffman and Novak (2018) and Metcalf et al. (2019). Social media use was measured using four items adapted from Foltean et al. (2019). Six items were adapted from the research of Rubach and Lazarides (2021) to measure digital competencies. Six items for SMEs' sustainable performance were adapted from Mitra and Datta's (2014) and Hanim Mohamad Zailani et al.'s (2012) studies. Table 1 summarises the items used for this study. A 5-point Likert scale is used to collect and analyze data based on respondents' agreement or disagreement with statements. A set of questionnaires was administered using Google Drive, and the online access can be shared and distributed via email or social media. The set of questionnaires administered was also automatically conditioned so that a respondent could only answer once to ensure no data duplication.

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In this study, the researchers shared online access to the questionnaire with several entrepreneur groups on Facebook, such as the National Association of Women Entrepreneurs of Malaysia (NAWEM), WAWASANITA, Persatuan Rangkaian Usahawan Wanita (WENA), and Association of Bumiputera Women in Business and Profession. IBM SPSS Amos 26 software was used to test the hypothesis. The use of Structural Equation Modeling (SEM) AMOS (Analysis of Moment Structure) path analysis can identify the direct and indirect effects between exogenous variables (independent), mediator, and endogenous variables (dependent) used by researchers in this study. In this regard, Hair et al. (2010) suggested two steps for data analysis using SEM statistical analysis: evaluating the measurement and structural models. Three validity criteria need to be met in analyzing the SEM: unidimensionality, validity, and reliability. The research process is portrayed in Figure 3.

Table 1: Measurement of Variables

Variable	Items
Artificial Intelligence (AI)	1. AI helps my enterprise to predict customer needs accurately. 2. AI supports the marketing promotion of my enterprise by eliminating human errors. 3. AI is important to the collaborative decision-making process in my enterprise. 4. AI has increased my enterprises' brand awareness in real time. 5. AI enables my enterprise to personalize its marketing activities to individual customers.
Social Media Usage	1. Our business uses social media to create conversations with customers. 2. Our business uses social media to create social relationships with customers. 3. Our business uses social media to manage communities. 4. Our business uses social media to share content.
Digital Competencies	1. I can communicate using different digital tools. 2. I can actively participate in society using digital media. 3. I know about the dangers and risks in digital environments and consider them. 4. I can independently use digital learning opportunities and appropriate tools.
Sustainable Performance	1. We strongly consider stakeholders' welfare. 2. We tried to minimize energy consumption. 3. We tried to reduce waste. 4. Sales. 5. Net profit. 6. Market Share.

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Figure 3: Research Process

Findings

Demographics Profile

Table 2 shows the demographic profile of the respondents. Most respondents were aged 25 – 29 years, with 67 respondents (30.8%). This is followed by 18-24 years (n=65, 29.9%), 30-35 years (n=46, 21.1%), 35-40 years (n=25, 11.5%), and 40 years and above (n=15, 6.7%). Next, most respondents have obtained a bachelor's degree qualification, with 121 respondents (55.5%). This is followed by Diploma/Foundation (n=45, 20.7%), Secondary Level (n=32, 14.7%), Graduate degree (MA or PhD) (n=15, 6.9%), and Others (n=5, 2.3%). A total of 129 respondents are single (59.2%). This is followed by married(n=78, 35.8%) and Divorce (n=11, 5.0%). Finally, most women entrepreneurs handled and owned a micro business (n=134, 61.5%). This is followed by small businesses (n=84, 38.5%).

Table 2: Demographic Profiles

Profile		Frequency (n)	Percentage (%)
Age	18-24 years	65	29.9
	25 – 29 years	67	30.8
	30-35 years	46	21.1
	35-40 years	25	11.5
	40 years and above	15	6.7
Highest Educational Level	Secondary Level	32	14.7
	Diploma/Foundation	45	20.7
	Bachelor's degree	121	55.5
	Graduate degree (MA or PhD)	15	6.9
	Others	5	2.3
Status	Married	78	35.8
	Single	129	59.2
	Divorce	11	5.0
SME category	Micro (i.e., sales turnover <RM300,000 or <5 full-time employees)	134	61.5
	Small (i.e., sales turnover from RM300,000 to <RM15 million or full-time employees from 5 to <75).	84	38.5
	Medium (i.e., sales turnover from RM15 million to < RM50	0	0

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million or full-time employees
from 75 to <200)

Confirmatory Factor Analysis (CFA)

SEM analysis in this research was done using a two-step approach. Model fit can be measured with various parameters. The Root Mean Square Error of Approximation (RMSEA) value must be less than 0.07 (Steiger, 2007). Next, CMIN/DF is the chi-square value divided by the degree of freedom. The model is said to fit, and < 3.00 indicates an acceptable fit between the model and the data. The Comparative Fit Index (CFI), the Goodness of Fit Index (GFI), the (Non) Normed Fit Index (NFI), and the Tucker-Lewis index should be > 0.90 (Byrne, 1994). The goodness of fit indices are produced as follows: 1) CFI=0.940, 2) GFI=0.900, 3) NFI=0.920, 4) TLI=0.950, 5) RMSEA =0.0450, and 6) CMIN/DF=1.769. Therefore, the model is said to be fit. Figure 4 shows the CFA results for this study.

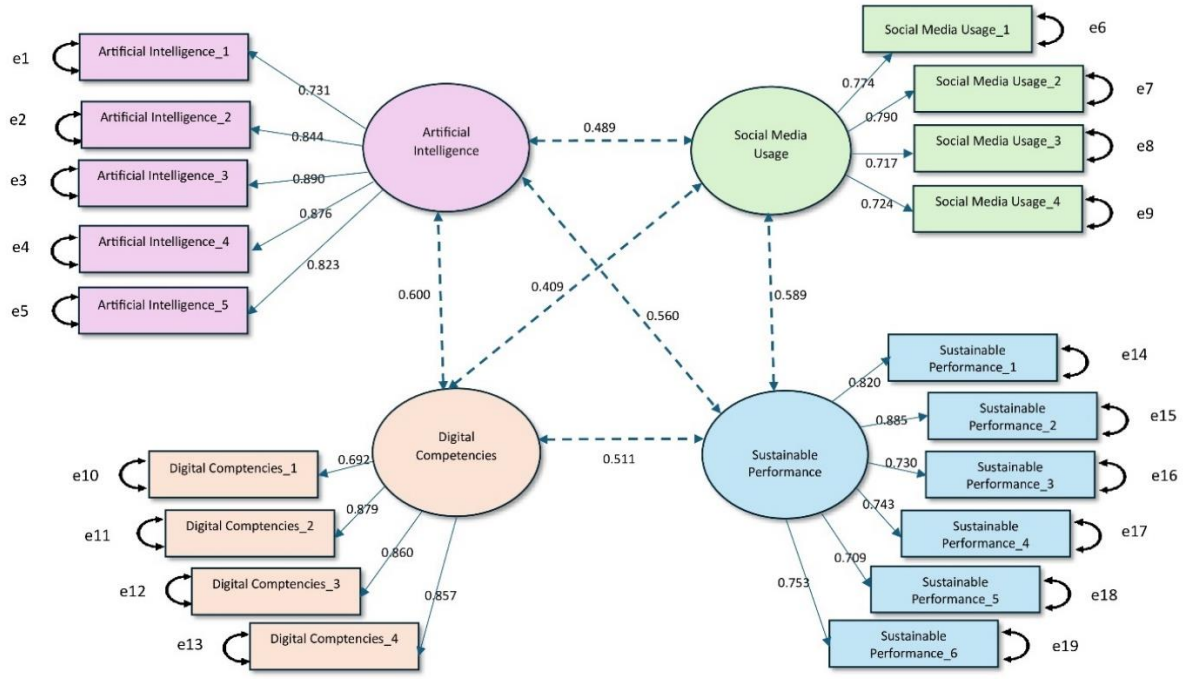

Figure 4: CFA Results

Validity and Reliability Tests

The validity test performed with the AMOS application can be seen from the loading factor value that must meet >0.50 for the research instrument. For the reliability test in the AMOS application, two formulas can be used, including Composite Reliability (CR), which must meet >0.70, and Average Variance Extracted (AVE), which must meet >0.50 for the research instrument. Table 3 shows that the AVE results in this research are all > 0.5. Thus, all the indicators that make up the variable construct can be declared valid. Composite reliability (CR) measures internal consistency in scale items, much like Cronbach's alpha. Based on the results obtained in Table 3, the CR value of all variables above 0.7 indicates that the research instrument is reliable.

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Table 3: Validity and Reliability Test Results

Variable	Items	Item Loadings	AVE	CR
Artificial Intelligence (AI)	Artificial Intelligence_1	0.731***	0.679	0.802
	Artificial Intelligence_2	0.844***		
	Artificial Intelligence_3	0.890***		
	Artificial Intelligence_4	0.876***		
	Artificial Intelligence_5	0.823***		
Social Media Usage	Social Media Usage_1	0.774***	0.709	0.863
	Social Media Usage_2	0.790***		
	Social Media Usage_3	0.717***		
	Social Media Usage_4	0.724***		
Digital Competencies	Digital Competencies_1	0.692***	0.640	0.879
	Digital Competencies_2	0.879***		
	Digital Competencies_3	0.860***		
	Digital Competencies_4	0.857***		
Sustainable Performance	Sustainable Performance_1	0.820***	0.777	0.847
	Sustainable Performance_2	0.885***		
	Sustainable Performance_3	0.730***		
	Sustainable Performance_4	0.743***		
	Sustainable Performance_5	0.709***		
	Sustainable Performance_6	0.753***		

Discriminant Validity

Discriminant validity measures how far a construct is different from other constructs. A high discriminant validity value proves a construct is unique and can capture the measured phenomenon. The test compares the square root value of Average Variance Extracted (AVE) with the correlation value between constructs (Fornell & Larcker, 1981). In Table 4, the square root value of AVE is higher than the value of the correlation between latent variables; this shows that the indicator (construct) differs from other indicators.

Table 4: Discriminant Validity for the Variables

No.	Variable	1	2	3	4
1	Artificial Intelligence (AI)	**0.824**			
2	Social Media Usage	0.489**	**0.842**		
3	Digital Competencies	0.600**	0.409**	**0.800**	
4	Sustainable Performance	0.560**	0.589**	0.511**	**0.811**

Note: Values in the diagonal show the square root of AVE

Hypothesis Testing

This research aims to determine the influence of artificial intelligence adoption and social media usage on sustainable performance with digital competencies as a mediating variable. From Table 5, it can be concluded that artificial intelligence (β=0.380***), social media usage (β =0.120***), and digital competencies (β=0.260***) have a significant influence on sustainable performance due to their probability value, which shows a value of 0.000 which means <0.05. Thus, H1 and H2 were accepted. Next, the standardized estimate value between artificial intelligence and digital competencies 0.230 indicates a positive influence. This means

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that the better the level of artificial intelligence, the better the digital competencies. Then, the results also show that social media usage significantly influences digital competencies (β=0.310***). Mediation analysis is discussed in Table 5. There is a mediation effect between artificial intelligence (β=0.060***) and social media usage (β=0.081***) with sustainable performance. Lower-Level Confidence Intervals (LLCI) and Upper-Level Confidence Intervals (ULCI) values do not contain zero. Thus, hypothesis 3 is accepted. Digital competencies mediate the relationships between artificial intelligence, social media usage, and SMEs' sustainable performance.

Table 5: Assessment of the Structural Model

Path			***β***	**Bootstrap (95% CI)**	
Standardized Direct Effects				**Lower-Level Confidence Intervals (LLCI)**	**Upper-Level Confidence Intervals (ULCI)**
Artificial Intelligence (AI)	→	Sustainable Performance	0.380***		
Social Media Usage	→	Sustainable Performance	0.120***		
Digital Competencies	→	Sustainable Performance	0.260***		
Artificial Intelligence (AI)	→	Digital Competencies	0.230***		
Social Media Usage	→	Digital Competencies	0.310***		
Standardized Indirect Effects (Mediation Effect via Digital Competencies)					
Artificial Intelligence (AI)	→	Sustainable Performance	0.060***	0.210	0.320
Social Media Usage	→	Sustainable Performance	0.081***	0.330	0.430
Standardized Total Effects (Direct Effect + Indirect Effect)					
Artificial Intelligence (AI)	→	Sustainable Performance	0.440***		
Social Media Usage	→	Sustainable Performance	0.201***		

*Note: ***Paths are significant at the 1% level ($p < 0.01$). ***Indirect effects are significant at the 1% level with bootstrap at 5000 and bias-corrected percentile method*

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Figure 5 summarises the final model of the study.

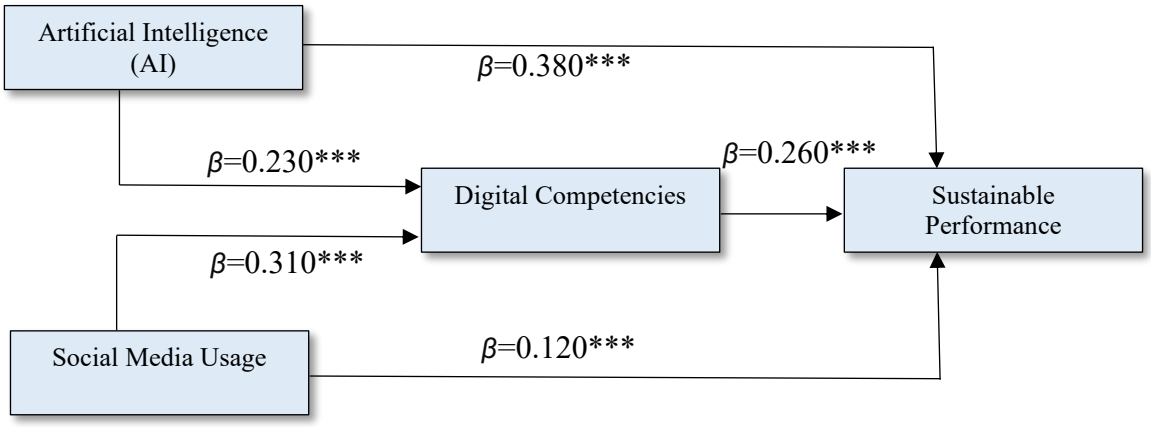

Figure 5: Final Model

Discussion

The study findings showed a significant direct relationship between artificial intelligence (AI), social media adoption, digital competencies, and sustainable performance. Businesses use Artificial Intelligence (AI) to improve efficiency, innovation, and user experience (Giuggioli & Pellegrini, 2023). AI quickly analyzes large amounts of data and identifies patterns or trends that cannot be detected manually (Chalmers et al., 2021; Lévesque et al., 2022). This helps businesses make sales forecasts, market demand, or stock needs. On the other hand, using social media among entrepreneurs requires minimal and sometimes no cost invested in marketing products and services on digital platforms (Secundo et al., 2021). This is because there are free applications that entrepreneurs can use, such as Facebook, Instagram, YouTube, Twitter, and many more, that can display products in digital browsers. These platforms can overcome the capabilities of traditional media, such as television, radio, newspapers, and magazines, which certainly require a large budget (Palalic et al., 2021; Troise et al., 2022).

Second, the study findings also showed that digital competencies mediate the relationship between artificial intelligence (AI), social media adoption, and sustainable performance. In the increasingly digital age, knowledge of digital marketing is an indispensable skill (Noor et al., 2024). Knowledge of search engine optimization, search engine marketing, social media, email marketing, and web analytics has helped many companies and individuals to attract and engage with customers online, increasing their brand and sales (Simović & Domazet, 2021). Mastering digital technology skills in a business context is an excellent step. Therefore, some suggestions can be considered. This includes providing training and education opportunities for entrepreneurs to improve their competencies in using digital technology (d'Ignazio et al., 2025). It can involve courses, seminars, or online training resources. The next step is to provide a mentoring or guidance program for entrepreneurs by those who are skilled in digital technology. With the help of a mentor, entrepreneurs can get helpful advice and instructions in overcoming digital technology challenges.

In addition to providing mentoring and guidance, it is also recommended to refer to experts by providing access to digital technology experts such as software engineers, digital marketing experts, or IT consultants to help solve complex problems or provide advice on using certain technologies. In achieving competitive entrepreneurs, it is recommended to develop a

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community or network of digital entrepreneurs where they can share their experiences, knowledge, and recipes for success in facing digital technology challenges.

However, awareness and support from the government are needed to support entrepreneurs in their efforts to master digital technology skills by providing financial support, incentives, and appropriate training programs (Noor et al., 2024). The following recommendation is to provide awareness to entrepreneurs about data security and privacy, namely by providing training and support to entrepreneurs. This is important because entrepreneurs need to ensure that they protect the sensitive information of their customers and businesses from cyber threats. Companies need a clear implementation plan covering all aspects of digital transformation. This includes planning for smart factories, digital lean, and effective project management. Effective project management is critical to ensure all implementation steps are carried out correctly and within the stipulated time.

Companies must invest in continuous training programs to ensure employees always have the skills to use new technologies. Involving employees in the change process ensures they accept and support digital transformation (Mohd Noor et al., 2024b). This includes allowing them to provide feedback and participate in the planning process. Companies must also invest in security technology to protect their systems and data. This includes firewalls, antivirus software, and data encryption. Clear communication is essential to ensure that all stakeholders understand the purpose and benefits of digital transformation. This includes consistent and transparent communication about the changes that will occur. Therefore, implementing these recommendations is hoped to help with difficulties and increase the effectiveness of entrepreneurs in mastering digital technology skills to improve their businesses.

Conclusion

Entrepreneurs need to prepare themselves for digital technology knowledge and readiness to face internal challenges, such as organizational cultural barriers that may hinder the effective use of digital technology, and external challenges, such as a competitive business environment and changes in market needs. Thus, it is important to recognize that efforts to overcome challenges are an ongoing process requiring continuous commitment to learning and adaptation. Successful entrepreneurs will take the initiative to continuously update skills, explore new opportunities in digital technology, and collaborate with experts in the field. With this approach, entrepreneurs can leverage digital technology more effectively to expand their businesses, improve operations, and provide added value to their customers. The findings have proven that artificial intelligence utilization and social media adoption are crucial resources for SMEs and have a significant relationship with SMEs' sustainable performance. In addition, this study also provides a theoretical contribution by proving that digital competencies can act as a partial mediating variable on the relationship between artificial intelligence utilization, social media adoption, and SME sustainable performance. Furthermore, as suggested by previous researchers, all the variable measurement instruments used in the study show a high level of reliability and validity. Therefore, other researchers in related fields can adapt the instruments used in this study. There are several limitations of the study. First, the study only focuses on specific resources. Further research should identify several other resources that may impact the improvement of SME sustainable performance in Malaysia. Future studies can consider mediating variables other than digital competencies. In addition, this study uses a quantitative approach and questionnaire methods to collect data on SME sustainable performance in

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Malaysia. Therefore, conducting more detailed studies, such as qualitative or case studies, is necessary to support and strengthen the findings.

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