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Article

The influence of innovation, knowledge management, and e-commerce adoption on MSME performance, and its impact on MSMEs sustainability

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Abstract: In the current digital age, financial development has seen substantial shifts, particularly in buying and selling activities that are now facilitated by digital technology or electronic transactions (e-commerce), which offer convenience at relatively low costs. However, micro, small, and medium enterprises (MSMEs), which play a crucial role in the economy, must adapt to these advancements to sustain and grow their businesses. Despite the widespread adoption of e-commerce, many MSMEs have yet to fully capitalize on this technology. Limited knowledge often leads to hesitation in embracing e-commerce opportunities. Consequently, this study seeks to explore how innovation, information management, and e-commerce adoption impact MSME performance and its implications for business sustainability. The research targets MSME owners and managers in the Jabodetabek area (Jakarta, Bogor, Depok, Tangerang, and Bekasi) and nearby regions, with a sample of 420 individuals selected through random sampling. Data was collected through an online survey (Google Forms) administered to MSME management. The survey items were tested for validity and reliability, and the data analysis was conducted using various regression analyses with SEM-PLS and Smart-PLS3. The study's findings highlight the following key points: 1) E-commerce adoption significantly enhances information management, which supports MSME sustainability; 2) E-commerce adoption also improves performance through better information management, further promoting MSME sustainability; 3) While technology is important, e-commerce adoption is the primary factor driving MSME sustainability, with technology serving as a secondary factor.

Keywords: innovation; knowledge management; e-commerce adoption; MSME performance; MSME sustainability; digital native

1. Introduction

Governments worldwide, whether in developed or developing countries, place significant emphasis on micro, small, and medium enterprises (MSMEs) due to their substantial contributions to national income (Chong et al., 2014; Lembaga Pengembangan Perbankan Indonesia, 2015). In Malaysia, MSMEs are a crucial component of the economy, accounting for up to 32% of the nation's gross domestic product (GDP), 56.4% of total employment, and 19% of total exports (Aghmiyoni and Salimi, 2016; Chong et al., 2014). Similarly, in Jordan, MSMEs represent approximately 97% of all business activities, contribute 50% of GDP, and provide 45% of export revenues. In Indonesia, the MSME sector contributes 90% to the national GDP, as reported by the Ministry of Cooperatives and MSMEs.

The Indonesian government's focus on MSMEs was highlighted in a press release from the Ministry of Economic Affairs, with Planning Minister Airlangga emphasizing the goal of achieving a national entrepreneurship rate of 3.95% and a 4%

growth in new entrepreneurs by 2024. This compares to a 3.47% entrepreneurship rate in 2020. Supporting industry players, particularly MSMEs, is crucial as they are essential pillars of the Indonesian economy. According to data from the Ministry of Cooperatives and MSMEs, in 2020, there were 64.2 million MSMEs contributing 61.07% to GDP, equivalent to 8573.89 trillion Rupiah. Additionally, MSMEs accounted for 97% of the workforce and 60.4% of total investments. However, the large number of MSME entrepreneurs poses a challenge that must be addressed (National Development Planning Agency, 2020).

To meet future challenges in the digital age, MSMEs need to adapt and fully leverage digital technology. The Ministry of Trade predicts that the value of digital transactions in Indonesia will increase eightfold over the next decade, from IDR 632 trillion to approximately IDR 4531 trillion by 2030, with e-commerce contributing about 34%, or around IDR 1900 trillion (Sekretariat Kabinet RI, 2021).

The COVID-19 pandemic has had a significant impact on e-commerce businesses, affecting trade revenue, transaction volume, and the smooth delivery of goods from 2020 to 2023 (see **Table 1**) (Biro Pusat Statistik, 2023).

Table 1. Impact of the COVID-19 pandemic on e-commerce businesses in 2020–2023.

Activities/Year	Impact	Operating Revenue (%)	Transaction Volume (%)	Smooth Distribution of Goods (%)
Year 2020	Increase	4.58	4.62	3.51
	Remain	9.59	10.36	19.58
	Decreased	85.83	85.02	76.91
		100	100	100
Year 2021	Increase	9.72	9.77	7.09
	Remain	17.89	18.4	37.98
	Decreased	72.39	71.83	54.93
		100	100	100
Year 2022	Increase	27.65	27.4	23.27
	Remain	40.95	41.58	52.65
	Decreased	31.4	31.02	24.08
		100	100	100
Year 2022/23	Increase	24.26	23.67	19.78
	Remain	46.38	47.49	57.73
	Decreased	29.36	28.84	22.49
		100	100	100

Source: Biro Pusat Statistik (2023).

The COVID-19 pandemic has also accelerated the shift from offline to online commerce, boosting web traffic by approximately 15%–20%. This situation presents an ideal opportunity to accelerate the adoption of digital technology. Moreover, Indonesia, with its fourth-largest population globally and 196.7 million internet users, remains a significant player in the digital economy. Among the top ten e-commerce countries, Indonesia has the highest percentage of e-commerce users at 88.1% (Perekonomian and Indonesia, n.d.). The year 2020 marked a turning point in the global economy, with the pandemic driving both consumers and businesses to adopt

e-commerce more frequently, gradually replacing traditional business models (Costa and Castro, 2021).

According to Mustafa et al. (2022), digital transformation is primarily undertaken by proactive organizations that embrace digital change, due to the relationship between digitalization and organizational structure. Consequently, there is a different approach between digital natives and digital immigrants in adapting to digital changes (Mustafa et al., 2022). In the accounting field, Jackson noted that advances in digital technology have shifted accounting skills from focusing on transaction-based tasks to utilizing data generated by digital technology to enhance decision-making processes, resulting in changes in skill requirements (Jackson et al., 2022).

The effective utilization of digital technology hinges on whether each stakeholder understands and experiences the benefits of digitalization. Recent studies indicate that companies embracing e-commerce enhance their information management processes, which in turn impacts their innovation, marketing, and financial performance. With the evolution of digital technology, questions arise about how innovation persists and the role of organizational learning theory (Castagna et al., 2020). For instance, Nambisan et al. (2017) explored how organizational practices can be transformed by digitalization to improve the knowledge base and boost innovation performance. The current technological and organizational landscape demands that companies improve their knowledge management (KM) processes—such as acquisition, storage, and exchange—by not only focusing on internal information but also considering external data to foster growth (Nambisan et al., 2017).

The advancement of digital technology, from the initial transformation to the current Industry 4.0 era, has profoundly affected economic and social conditions globally. Embracing e-commerce, technological innovations, and digitalization can significantly enhance productivity, corporate competitiveness, and social welfare (Endrődi-Kovács and Stukovszky, 2021). Gu (2022) notes that the rapid development of digital technology has completely altered the industrial and business ecosystem. According to UNCTAD (United Nations Conference on Trade and Development) Estimates of Global E-Commerce 2018, global e-commerce transactions reached USD 25.6 trillion in 2018, with 1.45 billion global online buyers. In the context of internet+, e-commerce has become a crucial method for many micro, small, and medium enterprises (MSMEs) to achieve digital transformation and increase sales (Costa and Castro, 2021). However, most MSMEs that adopt e-commerce face challenges such as additional investment needs and underdeveloped internal data capabilities. As a result, e-commerce adoption among MSMEs is lower compared to large, established companies, and the pace of e-commerce adoption in developing countries lags behind that in developed nations. Therefore, there is a pressing need for more MSMEs to embrace e-commerce to achieve success in this area (Gu, 2022).

The recent evolution of e-commerce has shifted the global business paradigm, signaling a new era of commerce. The hope is that businesses utilizing digital markets will remain relevant and competitive, with online shopping becoming a routine part of daily life (Costa and Castro, 2021).

According to Zhao (2006), leveraging digital technology by entrepreneurs requires innovation. Zhao argues that integrating entrepreneurship with innovation is crucial for the long-term sustainability of e-commerce and e-business. He emphasizes

that entrepreneurship and innovation are closely related and mutually supportive in driving organizational growth. Zhao uses an integrative approach to explore how entrepreneurship and innovation interact and examines the factors that drive this interaction. His work provides a deeper understanding of the theoretical and practical aspects of entrepreneurship and innovation (Zhao, 2006). Additionally, Surya et al. (2021) notes that economic growth, coupled with technological advancement, can enhance the efficiency of economic sectors and improve overall welfare. Government policies, business capital support, and strengthening human resource capabilities significantly impact the development of MSMEs, with a determination coefficient of 97.6%. Surya suggests that an economic development strategy focused on technological innovation should guide government policymaking to boost the productivity of economic sectors in Indonesia (Surya et al., 2021).

With advancements in information technology, various activities have become increasingly easier to perform. One area notably impacted by technological progress is transaction efficiency. Traditional transactions are increasingly being integrated with new technologies; a process known as e-commerce.

As business competition becomes increasingly intense, companies must identify new business models to leverage their advantages more effectively. Concurrently, with the rapid advancement of the economy and technology, MSMEs face unavoidable competition from larger companies. To enhance their competitive edge, MSMEs need to explore more effective strategies, such as utilizing e-commerce. E-commerce is a modern trading medium of the 21st century that supports the growth of MSMEs and enhances their opportunity management capabilities.

In China, many MSMEs encounter challenges in the e-commerce development process, particularly factors that hinder e-commerce implementation. Several aspects of the business need improvement. First, investment in information technology is crucial for achieving success and gaining a competitive edge, as the effectiveness of the company's use of network technology significantly impacts outcomes. Second, expanding the business size can lead to a short-term increase in MSME transaction volume. Third, internet availability can positively affect e-commerce transaction volume, though its impact is generally steady and not always clearly defined (Chen and Zhang, 2015).

Despite growing support for e-commerce adoption, some research indicates that there is no significant direct relationship between e-commerce adoption and company performance. However, e-commerce has been identified as a mediator that connects e-commerce adoption with firm performance. This suggests that MSME owners and managers can leverage e-commerce as a mediator to gain a competitive advantage and improve MSME performance (Hariandi et al., 2019).

In Indonesia, a significant portion of national revenue comes from foreign trade, which encompasses both exports and imports. Expanding export value relies on enhancing the competitiveness of MSMEs. MSMEs are viewed as a key component in improving Indonesia's economy. However, the evolving market presents new challenges for MSMEs. To thrive, MSMEs need to dominate the market, which requires quick and easy access to information to broaden their marketing networks. Implementing information technology in MSMEs can facilitate market expansion, both domestically and internationally, and support the establishment of IT-based

MSME Development Centers (Adrian, 2019).

Research on e-commerce adoption by MSMEs in developing countries, particularly in Indonesia, has focused on understanding the benefits that MSMEs have experienced from adopting e-commerce and examining the relationship between e-commerce adoption levels and business performance. Findings indicate that many MSMEs are still in the early stages of e-commerce adoption, primarily using it for marketing activities. The six key benefits reported by MSMEs include expanded market reach, increased sales, improved external communications, enhanced company image, faster processing speeds, and greater employee productivity. Thus, increasing the level of e-commerce adoption could lead to even greater benefits (Rahayu and Day, 2017).

According to Teten Masduki, Minister of Cooperatives and Small and Medium Enterprises, approximately 19.5 million MSMEs out of 65 million have transitioned to the digital sector. "As of June 2022, 19.5 million MSMEs, or 30.4% of the total, are now present on e-commerce platforms," stated Teten Masduki at the B20 Indonesia Digital Economy event supporting the SDGs (Sustainable Development Goals) in Bali.

The ability to recover from the COVID-19 pandemic relies heavily on effective information management by business leaders regarding their internal and external capabilities (Chong et al., 2014). With strong information management capabilities, businesses are expected to show resilience and improve their performance, especially when taking calculated risks. Companies that have a solid grasp of their internal data are better equipped to handle risks, even though this is particularly effective for those with low risk tolerance (Hock-Doepgen et al., 2021).

This study focuses on the development of MSMEs in Jakarta and its surrounding areas (Jabodetabek). As the capital city, Jakarta represents a microcosm of Indonesia's broader conditions. Therefore, research conducted in Jabodetabek and its environs can provide valuable insights into the national context.

The number of MSMEs in Jakarta itself is relatively small, with many MSMEs in the Jakarta area using the DKI Jakarta (Daerah Khusus Ibukota or Special Capital Region of Jakarta) region primarily for their operations. Conversely, sectors such as services and trade are more prominent in the buffer zones around the capital, including Bogor, Tangerang, Bekasi, and Depok. This is likely due to high land costs and the dominance of large enterprises in Jakarta. Given Jakarta's role as a commercial hub, MSME credit growth is often constrained. Recent efforts by DKI Jakarta to support MSME development include enhancing payment systems to aid economic recovery and accelerate digitalization, primarily through the expansion of QRIS (Quick Response Code Indonesian Standard) and BI-FAST (Bank Indonesia Fast Payment) services, and improving access for various societal levels, especially in supporting MSMEs and local products (Bank Indonesia Provinsi DKI Jakarta, 2015).

According to recent records, many new entrepreneurs have emerged in Jakarta. As of 24 December 2021, Mochamad Abbas, Head of the DKI Jakarta Provincial Government's Economic and Financial Bureau, reported that the number of MSMEs in Jakarta had reached 289,370 (Fikri and Viva., 2021).

In contrast, the state of MSMEs in Depok, as per the 2021 Depok City Cooperatives and Enterprises Service Performance Report, indicates that the target for

achieving government office performance accountability was not met during the pandemic (Oktora et al., 2021).

In this context, future efforts by the Depok City Cooperative Department will focus on strengthening and supporting the cooperative business network through the Depok Store and providing business capital assistance (Hidayat, 2021). However, there remains a lack of clear strategies for utilizing digital technologies or adopting e-commerce to enhance businesses and improve post-pandemic MSMEs in Depok. According to Oktaviani and Wardani (2022), the adoption of e-commerce is expected to boost the performance and sustainability of MSMEs in the future, and integrating data technology with e-commerce can help revive economic activity, particularly for MSMEs that were affected by the pandemic (Oktaviani and Wardani, 2022). Similarly, Chee et al. (2016) argues that from a business management perspective, embracing e-commerce is a crucial step towards improving the management of business processes (Chee et al., 2016).

Given the changes observed in MSMEs during the COVID-19 pandemic, this research aims to determine and analyze the extent of the influence of innovation, knowledge management, and e-commerce adoption on MSME performance, and its impact on MSMEs sustainability (Case Study: MSMEs in Jabodetabek).

2. Literature Review

2.1. Business innovation

Open innovation means creating new values, which are generated through a combination of markets and technologies from various companies beyond the company's boundaries, as well as introducing new and combined business models. Although open innovation research began at the enterprise level, it has evolved from individual actors within organizations through pairs and from networks between organizations to national innovation ecosystems and systems (Yun et al., 2020).

Based on the results of the previous analysis and discussion conducted by Hardilawati et al. (2019), innovation has a perfect role in improving the marketing performance of small businesses. The more innovations carried out by small businesses, the more the marketing performance of this business will increase. On the other hand, e-commerce has a positive but insignificant influence on small business marketing performance variables. E-commerce has a negligible impact on increasing marketing performance due to a need for more education on using e-commerce in business. Another factor is that many business people still hesitate to use e-commerce because they want to be reassured and prefer to sell offline. This is an input for the government or related entrepreneurs to provide education and training in e-commerce and the use of technology to support the marketing performance of small businesses so that they can compete with similar business actors or new entrants (Hardilawati et al., 2019).

2.2. Knowledge management

In today's business environment with rapidly evolving communication and information technologies, knowledge management (KM) capabilities are a valuable

resource for innovation. However, more information is needed about the specific KM capabilities that lead to business model innovation (BMI) and whether the effect depends on the company's orientation towards risk-taking. Research was conducted on the impact of internal and external KM capabilities on BMI and how these effects are moderated by its risk-taking tolerance, resulting in knowledge management capabilities externally stimulating BMI. This relationship is strengthened significantly for companies with a high-risk tolerance. Knowledge management is internally only effective for companies with low risk-taking tolerance. The results of the FSQCA (fuzzy-set qualitative comparative analysis) support these findings and improve the structural equation model (SEM) by showing certain initial conditions for high-risk BMI levels (Hock-Doepgen et al., 2021).

Knowledge management represents the maximization of the company's knowledge excellence, the introduction of information and wisdom, and the strengthening of capabilities (human and digital). There still needs to be a consensus on the definition of knowledge management in the literature, as knowledge can be observed from various angles, and a consensus definition requires a multidisciplinary approach. Viewed from an epistemological point of view, where knowledge can appear in tacit form and explicit and articulated form, the definition of knowledge management can be as follows: Knowledge management is the transformation of individual knowledge from employees in an organization into collective, organizational knowledge, which will be available at the right time and in the right way to all members of the organization, at all levels (Petrović et al., 2019).

It represents a business model focusing on knowledge within an organization and its movement through five phases: creation, ownership, storage, sharing, and practical application (Zaboon et al., 2018). Knowledge is not just processed information but a combination of experience, context, interpretation, and reflection (Giuffrida et al., 2019). Today, knowledge is an asset that must be exchanged to multiply (Gavrila Gavrila and de Lucas Ancillo, 2021). This implies an entirely different approach. Knowledge management is like creating, storing, and transferring knowledge within an organization (Prensky, 2001).

2.3. E-commerce adoption

Studies on e-commerce adoption in MSMEs have theoretically been widely conducted using theoretical models from several ideas about organizations that analyze e-commerce adoption. The results show empirically that several variables affect trade adoption in MSMEs based on the theory of technology—organization—environment, which identifies and categorizes internal, environmental, and technological factors that affect this e-commerce adoption (Sánchez-Torres et al., 2021). The internal factors referred to by Sanchez are as follows.

2.3.1. Internal factors

Based on strategic resource theory, many studies show that e-commerce adoption is supported by its resources, processes, and knowledge. MSMEs are strategically oriented around their resources and take advantage of the surrounding conditions. MSMEs will work when driven by competitive forces and use their resources to formulate and implement strategies that allow them to make a profit in the market.

Internally, several variables that affect e-commerce adoption in MSMEs stand out. One is the extent to which managers are dispositioned toward innovation and the use of technology to improve company processes (Sánchez-Torres et al., 2021).

2.3.2. Environmental factors of the external contingency theory

As an external factor, environmental factors from the external contingency theory state that environmental agents can pressure MSMEs to adopt e-commerce. One of the external agents is the government, which, through government policies that prioritize transparency and competitiveness, establishes policies to motivate companies to adopt e-commerce (Ahluwalia and Merhi, 2020; Alrousan and Jones, 2016; Hui Nee and Xin, 2020). By government variables, the level of complexity of e-commerce adoption in a country is a factor that also affects adoption. With a greater level of e-commerce development in a country, there will be more significant investment in information and communication technology, and therefore, adoption by MSMEs will be easier. Another variable is the pressure exerted by suppliers, competitors, and other market forces on MSMEs about e-commerce adoption (Dethine et al., 2020). This is a pressure created by the obligation to maintain long-term relationships, although it does not necessarily affect the adoption of e-commerce (Cassetta et al., 2020; Dethine et al., 2020; Rahayu and Day, 2017).

2.3.3. Technology factors

Technological factors variables related to technological factors are the most important in the study of MSMEs worldwide (Sombultawee, 2020) when assessing technological disposition. Some authors rely on innovation diffusion theory, e-commerce adoption theory, and integrated theory of e-commerce adoption to explain the technological factors influencing e-commerce adoption. These studies have identified that the main variables are perceived risk, perceived utility (compatibility and observability), perceived facility use, and intention to use verifiability (Sombultawee, 2020). System risk perception variables negatively affect e-commerce adoption (Shemi and Procter, 2018). The risk of adopting e-commerce is associated with the risk of using the internet. In particular, it is assumed that a company's confidentiality level can be affected by the open disclosure of information and internet insecurity (Saridakis et al., 2018).

Rawashdeh (2015) said that a theoretical model, TAM (technology acceptance model), can be used to adopt e-commerce internet banking. This acceptance theory model uses four indicators: perceived usefulness (PUF), perceived ease of use (PEU), personal perception (perceived web privacy/PWP), attitude (attitude/ATT), and intention (INT) (Rawashdeh, 2015).

2.4. MSME performance

The performance of MSMEs is indeed different from that of large companies, but there are several advantages of MSMEs compared to large companies, including in terms of flexibility. MSMEs are more free to move and efficient despite problems in the organizational structure. In terms of managerial style, they can freely use outsourcing, and the management is more informal, as seen in **Table 2** (Zhang et al., 2013).

Table 2. Advantages and disadvantages of MSMEs and large companies (Zhang et al., 2013).

Category	Large firms	SMEs (including born-global firms)
Scope of operations	Greater, in diverse markets	Less
Resources	Relatively abundant	Resource-poor
Flexibility	Not high	Flexible and efficient, but bound in complicated organizational structures (e.g., Pratten (1991))
Research and development (R&D)	Higher resources available and spent for R&D and maintenance	Little or no resources available for R&D and maintenance (Johnston and Wright, 2004)
Relationship with supply chain	Greater control; and therefore, can demand services and quality from vendors, etc.	Little control over vendors, and believes in 'responsible behavior' from them (Perrini et al., 2007)
Strategy/management style	Disperse production globally and likely to adopt single sourcing (Tam et al., 2007)	Prefer multiple sourcing and use combination of in and outsourcing
Knowledge Management	Employees and artefacts sources of knowledge	Social interation-based
Management	formal	Informal approaches, less likely to commit to written policies (e.g., Gray and Mabey (2005))

E-business applications affect business performance in developing countries such as China. The results show that the implementation of e-business can improve the sales performance of small businesses, and e-business is an essential factor for success (Chen and Zhang, 2013).

Meanwhile, research conducted on Pakistani manufacturing MSMEs found an indirect relationship between e-commerce adoption and MSME performance, which provides insight into organizational and environmental factors. Empirical investigations reveal that top management support and competitive pressure have a significant direct relationship and an indirect effect on adopting e-commerce as a mediator on company performance.

Table 3. Industrial growth in Pakistan's exports.

Percentage change in export growth of Pakistan's manufacturing industry	2018–2019 (percentage change)
Textile industry	0.08
Sporting goods industry	−9.04
Surgical industry	−1.46
Leather industry	−8.41
Chemistry and pharmaceuticals	5.68
Goods engineering	−10.81
Cement	32.81
Carpet and metal	−12.5

However, the adoption cost and government support are not statistically significant in e-commerce adoption. It can be seen from the data in **Table 3** that there is a decrease in exports due to the need for more organizational insights to be involved in adopting e-commerce (Hussain et al., 2020).

According to Thanh et al. (2021), company performance is classified into non-financial and financial indicators. Thus, non-financial indicators that represent operating results from a non-financial point of view include (1) Business owner's satisfaction with unit development; (2) Perception of customer satisfaction; (3) Perception of employee satisfaction; (4) Relationship with suppliers; (5) Work

environment; (6) The level of acceptance of goods and services provided in the market and (7) The image of the company (Thanh et al., 2021).

This is in line with the financial indicators that are the target of measuring the company's financial results, including (1) Revenue, (2) Profitability, (3) Market share, and (4) Return on assets (ROA) (Achmad et al., 2009).

In this study, the financial indicators used by Thanh will be used, namely: (1) The company has revenue growth, (2) The company has profitability growth, (3) Business results have increased return on assets (ROA), and (4) The company has market share growth (Thanh et al., 2021).

2.5. MSME sustainability

Sustainability referred to in this study is how the sustainability of MSMEs so far and in the future is seen from several indicators that affect it. Several opinions say that the sustainability of MSMEs is seen from the role of knowledge management practices in sustainable entrepreneurship performance, that there is a relationship between six concepts: knowledge sharing behavior, innovative capacity, absorption capacity, dynamic ability, opportunity recognition, and sustainable entrepreneurship. The findings show that knowledge management practices positively and significantly impact the sustainable entrepreneurial performance and dynamic capabilities of MSMEs. In addition, the introduction of opportunities strengthens the relationship between the dynamic capabilities of MSMEs and sustainable entrepreneurial performance (Toshiba et al., 2021). Then reinforced by Ukko et al. (2019) in her research on the role of sustainability strategies in the relationship between digital business strategy and financial performance, her findings show that sustainability strategies function as promoters in the relationship between managerial capabilities and financial performance but inhibit the relationship between operational capabilities and financial performance (Ukko et al., 2019).

Meanwhile, the results of other studies prove the sustainability of MSMEs through several factors, including empathy, social value orientation, and innovation in the spirit of social entrepreneurship of start-ups, which have been proven to affect the social sustainability of MSMEs. Second, empathy, social value orientation, and innovation have been shown to influence government policy support, but risk-taking is not affected. Third, the support policies of the government of Korea have proven to have an impact on sustainability. Fourth, regarding the impact of social MSME entrepreneurship and sustainability, innovation and risk-taking are partly mediated by government support policies. In contrast, empathy and social value orientation are complete mediation (You and You, 2020).

3. Conceptual framework

The design of the research conceptual framework is as follows (see **Figure 1**):

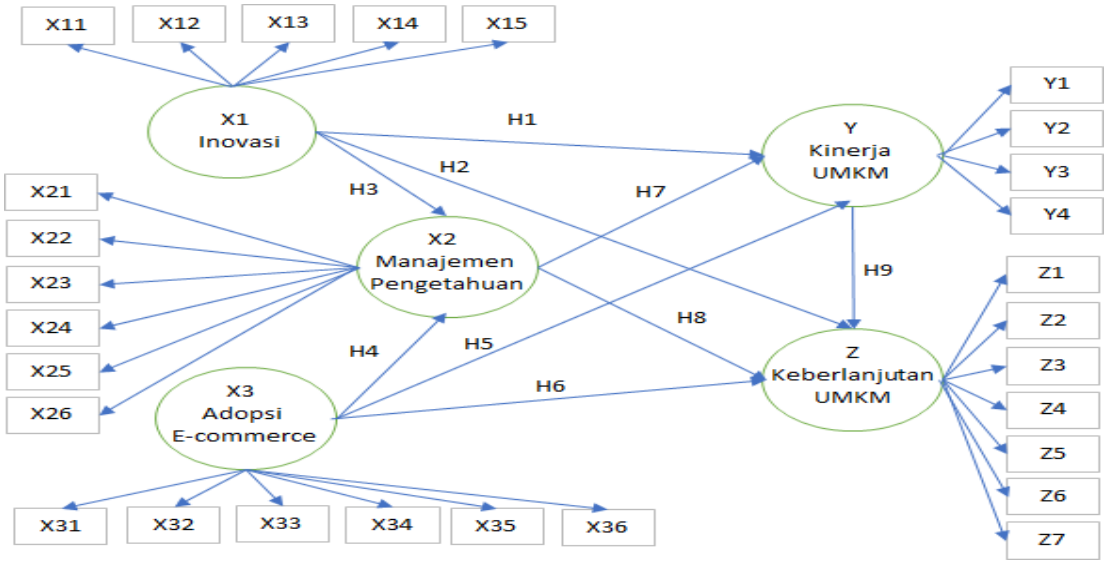

Figure 1. Research thinking framework.

Research hypothesis:

H1: There is an influence of innovation on the performance of MSMEs.

H2: There is an influence of innovation on the sustainability of MSMEs.

H3: There is an influence of innovation on knowledge management.

H4: There is an effect of e-commerce adoption on knowledge management.

H5: There is an Influence of e-commerce adoption on MSME performance.

H6: There is an influence of e-commerce adoption on the sustainability of MSMEs.

H7: There is an influence of knowledge management on MSME performance.

H8: There is an influence of knowledge management on the sustainability of MSMEs.

H9: MSME performance influences MSME sustainability.

H10: Innovation, knowledge management, and e-commerce adoption influence MSME performance and impact MSME sustainability.

4. Research method

This study uses a quantitative approach with a survey design. Such research is intended to test a hypothesis to strengthen or reject existing hypotheses. It is also categorized as explanatory research (Zikmund, 2003). In this regard, the variables studied are e-commerce adoption, e-commerce innovation, sustainability, and MSME performance.

4.1. Population

The unit of analysis in this research is MSMEs registered in Jabodetabek, as shown in **Table 4**.

Table 4. MSME population in greater Jakarta in 2021/2022.

No	City	Qty	%
1	Jakarta City	1,061,988	60%
2	Bogor City	116,656	7%
3	Depok City	219,237	12%
4	Tangerang City	90,128	5%
5	Bekasi City	274,142	16%
	Amount	1,762,151	100%

Source: Indonesia Ministry of Cooperatives and Small and Medium Enterprises (2023).

4.2. Sampel

Sampling was carried out randomly using the probability sampling technique. The probability sampling method used is random sampling (Teddlie and Yu, 2007). The determination of the number of samples uses the Slovin formula (Sugiyono, 2012), as follows: (see **Table 5**)

$$n = \frac{N}{1 + Nd^2} = \frac{1.762.151}{1 + (1.762.151)(0.05)^2} = 400 \text{ responden}$$

Table 5. Sample of MSMEs in greater Jakarta in 2021/2022.

No	City	Population	%	Sample
1	Jakarta City	1,061,988	60%	241
2	Bogor City	116,656	7%	26
3	Depok City	219,237	12%	50
4	Tangerang City	90,128	5%	20
5	Bekasi City	274,142	16%	62
	Amount	1,762,151	100%	400

Source: processed data.

4.3. Data types and data collection methods

The types of data used in this study are primary and secondary.

1) Primary data is data obtained directly from respondents through the MSME community in the WhatsApp group. The research sample includes owners and managers of MSMEs in Greater Jakarta.
2) Secondary data was obtained from references, documentation, previous research sources, and interviews.

To obtain data that meets these needs, two research methods are used, namely:

1) Literature research: Data collection is carried out by tracing data sources by reading and studying documents and other written materials such as books and documents related to the business environment, managerial, strategy, performance, and competitive advantage so that secondary data that is objective, accepted, and recognized as true is obtained.
2) Field research: Field research is an effort to obtain primary data and actual information by distributing questionnaires.

4.4. Variable operations

The operational variables are seen in **Table 6** as follows:

Table 6. Variable operations.

No	Variable	Dimension	Indicator	Scale
1	Innovation (X1)	1) Product	The company supports the development of new products (X11)	Ordinal
		2) Business Process	The company supports the sale of new products to the market (X12)	Ordinal
		3) Organization	The company supports all activities for the development of new products (X13)	Ordinal
		4) Marketing	The company supports the number of new products released to the market (X14)	Ordinal
			The company supports an increase in the percentage of revenue generated from new products (X15)	Ordinal
2	Knowledge Management (X2)	1) Business Model Innovation Developed in-house	Find out what business is being carried out so far (X21)	Ordinal
		2) Knowledge management technology	Creating new ways or methods in business (X22)	Ordinal
		3) Knowledge management structure	Every way/method is always shared with other employees (X23)	
		4) Knowledge management culture	Every new way/method created is always applied in this business (X24).	Ordinal
		5) Knowledge management acquisition process	Using knowledge to make the work process easier (X25)	Ordinal
		6) Knowledge management conversion process	Understand the state of business competitors out there (X26)	Ordinal
3	E-Commerce Adoption (X3)	1) Use for Internal Activities	At work, always use the computer (X31)	Ordinal
			All computers are connected to the internet (X32)	Ordinal
		2) Use for marketing, sales, and Customer interaction	Using a computer when dealing with other business associates (X33)	Ordinal
		3) Usage in Production	Conduct sales transactions to consumers electronically (e-commerce) (X34)	Ordinal
		4) Use for partnerships	Provide funds to use electronic buying and selling transactions (e-Commerce) (X35)	Ordinal
			The company supports the development of new products (X36)	Ordinal
4	MSME performance (Y)	1) Income	Experiencing an increase in sales every month (Y1)	Ordinal
		2) Profitability	Business profit/profit every month always increases (Y2)	Ordinal
		3) Market share	Business capital is always increasing (Y3)	Ordinal
			Conducting marketing activities within and outside the region (Y4)	Ordinal
		4) Return on asset (ROA)	Every year, it adds more employees as more and more work (Y5)	Ordinal
5	MSME Sustainability (Z)	1) Knowledge sharing behavior	My knowledge of business makes work easier	Ordinal
		2) Innovative capacity	Every new way created is always applied in the business	Ordinal
		3) Absorption capacity	Using computers and the internet at work	Ordinal
		4) Dynamic capabilities	Able to increase the percentage of business revenue	Ordinal
		5) Opportunity recognition	Knowledge of competitors is said to be a business	Ordinal
		6) Sustainable entrepreneurship.	Electronic sales transactions with consumers (e-commerce)	Ordinal
		7) Empathy	Able to understand the importance of providing funds to use electronic transactions (e-Commerce)	Ordinal

For responses to questions, 5 points of the Likert scale are used: 5 = strongly

agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, and 1 = strongly disagree.

4.5. Validity and reliability test

The validity and reliability test were conducted on 30 respondents. In this stage, improvements were also made to questionnaire statements that were considered difficult for respondents to understand. Calculations were performed using SPSS v25 software.

4.5.1. Validity test

The test technique used for the validity test is the correlation of Pearson moment products. The following are the criteria for validity testing:

1) If the *r*-count ≥ *r* table, the instrument or statement items significantly correlate with the total score or are declared valid.
2) If *r*-counts < *r* table, the instrument or statement items are not significantly correlated with the total score or declared invalid.
3) Based on the critical table *r*-Product Moment, the critical value of the *r*-table is 0.361 for a sample of 30 respondents, and the significance level is $\alpha = 0.05$.

4.5.2. Reliability test

The reliability test in this research was measured using Cronbach's Alpha score. Sekaran and Bougie (2016) states that a reliability value of less than 0.60 is not good, 0.70 is acceptable, and above 0.80 is good.

The following presents the results of the validity and reliability test with the help of SPSS v25 software (See **Tables 7** and **8**).

Table 7. Validity of variable items X1, X2 and X3.

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**	**Validitas *N* = 17, sig = 5%, *r* = 0.3887**
X11	67.38	43.964	0.548	0.907	Valid
X12	67.30	43.746	0.586	0.906	Valid
X13	67.37	44.357	0.552	0.907	Valid
X14	67.37	43.742	0.600	0.905	Valid
X15	67.43	43.687	0.579	0.906	Valid
X21	67.26	43.640	0.613	0.905	Valid
X22	67.34	43.915	0.580	0.906	Valid
X23	67.45	43.857	0.533	0.907	Valid
X24	67.36	43.567	0.611	0.905	Valid
X25	67.32	43.292	0.628	0.904	Valid
X26	67.40	44.078	0.575	0.906	Valid
X31	67.40	42.786	0.571	0.906	Valid
X32	67.30	43.753	0.584	0.906	Valid
X33	67.45	43.527	0.578	0.906	Valid
X34	67.36	43.453	0.602	0.905	Valid
X35	67.39	43.504	0.588	0.905	Valid
X36	67.38	43.835	0.602	0.905	Valid

Reliability Statistics: Cronbach's Alpha: 0.911, *N* of Items: 17.

Table 8. Validity of variable items Y and Z.

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**	**Validitas *N* = 12, sig = 5%, *r* = 0.4575**
Y1	45.96	20.915	0.621	0.864	Valid
Y2	46.06	20.963	0.586	0.866	Valid
Y3	46.05	21.189	0.591	0.866	Valid
Y4	45.98	20.811	0.586	0.866	Valid
Y5	46.20	20.751	0.521	0.871	Valid
Z1	45.99	21.231	0.581	0.866	Valid
Z2	45.97	21.443	0.538	0.869	Valid
Z3	46.01	21.265	0.562	0.867	Valid
Z4	45.94	20.908	0.587	0.866	Valid
Z5	45.97	21.672	0.501	0.871	Valid
Z6	45.96	21.113	0.598	0.865	Valid
Z7	46.00	21.475	0.564	0.867	Valid

Reliability Statistics: Cronbach's Alpha: 0.877, *N* of Items: 12.

4.6. Data analysis technique

The analytical technique employed in this study utilizes SmartPLS 3.0 software, specifically partial least squares (PLS). The analysis involves testing the model and relationships among dimensions using structural equation modeling (SEM). The structural model that represents the causal relationships among the dimensions or variables under investigation can be observed in **Figure 2**:

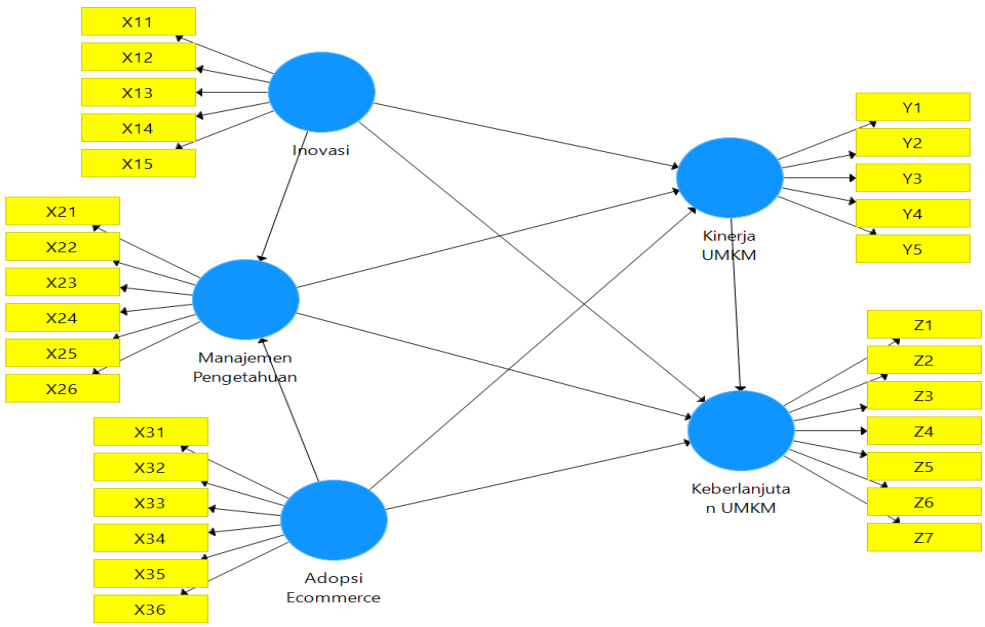

Figure 2. Partial least squares.

The analysis technique is using the SEM with the PLS approach. The analysis technique in this study uses SmartPLS 3.0 software. PLS is one of the variant-based SEM statistical methods designed to solve multiple regressions when specific

problems occur in the data, such as the size of the research sample, the presence of missing value and multicollinearity. According to Suharjo et al. (2009), PLS as a prediction model does not assume a specific distribution to estimate parameters and predict causality relationships (hypothesis testing with prediction models).

To test the model and relationships developed in this study, an analysis technique is needed. The analysis technique used in this study is SEM. SEM is a set of statistical techniques that allow testing a series of complex relative relationships simultaneously (Mardani et al., 2017).

The appearance of a complex model has the impact that in reality the management decision-making process is a complex process or a multidimensional process with various patterns of cascading causal relationships. Therefore, a model as well as an analytical tool that is able to accommodate the multidimensional research is needed.

SEM is an integrated approach between factor analysis, structural modeling, and path analysis for the development of theoretical concepts. To create a complete modeling, it is necessary to perform the following steps:

1) Theoretical Model Development: In the step of developing a theoretical model, what must be done is to carry out a series of scientific exploits through literature review to get justification for the theoretical model to be developed. SEM is used not to produce a model, but to confirm the theoretical model through empirical data.
2) Path Diagram Development: In this second step, the theoretical model that has been built in the first stage will be depicted in a path diagram, which will make it easier to see the causality relationships that you want to test. In the path diagram, the relationships between constructs will be expressed through arrows. A straight arrow indicates a direct causal relationship between one construct and another. The correlation between the constructs built in the path diagram can be distinguished in two groups.
3) Convert Path Diagram into equations: The equation obtained from the converted path diagram consists of:
    a) A structural equation formulated to express the causal relationship between various constructs.

$$V \text{ endogen} = V \text{ eksogen} + V \text{ endogen} + \text{error}$$

    b) The specification equation of the measurement model where the variables that measure the construct must be determined and a series of matrices that show the hypothetical correlation between the constructs or variables.

$$\eta 1 = \gamma 1\xi 1 + \gamma 2\xi 2 + \delta 1$$

$$\eta 2 = \gamma 1\xi 1 + \gamma 2\xi 2 + \beta 1\eta 1 + \delta 2$$

Based on the equations for measuring exogenous variables, endogenous variables, and structural equations above, it can be seen that these equations use mathematical notations. Such notation is one of the efficient approaches to explaining the relationship between latent variables and the measures used to reflect those latent variables and is also the standard rules that are often used for dialogue between SEM researchers. The following table is a summary of the notations used (See **Table 9**).

Table 9. Math notation.

Notasi	Information
ξ (ksi)	Exogenous latent variables (independent variables), described as circles in the structural SEM model
η (eta)	Endogenous latent variables (dependent variables and can also be independent variables on other equations), are also drawn as circles
γ (gamma)	Direct relationship of exogenous variables to endogenous variables
β (beta)	Direct relationship of endogenous variables to endogenous variables
X	Exogenous variable indicators
Z	Endogenous variable indicators
Y	Endogenous variable indicators
λ (lambda)	The relationship between exogenous or endogenous latent variables to their indicators
δ (Delta)	Measurement error of exogenous variable indicators
ε (Epsilon)	Measurement error of endogenous variable indicators
ζ (Zeta)	Errors in the equation are between exogenous and/or endogenous variables against endogenous variables

Source: Processed by Researchers (2021).

Based on the statistical assumptions, PLS is classified as a non-parametric type while SEM is more of a multivariate normal distribution and independent observation (parametric). Therefore, in PLS modeling, data with normal distribution is not required.

4.7. PLS analysis stages

The analysis on PLS is carried out by:

1) The outer model analysis: Outer model analysis is carried out to ensure that the measurements used are suitable for measurement (valid and reliable). Outer model analysis can be seen from several indicators:
   a) Convergent Validity. The convergent validity value is the factor loading value on the latent variable with its indicators. Expected value > 0.7.
   b) Average Variance Extracted (AVE). Expected AVE value > 0.5.
   c) Cronbach Alpha. The reliability test is strengthened with Cronbach Alpha. Expected value > 0.6 for all constructs.
2) The inner model analysis: Meanwhile, inner model analysis/structural model analysis is carried out to ensure that the structural model built is robust and accurate. Evaluation of the inner model can be seen from several indicators which include:
   a) Coefficient of determination (R^2)
   b) Predictive relevance (Q^2)

   To calculate predictive relevance (Q^2) use the formula:

$$Q^2 = 1 - (1 - R1^2)(1 - R2^2)...(1 - Rp^n)\ldots$$

   c) Goodness of Fit Index (GoF)

To calculate the GoF value in SEM with PLS, it is done manually using the formula:

$$\text{GoF} = \sqrt{\text{AVE}^2 \times R^2}$$

4.7.1. Outer model evaluation

Analysis of the outer model from **Figure 3** can be seen the values of several indicators:

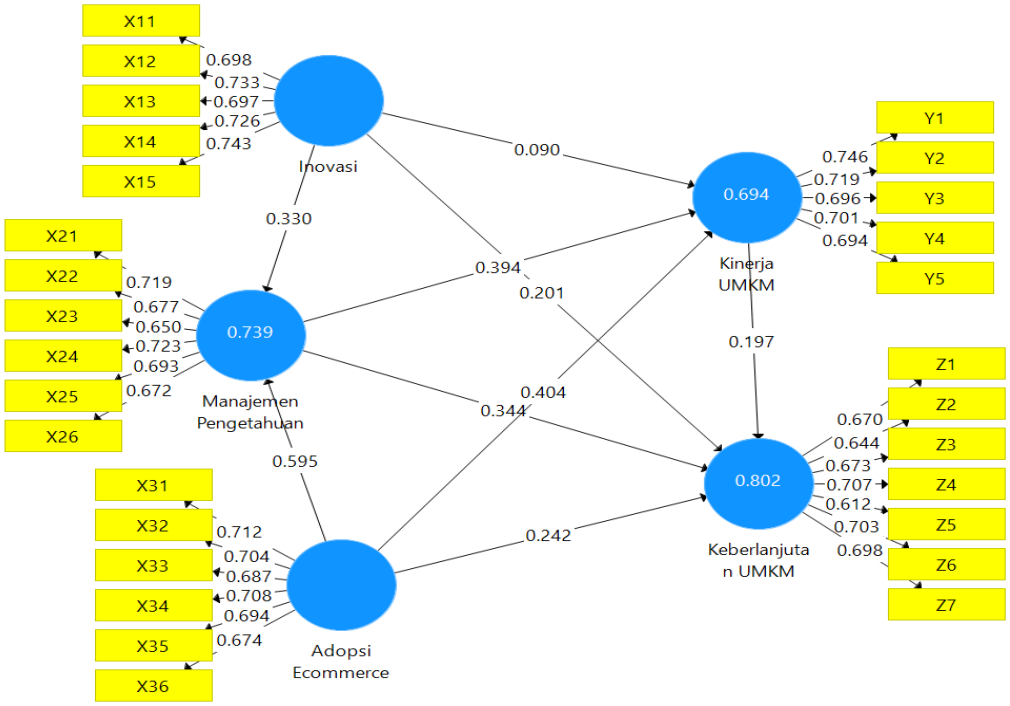

Figure 3. Outer model.

Source: Data Processing Results (2024).

1) Convergent validity. The convergen validity value is the value of loading factors on latent variables with their indicators. There are several factor loading indicators whose values are below 0.7 as seen in **Table 10**.

Table 10. Value loading factor.

	E-commerce Adoption	Innovation	Sustainability of MSMEs	MSME Performance	Knowledge Management
X11		0.698			
X12		0.733			
X13		0.697			
X14		0.726			
X15		0.743			
X21					0.719
X22					0.677
X23					0.650
X24					0.723
X25					0.693
X26					0.672
X31	0.712				
X32	0.704				
X33	0.687				

Table 10. (*Continued*).

	E-commerce Adoption	Innovation	Sustainability of MSMEs	MSME Performance	Knowledge Management
X34	0.708				
X35	0.694				
X36	0.674				
Y1				0.746	
Y2				0.719	
Y3				0.696	
Y4				0.701	
Y5				0.694	
Z1			0.670		
Z2			0.644		
Z3			0.673		
Z4			0.707		
Z5			0.612		
Z6			0.703		
Z7			0.698		

Source: Data Processing Results (2024).

The loading value of factors below 0.7 can be seen for the innovation variables, namely X11 and X13, then for the knowledge management variables, namely X22, X23, X25, and X26, then for the e-commerce adoption variables, namely X33, X35, and X36, then for the MSME performance variables, namely Y3 and Y5, and for the MSME sustainability variables, namely Z1, Z2, Z3, Z5, and Z7.

2) Average variance extracted (AVE). The expected AVE value is > 0.5 (see **Table 11**).

Table 11. Average variance extracted (AVE).

	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Ecommerce Adoption (X3)	0.788	0.788	0.850	0.486
Innovation (X1)	0.767	0.768	0.843	0.518
MSMEs Sustainability (Z)	0.798	0.800	0.853	0.453
MSME Performance (Y)	0.756	0.757	0.837	0.506
Knowledge Management (X2)	0.779	0.781	0.844	0.475

Source: Data Processing Results (2024).

Because the AVE values for e-commerce adoption (X3), MSME sustainability (Z), and knowledge management (X2) are smaller than 0.5, the loading factor indicators of each of these variables that are dropped, are only the smallest factor loading, namely X23, X36, Z2, and Z5, which are expected to have an AVE value greater than 0.5. Therefore, the analysis continues to the SEM-PLS analysis stage 2nd.

4.7.2. Outer model evaluation phase 2

After some of the indicators with the minor loading factors, X23, X36, Z2, and Z5, are removed, then they are recalculated to produce a new outer model as follows:

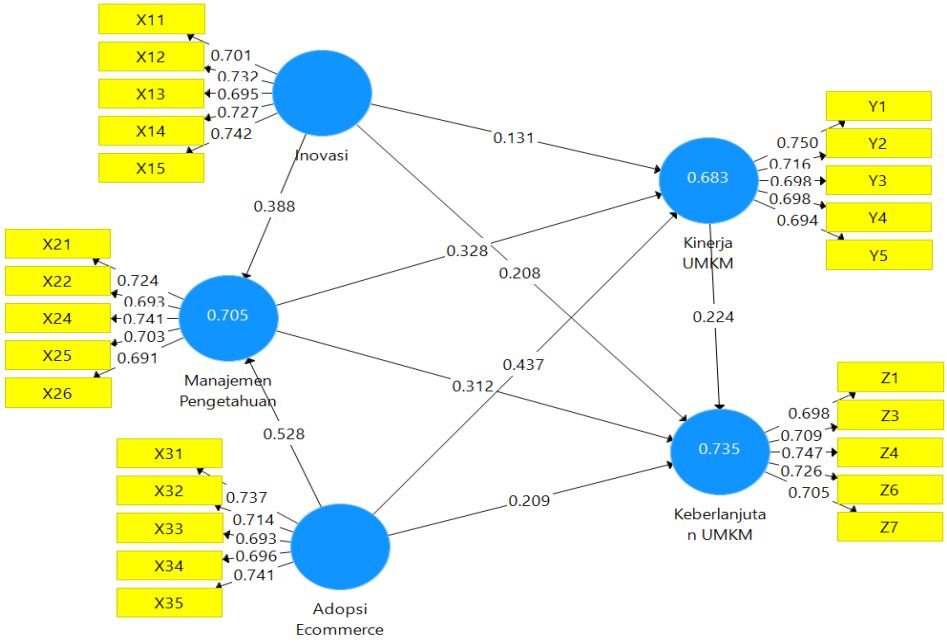

Figure 4. Outer model phase-2.

Source: Data Processing Results (2024).

Analysis of the outer model from **Figure 4** can be seen the values of several indicators:

1) Convergent validity. The convergent validity value is the value of loading factors on latent variables with their indicators. There are several loading factor indicators whose values are below 0.7 as seen in the **Table 12**.

Table 12. Loading factor value stage-2.

	E-commerce Adoption	Innovation	Sustainability of MSMEs	MSME Performance	Knowledge Management
X11		0.701			
X12		0.732			
X13		0.695			
X14		0.727			
X15		0.742			
X21					0.724
X22					0.693
X24					0.741
X25					0.703
X26					0.691
X31	0.737				
X32	0.714				
X33	0.693				
X34	0.696				
X35	0.741				
Y1				0.750	
Y2				0.716	

Table 12. (*Continued*).

	E-commerce Adoption	Innovation	Sustainability of MSMEs	MSME Performance	Knowledge Management
Y3				0.698	
Y4				0.698	
Y5				0.694	
Z1			0.698		
Z3			0.709		
Z4			0.747		
Z6			0.726		
Z7			0.705		

Source: Data Processing Results (2024).

The loading value of the stage-2 factor, which is below 0.7, has decreased a lot, although it is still visible for the innovation variable, namely X13, then for the knowledge management variable, namely X22, and X26, then for the e-commerce adoption variable, namely X33 and X34, then for the MSME performance variable, namely Y3, Y4 and Y5, and for the MSME sustainability variable, namely Z1.

2) Average variance extracted (AVE). The expected AVE value is > 0.5 (See **Table 13**).

Table 13. Average variance extracted (AVE) stage-2.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
E-commerce Adoption	0.763	0.763	0.840	0.513
Innovation	0.767	0.768	0.843	0.518
Sustainability of MSMEs	0.764	0.765	0.841	0.514
MSME Performance	0.756	0.757	0.837	0.506
Knowledge Management	0.755	0.756	0.836	0.505

Source: Data Processing Results (2024).

The results of the calculation of stage-2 of the average variance extracted (AVE) value for all variables are now above 0.5, both for innovation (X1), knowledge management (X2), e-commerce adoption (X3), MSME performance (Y) and MSME sustainability (Z). So, for the stage-2 loading factor indicator below 0.7 of each of these variables, it does not need to be dropped so that it can be used for the following analysis: reliability analysis with Cronbach alpha.

3) Cronbach's alpha. The reliability test is strengthened with Cronbach alpha. The expected value is > 0.6 for all constructs. In **Table 13**, it can be seen that the results of the calculation of stage 2 of Cronbach's Alpha values for all variables are above 0.6, so the reliability requirements are met.

From the results of the calculation of stage 2 for the evaluation of the outer model (structural model), it can be concluded that the requirements of SEM-PLS for loading factor (LF), average variance extracted (AVE), and reliability with Cronbach's alpha can be met. Therefore, the following analysis is carried out to evaluate the inner model (measurement model).

4.7.3. Inner model evaluation

Hypothesis testing is carried out based on the results of the inner model test which includes *R*-square output, parameter coefficient and *T*-statistics. These values can be seen from the bootstrapping results (See **Figure 5**).

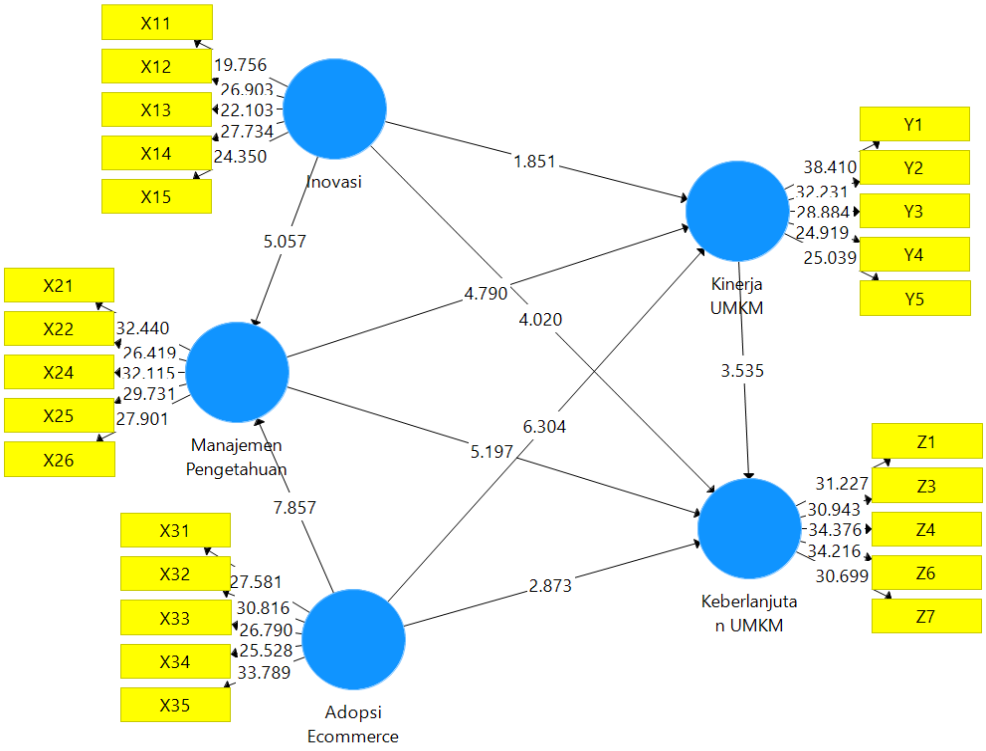

Figure 5. Results of bootstrapping research model.

Source: Data Processing Results (2024).

The following are the results of the hypothesis test obtained in this study through the inner model (See **Table 14**).

Table 14. Path coefficient.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	*P* Values
E-commerce Adoption → MSME Sustainability	0.209	0.210	0.073	2.873	0.004
E-commerce Adoption → MSME Performance	0.437	0.434	0.069	6.304	0.000
E-commerce Adoption → Knowledge Management	0.528	0.522	0.067	7.857	0.000
Innovation > MSME Sustainability	0.208	0.217	0.052	4.020	0.000
Innovation > MSME Performance	0.131	0.137	0.071	1.851	0.065
Innovation → Knowledge Management	0.388	0.394	0.077	5.057	0.000
MSME Performance → MSME Sustainability	0.224	0.223	0.063	3.535	0.000
Knowledge Management → MSME Sustainability	0.312	0.303	0.060	5.197	0.000
Knowledge Management → MSE performance	0.328	0.325	0.069	4.790	0.000

Source: Data Processing Results (2024).

Path coefficient evaluation is used to show how strong the effect or influence of independent variables is on dependent variables. Meanwhile, coefficient

determination (*R*-Square) measures how much other variables affect endogenous variables. Hair et al. (2021), stated that the R2 result of 0.67 and above for endogenous latent variables in the structural model indicates that the influence of exogenous variables (which affect) on endogenous variables (influenced) is included in the excellent category. Meanwhile, if the result is 0.33–0.67, it is included in the medium category, and if the result is 0.19–0.33, it is included in the weak category.

The *t*-count value shows how strong the influence of one variable is on other variables. Based on the inner model scheme shown in **Table 14**, it can be explained that the most considerable t-count value is shown by the influence of e-commerce adoption on knowledge management 7.857. The second most significant influence is the influence of e-commerce adoption on the performance of MSMEs by 6304, and the smallest influence is shown by the influence of innovation on the performance of MSMEs by 1851.

Hypothesis testing is carried out based on the inner model (structural model) test results, which include *R*-square output, parameter coefficient, and *T*-statistics. To see whether a hypothesis can be accepted or rejected, attention must be paid to *T*-statistics and *P*-values. This research hypothesis was tested with the help of Smart-PLS 3.0 software. These values can be seen from the bootstrapping results. The rules of thumb used in this study were *t*-statistics >1.96 with a significance level of *p*-value 0.05 (5%) and a positive beta coefficient. Based on the data presentation in **Table 15**, it can be seen that there is one of the hypotheses proposed in this study has a statistical *T* of < 1.96 and *P* values > 0.05, so it is rejected.

The following are the results of the hypothesis model test obtained in this study through the inner model:

Table 15. Hypothesis test results.

	***T* Statistics (|O/STDEV|)**	***P* Values**	**Result**
E-commerce Adoption → MSME Sustainability	2.873	0.004	Accepted
E-commerce Adoption → MSME Performance	6.304	0.000	Accepted
E-commerce Adoption → Knowledge Management	7.857	0.000	Accepted
Innovation → MSME Sustainability	4.020	0.000	Accepted
Innovation → MSME Performance	1.851	0.065	Rejected
Innovation → Knowledge Management	5.057	0.000	Accepted
MSME Performance → MSME Sustainability	3.535	0.000	Accepted
Knowledge Management → MSME Sustainability	5.197	0.000	Accepted
Knowledge Management → MSME Performance	4.790	0.000	Accepted

Source: Data Processing Results (2024).

4.7.4. Direct impact analysis

Based on the data presentation in **Table 16**, it can be seen that nine of the hypotheses proposed in this study are as follows:

Table 16. Path coefficient direct influence.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	*T* Statistics (|O/STDEV|)	*P* Values	Hypothesis
E-commerce Adoption → MSME Sustainability	0.209	0.210	0.073	2.873	0.004	Accepted
E-commerce Adoption → MSME Performance	0.437	0.434	0.069	6.304	0.000	Accepted
E-commerce Adoption → Knowledge Management	0.528	0.522	0.067	7.857	0.000	Accepted
Innovation > MSME Sustainability	0.208	0.217	0.052	4.020	0.000	Accepted
Innovation > MSME Performance	0.131	0.137	0.071	1.851	0.065	Rejected
Innovation → Knowledge Management	0.388	0.394	0.077	5.057	0.000	Accepted
MSME Performance → MSME Sustainability	0.224	0.223	0.063	3.535	0.000	Accepted
Knowledge Management → MSME Sustainability	0.312	0.303	0.060	5.197	0.000	Accepted
Knowledge Management → MSME Performance	0.328	0.325	0.069	4.790	0.000	Accepted

Source: Data Processing Results (2024).

From the 9 hypotheses above, it can be concluded that the strongest and most significant influence is the influence of e-commerce adoption on knowledge management, while the insignificant influence is the influence of innovation on performance. According to Love and Roper (2015), the innovations carried out by MSMEs have not been structured, and it is not even clear what innovations they use (Love and Roper, 2015).

4.7.5. Indirect influence analysis

Based on the data presentation in **Table 17**, it can be seen that nine of the hypotheses proposed in this study are as follows:

Table 17. Path coefficient indirect influence.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	*T* Statistics (|O/STDEV|)	*P* Values	Hypothesis
Innovation → MSME Performance → MSME Sustainability	0.029	0.030	0.018	1.652	0.099	Rejected
Innovation → Knowledge Management → MSME Performance	0.127	0.126	0.028	4.594	0.000	Accepted
Knowledge Management →MSME Performance > -MSME Sustainability	0.074	0.074	0.029	2.536	0.012	Accepted
E-commerce Adoption → MSME Performance → MSME Sustainability	0.098	0.096	0.031	3.191	0.002	Accepted
E-commerce Adoption → Knowledge Management → MSME Sustainability	0.165	0.159	0.040	4.132	0.000	Accepted
Innovation → Knowledge Management → MSME Sustainability	0.121	0.118	0.029	4.124	0.000	Accepted.
E-commerce Adoption → Knowledge Management → MSME Performance	0.173	0.172	0.050	3.496	0.001	Accepted
E-commerce Adoption → Knowledge Management → MSME Performance → MSME Sustainability	0.039	0.039	0.018	2.192	0.029	Accepted
Innovation → Knowledge Management → MSME Performance → MSME Sustainability	0.029	0.028	0.011	2.612	0.009	Accepted

Source: Data Processing Results (2024).

From the nine indirect influence hypotheses above, it can be concluded that all hypotheses are acceptable; only the most robust path is innovation through knowledge management on MSME performance with a *T*-value = 4.594.

5. Research Findings and Novelty

From the SEM PLS analysis results, all the test results of the above hypothesis model can be described in the path model based on the *T*-value in **Table 18** and the inner model in **Figure 6**. When viewed from the initial process of the movement of variable paths, namely innovation and e-commerce adoption to MSME performance and sustainability, it can be seen that there are four priority paths or the most robust paths in order as follows: 1) The adoption of e-commerce strengthens knowledge management to support the sustainability of MSMEs; 2) Innovation strengthens knowledge management to support MSME performance; 3) Innovation strengthens knowledge management to support the sustainability of MSMEs; 4) E-commerce adoption strengthens knowledge management to support MSME performance.

The four priority paths show that innovation and e-commerce adoption lead to knowledge management first, so knowledge management can bridge or have the strongest central role in achieving the ultimate goal of MSME sustainability.

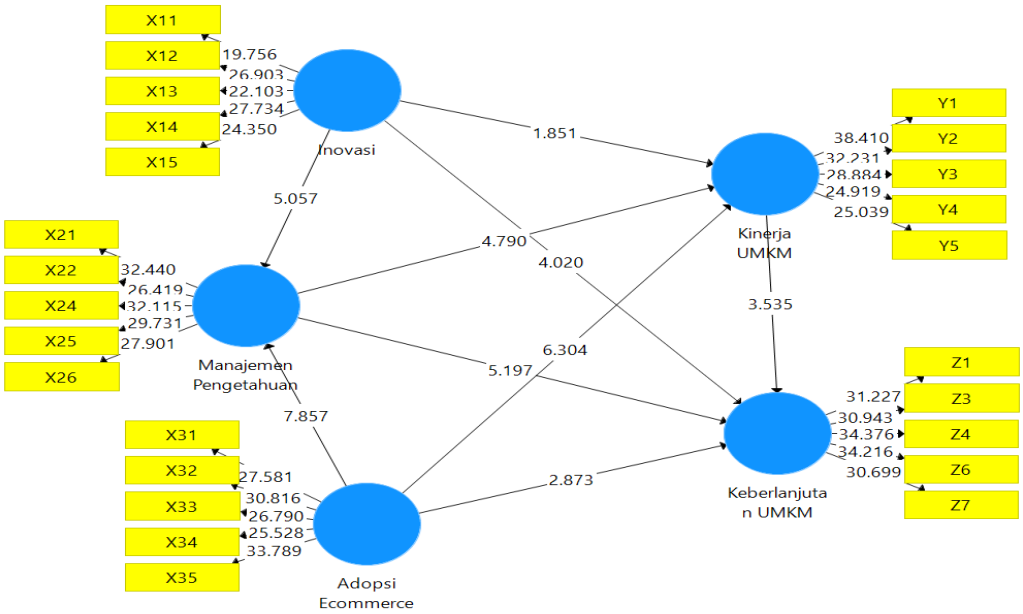

Figure 6. Inner model.

Source: Data Processing Results (2024).

Table 18. *T*-Value direct influence.

Variable Relationship	*T* Statistics (|O/STDEV|)
E-commerce Adoption → MSME Sustainability	2.873
E-commerce Adoption → MSME Performance	6.304
E-commerce Adoption → Knowledge Management	7.857
Innovation - > MSME Sustainability	4.020
Innovation → MSME Performance	1.851

Table 18. (*Continued*).

Variable Relationship	*T* Statistics (|O/STDEV|)
Innovation → Knowledge Management	5.057
MSME Performance → MSME Sustainability	3.535
Knowledge Management → MSME Sustainability	5.197
Knowledge Management - >MSME Performance	4.790

Source: Data Processing Results (2024).

The adoption of e-commerce through knowledge management is most strongly starting to drive the sustainability of MSMEs. Then, the most powerful thing that affects sustainability is knowledge management, not MSME performance.

Knowledge management directly affects sustainability and strengthens the performance of MSMEs supported by e-commerce, although their performance is not very strong in affecting sustainability.

Furthermore, it can also be concluded that knowledge management is the main key activity for the sustainability and performance of MSMEs. The adoption of e-commerce is an effective way to encourage knowledge management rather than innovation because it has a strong direct influence on knowledge management and, at the same time, on the performance of MSMEs.

Therefore, as a priority for MSMEs that can be sustainable, they are encouraged to use e-commerce, without going through innovation first because MSMEs will form their own knowledge management after adopting e-commerce, which will ultimately encourage the sustainability of MSMEs. Performance can be later because performance itself is formed by knowledge management. In this case, innovation is the second priority and is insignificant compared to the adoption of e-commerce.

From the results of the research findings in an integrated manner, the novelty in this study gives rise to novelty explained in detail as follows: 1) It was found that the variable of e-commerce adoption contributes to knowledge management and encourages the sustainability of MSMEs; 2) It was found that the variable of e-commerce adoption contributes to knowledge management, resulting in performance that drives the sustainability of MSMEs; 3) In this case, the innovation variable is not the main but becomes the second choice after adopting e-commerce to encourage the sustainability of MSMEs.

6. Conclusions

In light of the path analysis results obtained through SEM-PLS, which explored the interplay between MSME performance and sustainability against the backdrop of variables such as innovation, knowledge management, and e-commerce adoption, several key insights emerge.

Firstly, e-commerce adoption emerges as the most influential driver of MSME sustainability, particularly when channeled through knowledge management. It also plays a significant role in enhancing MSME sustainability through its impact on performance, though this influence is secondary to its effect through knowledge management.

Secondly, knowledge management itself directly influences the sustainability of

MSMEs and contributes to improving their performance. Although e-commerce adoption supports this process, its direct effect on sustainability is not as substantial as its impact through knowledge management.

Furthermore, knowledge management is identified as a critical component for ensuring the sustainability of MSMEs. Once established, it serves as a foundation for boosting MSME performance.

Lastly, e-commerce adoption proves to be more effective than innovation in fostering knowledge management. It exerts a strong direct influence on both knowledge management and MSME performance, underscoring its pivotal role in driving overall MSME success.

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