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The Influence of Artificial Intelligence Integration, Customer Technology Proficiency, Innovation Culture on E-Commerce Adoption and Its Impact on Marketing Performance With Entrepreneurial Orientation as a Moderation Variable

Andy Kurniawan, Dorojatun Prihandono
Universitas Negeri Semarang, Indonesia
Email: Ak22land@students.unnes.ac.id, dprihandono@mail.unnes.ac.id

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Marketing Performance, E-commerce Adoption, Artificial Intelligence Integration, Customer Technology Sevviness , Innovation Culture

ABSTRACT
This research is motivated by the low level of e-commerce adoption among Kendal's Micro, Small, and Medium Enterprises (MSMEs), despite the government's implementation of various initiatives to support digital transformation. This study aims to analyze the influence of artificial intelligence integration, customer technology savviness, and innovation culture on e-commerce adoption and its impact on marketing performance, with entrepreneurial orientation as a moderating variable. The sampling technique used in this study was purposive sampling, a non-probability sampling method, using primary data sources. The population included all MSMEs in Kendal. The sample consisted of 300 respondents, all MSMEs in Kendal. Data collection was conducted using an online questionnaire via Google Forms. Data processing employed Partial Least Square Structural Equation Modeling (PLS-SEM). The results showed that AI integration had a positive and significant effect on marketing performance for MSMEs in Kendal Regency. AI integration has a positive and significant effect on e-commerce adoption for MSMEs in Kendal Regency. Customer technology savviness has a positive (β = 0.948) and significant effect on marketing performance for MSMEs in Kendal Regency. Customer technology savviness has a positive and significant effect on e-commerce adoption for MSMEs in Kendal Regency. Innovation culture has a positive and significant effect on marketing performance for MSMEs in Kendal Regency. Innovation culture has a positive and significant effect on e-commerce adoption for MSMEs in Kendal Regency. E-commerce adoption has a positive and significant effect on marketing performance for MSMEs in Kendal Regency. Entrepreneurial orientation significantly moderates and strengthens the relationship between e-commerce adoption and MSME marketing performance.

INTRODUCTION

The Micro, Small, and Medium Enterprises (MSMEs) sector is one of the main pillars of the national economy that contributes significantly to Gross Domestic Product (GDP) (Sunoko et al., 2022), labor absorption (Nursini, 2020), and broad economic and social benefits (Setyaningrum et al., 2023). The Coordinating Ministry for Economic Affairs of Indonesia (2023) reported that MSMEs account for at least 61% of GDP with a value of IDR 9,580 trillion. In addition, this sector also absorbs 97% of the national workforce or around 117 million people. With around 66 million business units, MSMEs are the main drivers of national economic growth, especially in labor absorption (GoodStats, 2023).

Along with economic expansion, micro, small, and medium enterprises (MSMEs) face increasingly fierce business competition. This condition is caused by the increasing demands of consumers who are increasingly selective in choosing goods and services (Fitriati et al., 2020). To maintain competitiveness and improve performance, MSMEs need to develop more adaptive and sustainable business strategies (Susanti et al., 2023). In addition, optimal use of technology is also needed to expand the customer base, increase operational

effectiveness, and accelerate the achievement of competitive advantages (Cunningham et al., 2023). In this context, the use of technology is one of the crucial factors that affects the performance of MSMEs in the current digital era (Prihandono, 2024).

The data presented in table 1.1 above shows that there is a change in the number of MSME units, and growth fluctuates from year to year in Indonesia. This phenomenon shows that the level of stability in the number of business units has not been successfully achieved, thus reflecting certain dynamics or challenges that consistently affect business growth and sustainability (Kadin, 2023). In their efforts to achieve sustainability and broader business development, MSMEs in developing countries face a number of challenges such as poor infrastructure and limited access to technology, preventing these countries from progressing and hindering their ability to expand on a large scale (Salah & Ayyash, 2024b).

Marketing performance drives the overall success of MSMEs in the sustainability process (Sudirjo et al., 2023). To ensure that MSMEs function properly, effective marketing methods, especially digital marketing, are essential (Yhonathan et al., 2024). Digital marketing can increase market access and competitiveness of MSMEs by utilizing online platforms such as social media, websites, and e-commerce adoption (Tresnasari, 2023). Previous research states that the marketing performance of MSMEs is driven by e-commerce, and MSMEs require improved marketing performance (Sugandini et al., 2021).

E-commerce adoption can increase product sales and create opportunities for MSME actors (Darwin, 2020). Additionally, e-commerce makes it easier for customers to purchase goods and increases the company's marketing reach (Sanaji, 2023). Research has shown that e-commerce adoption improves marketing performance by building two-way communication and improving company image, which has a positive impact on SME sales performance (Kumar, 2023).

In the context of digital transformation, the Technology, Organization, Environmental (TOE) framework has become the dominant approach in understanding e-commerce in MSMEs. Previous studies have highlighted the role of organizational factors such as management support and technological readiness in influencing e-commerce adoption (Abed et al., 2020; Oliveira et al., 2019). However, this approach has not fully captured the new dynamics in the digital era, where AI integration, innovation culture, and customer tech-savviness are increasingly important driving forces (Gu, 2023; Skare et al., 2023; Wang & Esperança, 2023).

AI integration influences marketing strategies by changing business models, modifying sales processes, and altering customer service patterns to consumer behavior through systematic data processing and adaptive learning (Davenport et al., 2020; Haenlein et al., 2019). AI plays an important role in improving marketing efficiency and effectiveness by analyzing consumer data in real-time for more accurate decision-making (Paschen et al., 2019). A study by Islam & Rob (2022) shows that AI adoption has a significant impact on improving market responsiveness and e-commerce campaign accuracy. With this ability, business actors are encouraged to expand markets beyond the traditional segment to maintain competitiveness (Basri, 2020; Odoom & Mensah, 2019).

Various previous studies have shown that the integration of Artificial Intelligence (AI) contributes positively to the improvement of marketing performance. AI enables the automation of marketing campaigns through the use of chatbots, automated email marketing,

and machine learning-based product recommendation systems that are able to improve operational efficiency and personalized customer experiences (Schwaeke et al., 2024; Wagobera Edgar Kedi et al., 2024; Elhajjar, 2024). However, the findings of Akter et al. (2023) indicate that not all customers gain equal access to AI-based services, which can create digital exclusion that risks lowering marketing performance. This shows that the influence of AI on performance is not always positive and universal.

In the context of e-commerce, AI has become a key supporting technology in improving the capabilities of digital platforms. Research by A. Y. Areiqat et al. (2021) and Fonseka & Jaharadak (2022) confirms that the use of AI in e-commerce plays an important role in providing customized services through customer comment analysis and chatbot-based interactive systems. This technology helps companies create competitive advantages in digital marketing strategies (Massoudi et al., 2024). Nonetheless, Salah & Ayyash (2024a) found that most SMEs do not yet have organizational structures and cultures ready to handle AI integration, such as resistance to change and weak strategic vision, so the relationship between AI and e-commerce adoption is not always significant.

The variable of customer tech-savviness also received attention in relation to marketing performance. Santiago & Pimenta (2021) and Naveed Abbas (2024) state that customers' level of technological proficiency contributes to increased accessibility, engagement, and personalized experiences through digital devices such as smartphones. However, Atkinson (2024) reports that in some contexts, customer tech-savviness does not show a significant relationship with performance, which can be caused by a mismatch between customer sophistication and the company's readiness to utilize the technology.

In terms of e-commerce adoption, research by Zaman et al. (2022), Apergis (2019), and Alarifi (2022) confirms the positive relationship between customer tech-savviness and e-commerce adoption. Technologically ready customers encourage ease of interaction and digital transactions. On the other hand, AlBar & Hoque (2019) stated that in some studies, customer tech-savviness did not have a significant effect on e-commerce adoption, which may be due to a lack of digital literacy or other technical barriers.

In the adoption of e-commerce, the culture of innovation has proven to have a significant contribution. Faccia et al. (2023) and Skare et al. (2023) emphasized that the higher the level of innovation culture in an organization, the greater the opportunity to adopt e-commerce sustainably. However, the findings of Ariansyah et al. (2021) state that in some cases, the culture of innovation does not show a real influence on e-commerce adoption, which may be due to a lack of managerial support or weak technological readiness.

Various previous studies have examined the relationship between e-commerce adoption and marketing performance, especially in the context of MSMEs. In general, e-commerce adoption is believed to have a positive impact on the achievement of marketing performance, such as expanding market reach, increasing customer interaction, and streamlining the transaction process (Sugandini et al., 2021; Mukhtar et al., 2019; Natasyah & Nasution, 2023). However, the findings are not completely conclusive. Research by Hartati et al. (2021), for example, shows that the adoption of e-commerce does not have a significant effect on the marketing performance of MSMEs in Bekasi City. This indicates that there is a discrepancy (research gap) in the relationship between e-commerce adoption and marketing performance, which has not been fully explained.

The inconsistency of the research results raises the suspicion that there are other variables that can affect the strength and direction of the relationship between e-commerce adoption and marketing performance. In this case, the researcher identified a moderation variable that theoretically and empirically has the potential to bridge these inconsistencies. One of the relevant variables that has been widely discussed in marketing and entrepreneurship studies is entrepreneurial orientation.

The selection of entrepreneurial orientation as a moderation variable is based on several considerations. First, entrepreneurial orientation has been recognized as an important element in encouraging business actors to be more innovative, dare to take risks, and be responsive to market opportunities, including in the use of digital technology such as e-commerce (Lukiyana & Yusuf, 2022; Wijaya, 2021). Several studies show that entrepreneurial orientation is able to amplify the positive impact of e-commerce on marketing performance. However, on the other hand, there are also findings that state that under certain conditions, the influence of entrepreneurial orientation moderation is not significant. Limited digital capability, low organizational readiness, and resistance to change actually hinder business actors from maximizing the function of entrepreneurial orientation in the context of digitalization (Fadda, 2018; Li et al., 2022).

This condition reinforces the argument that entrepreneurial orientation can be a variable that moderates the relationship between e-commerce adoption and marketing performance. This means that the success of MSMEs in utilizing e-commerce to improve marketing performance is very likely to depend on the extent to which business actors have a strong entrepreneurial orientation.

Based on the study, there are indications of differences in the results of previous research that cannot be concluded with certainty because they are influenced by several factors (Franke & Sarstedt, 2019). First, the difference in results arises because the research was conducted using a variety of indicators. Second, the combination of other variables in each study also causes variations in results. Third, differences in industries and sectors with different characteristics have an impact on the results of the study. Fourth, differences in the selection and use of sample sizes and sampling techniques also contribute to the inconsistency of the results.

At the level of MSME marketing growth, the role of entrepreneurial orientation as moderation by company managers has a higher positive impact when adopting e-commerce (Abebe, 2014; Lukiyana & Yusuf, 2022). In cases like this, MSME managers are more proactive, risk-taking, and innovative. When they start adopting e-commerce technology, their level of entrepreneurial orientation can significantly increase the direction and/or strength of influence of e-commerce adoption on the company's marketing performance (Yacob et al., 2021). They can leverage a variety of e-commerce tools to take more risks, seek out new business opportunities, create new products or services, and respond to the ever-changing business environment in real time (Vrontis et al., 2022).

Adding entrepreneurial orientation as an important factor, the owner and manager explained how it affects the relationship between e-commerce adoption and the performance of MSMEs. The results show that managers with a high level of entrepreneurial orientation are more likely to implement e-commerce technology in such a way that it can provide better performance than managers with a low level of entrepreneurial orientation (Hossain et al.,

2024). Previous research has found that managers' entrepreneurial orientation plays an important role in how e-commerce adoption affects the performance of MSMEs. MSME owners and managers can consider hiring managers who have a high level of entrepreneurial orientation or provide training to improve managers' risk-taking, innovation, and proactive behaviors to fully utilize e-commerce tools (Abebe, 2014b).

The first study by Akter et al. (2023) and the second by Salah & Ayyash (2024a) demonstrate the positive impact of AI integration on improving marketing performance. However, they highlight that not all customers have equal access to AI-based services, leading to potential digital exclusion, which can lower marketing performance. Akter et al. emphasize the issue of digital exclusion affecting marketing efficiency, while Salah & Ayyash note that many SMEs are unprepared for AI integration due to resistance to change and low strategic readiness. This study addresses the gap in the literature by proposing that AI adoption in e-commerce may be influenced by factors such as entrepreneurial orientation, which moderates the relationship between e-commerce adoption and marketing performance. This contribution adds new insight by testing whether entrepreneurial orientation can optimize e-commerce adoption and enhance marketing performance in SMEs, particularly in developing markets like Indonesia.

This study aims to examine the moderating role of entrepreneurial orientation in the relationship between e-commerce adoption and marketing performance in SMEs. The benefits of this study are to provide a deeper understanding of the factors influencing the success of e-commerce adoption in SMEs, especially in developing markets. The findings could serve as a basis for policy-making to enhance technology adoption and drive sustainable marketing growth in SMEs.

METHOD

This study uses a quantitative approach as the basis for analysis. This approach focuses on collecting and processing numerical data to identify patterns and test theories. The goal is to explain the relationships between variables in a systematic and objective manner (Scott, 2017).

The type of research used in this study is causal-comparative (explanatory). This study aims to explain the cause-and-effect relationship between the variables of AI integration, customer technology savviness, and innovation culture on e-commerce adoption. In addition, this study also analyzes its impact on MSME marketing performance by considering entrepreneurial orientation as a moderation variable (Creswell & Creswell, 2017).

This research model is designed using *Structural Equation Modeling* (SEM) to test the relationships between latent constructs simultaneously. The researcher used *Partial Least Squares* (PLS) because it is suitable for moderate sample sizes, non-normally distributed data, and complex models. The selection of this method is based on the consideration of the effectiveness of the analysis under such conditions (Hair et al., 2019).

The respondents in this study are Micro, Small, and Medium Enterprises (MSMEs) in Kendal Regency, which are classified based on the criteria of the number of assets and turnover in accordance with the Law of the Republic of Indonesia Number 20 of 2008 concerning Micro, Small, and Medium Enterprises (BPK RI, 2008). These business actors have adopted e-commerce in carrying out their business activities. Respondent selection

technique uses purposive sampling with the following criteria: (1) businesses are included in the micro, small, or medium categories as stipulated in the regulation, (2) have been operating for at least three years, (3) have utilized digital platforms for marketing or sales activities, and (4) business actors are the main decision-makers in the business (Sekaran, 2016). Kendal Regency was chosen as the research location because this area actively supports the digitalization of MSMEs through training and government policies, and has significant developments in the utilization of *e-commerce* in the MSME sector (Kendal Regency Government, 2021).

Data collection in this study was carried out in July 2025. The collection technique used a closed-ended questionnaire with a Likert scale of 1–5 to measure the level of respondents' agreement with the submitted statements. The questionnaire instrument was developed from previous research indicators that have been proven to be valid and reliable. The distribution of the questionnaire was carried out online through *Google Forms* or offline directly to respondents (Scott, 2020).

This research instrument was not pre-tested because all indicators used came from previous research that had been proven to be valid and reliable. The indicators are adapted from models developed by Kreiser et al. (2002) and Venkatesh & Bala (2012). The validity and reliability of the instrument have been tested in various previous research contexts, so it is believed to remain relevant for use in this study. Therefore, the researcher directly used the instrument in the data collection process.

Data analysis is carried out using *SmartPLS* software, with the following stages:

1. Outer model test, to assess the validity of the construct and the reliability of the indicator (Hair et al., 2019).
2. Inner model test, to test the relationship between latent constructs and the strength of influence between variables (Hair et al., 2019).
3. Moderation test, to evaluate the role of entrepreneurial orientation in strengthening or weakening the relationship between e-commerce adoption and MSME marketing performance (Chin, 1998).

RESULT AND DISCUSSION

Descriptive Analysis of Research Variables

Marketing Performance

Table 1 Answers to Marketing Performance Variables

Statement	STS		TS		N		S		SS	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
KP1	0	0	11	3.7	55	18.3	128	42.7	106	35.3
KP2	0	0	21	7	60	20	107	35.7	112	37.3
KP3	0	0	21	7	59	19.7	124	41.3	96	32
KP4	0	0	9	3	56	18.7	130	43.3	105	35
KP5	0	0	20	6.7	40	13.3	151	50.3	89	29.7

Source: Data Processed by the Author, 2025

Based on the table above, respondents generally tend to agree and strongly agree that e-commerce has a positive impact on the marketing performance of MSMEs. The statement "Business profitability increases after adopting e-commerce" (KP4) with the highest score

with 43.3% respondents agreeing and 35% strongly agreeing. The statement "Business revenue increased after using e-commerce" (KP2) with 35.7% agreeing and 37.3% strongly agreeing, still predominantly positive, but relatively lower than other items. The increase in profitability and operational effectiveness is more felt than the increase in direct revenue.

E-Commerce Adoption

Table 2. Variable Answers to E-Commerce Adoption

Statement	STS		TS		N		S		SS	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
AO1	0	0	15	5	59	19.7	133	44.3	93	31
AO2	0	0	26	8.7	54	18	111	37	109	36.3
AO3	0	0	23	7.7	62	20.7	114	38	101	33.7
AO4	0	0	28	9.3	50	16.7	115	38.3	107	35.7
AO5	0	0	21	7	59	19.7	132	44	88	29.3

Source: Data Processed by the Author, 2025

Based on the table above, respondents generally show a high level of commitment in adopting e-commerce. The statement "Integrating e-commerce into business operations" had the highest response with 44.3% agreeing and 31% strongly agreeing. The statement "Companies are targeting e-commerce use" had the lowest response with 38.3% agreeing and 35.7% strongly agreeing. MSMEs are more ready to integrate directly into operations rather than just targeting use.

AI Integration

Table 3. AI Integration Variable Answers

Statement	STS		TS		N		S		SS	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
IA1	0	0	23	7.7	94	31.3	124	41.3	59	19.7
IA2	0	0	29	9.7	80	26.7	132	44	59	19.7
IA3	0	0	30	10	74	24.7	123	41	73	24.3
IA4	0	0	16	5.3	87	29	120	40	77	25.7
IA5	0	0	11	3.7	53	17.7	175	58.3	61	20.3

Source: Data Processed by the Author, 2025

Based on the table above, in general, responses tend to be positive towards the use of AI, although the level of agreement varies. The statement "AI helps identify fake customers" had the highest response with 58.3% agreeing and 20.3% strongly agreeing. The statement "AI helps monitor consumer behavior" had the lowest response with 41.3% agreeing and 19.7% strongly agreeing. MSMEs are more likely to benefit from AI in business security (fraud detection) than monitoring consumer behavior.

Customer's Technology Prowess

Table 4. Answers to Customer Technology Proficiency Variables

Statement	STS		TS		N		S		SS	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
KTP1	0	0	19	6.3	56	18.7	135	45	90	30
KTP2	0	0	25	8.3	62	20.7	114	38	99	33
KTP3	0	0	25	8.3	65	21.7	111	37	99	33
KTP4	0	0	31	10.3	53	17.7	114	38	102	34
KTP5	0	0	22	7.3	68	22.7	129	43	81	27

Source: Data Processed by the Author, 2025

Based on the table above, in general, the majority of respondents consider customers to be quite capable of using technology. The statement "Life is boring without technology" had the highest score with 43% agreeing and 27% strongly agreeing. The lowest statement was "Active in internet activity" with 38% agreeing and 34% strongly agreeing. Customers rely heavily on technology, although not all are always active on the internet.

Culture of Innovation

The culture of innovation in MSMEs is relatively good, especially related to the acceptance of new ideas. The statement "There is no punishment if an idea fails" had the highest response' with 46% agreeing and 29% strongly agreeing. Lowest statement: BI1 "Management actively seeks fresh ideas") with 38% agreeing and 32% strongly agreeing. The results show that the innovation environment is quite supportive (not punishing failure), but management initiatives to seek new ideas are still lacking.

Entrepreneurial Orientation

The entrepreneurial orientation looks positive, although the distribution of answers is more diverse. The statement "Making decisions in the midst of uncertainty" had the highest score with 43% agreeing and 27% strongly agreeing. The lowest statement was "Face market competition aggressively") with 38% agreeing and 34% strongly agreeing. These results show that MSMEs are more confident in making strategic decisions than being aggressive in facing competition.

Testing Research Variables

Outer Model Test Results

a. Convergent Validity Test

The convergent validity test aims to find out the extent to which the indicators in a construct can represent the construct well. This test is seen from the value of outer loading and Average Variance Extracted (AVE)

The overall indicators of each statement item have been in accordance with the outer loading value >0.70, and the Average Variance Extracted (AVE) value >0.5. So it can be concluded that the data that has been collected is valid.

b. Discriminating Validity Test

The discriminant validity test is used to ensure that each construct is completely different from the other. Discriminant validity testing can be done by comparing loading values between constructs.

Table 5. ***Fornell Lacker***

	AdopEcom	BudInovasi	IntegrasiAI	KecTekPlggan	KinPemasaran	OriKewira
AdopEcom	0,908					
BudInovasi	0,873	0,855				
IntegrasiAI	0,821	0,800	0,812			
KecTekPlggan	0,878	0,810	0,288	0,912		
KinPemasaran	0,645	0,092	0,333	0,199	0,905	
OriKewira	0,863	0,858	0,305	0,991	0,184	0,872

Source: Data Processed by the Author, 2025

Based on the results of the discriminant validity test (discriminant table), it can be seen that the loading value between indicators on the construct is higher than the loading value for other constructs. The data show that each indicator is more representative of its own construct than the other, so it can be concluded that the entire construct has met the discriminant validity.

c. Reliability Test

The reliability test was carried out to determine the consistency of the respondents' answers to the statements in the questionnaire. Reliability testing was performed by looking at Cronbach's Alpha and Composite Reliability (CR) values.

Table 6. Reliability Test

	Cronbach's alpha
AdopEcom	0,947
BudInovasi	0,878
IntegrasiAI	0,868
KecTekPlggan	0,949
KinPemasaran	0,945
OriKewira	0,954

Source: Data Processed by the Author, 2025

Based on the test results on the reliability table, the entire construct has a Cronbach's Alpha value above 0.7. Construct is said to be reliable if it has a value of ≥ 0.7.

Inner Model Test Results

a. R-square (R2)

The R-square test is carried out to assess how much the contribution of independent variables in explaining the dependent variables. The R-square value of 0.75 indicates a strong influence, 0.50 indicates a moderate influence, and 0.25 indicates a weak influence.

Table 7. R-square *values*

	R-square	R-square adjusted
AdopEcom	0,843	0,711
KinPemasaran	0,861	0,741
OriKewira	0,869	0,756

Source: Data Processed by the Author, 2025

Based on the table, it is known that the R-square value of the variable has an influence in the strong category so that it is eligible for the research model because it is close to 1.

b. F Test (Effect Size/f^2)

The F test in PLS-SEM is represented by an effect size (f^2) to see how much each independent variable contributes to the dependent variable. Cohen's (1988) guidelines: f^2 = 0.02 (small), 0.15 (medium), 0.35 (large).

Table 8 F value (*Effect size*)

Jalur Hypothesis	f^2
AI Integration → Marketing Performance	0,187
AI Integration → E-commerce Adoption	0,401
Customer Technology Proficiency → Marketing Performance	0,079
Customer's Technology Proficiency → E-commerce Adoption	0,146

Jalur Hypothesis	f^2
Culture of Innovation → Marketing Performance	0,115
Culture of Innovation → E-commerce Adoption	0,114
E-commerce Adoption → Marketing Performance	0,403
Moderation of Entrepreneurial Orientation × E-commerce Adoption → Marketing Performance	0,223

Source: Data Processed by the Author, 2025

The results of the f^2 test show that the AI Integration → E-commerce Adoption and E-commerce Adoption → Marketing Performance pathways have a great influence so that they become the dominant factors. Some other tracks contribute moderately (e.g. Entrepreneurial Orientation as a moderator), while Innovation Culture and Customer Technology Proficiency while significant, contribute relatively small.

c. Q^2 test (Predictive Relevance)

The Q^2 test is used to assess whether the model has predictive capabilities. The basic rule: $Q^2 > 0$ means that the model has predictive relevance.

Table 9 Test Q^2

Endogenous constructs	Q^2
E-commerce Adoption	0,312
Marketing Performance	0,287
Entrepreneurial Orientation	0,224

Source: Data Processed by the Author, 2025

All endogenous constructs have a value of $Q^2 > 0$. This means that the model has good predictive capabilities, especially on *E-commerce* Adoption and Marketing Performance, while Entrepreneurial Onboarding has enough predictive relevance.

Hypothesis Testing

Based on the results of the data analysis that has been carried out, the findings of this study can be used to test the hypothesis that has been formulated previously. The hypothesis testing process is carried out by paying attention to the p-values as the basis for decision-making. A hypothesis is declared acceptable if the p-values show a number smaller than 0.05. The following are presented the results of the hypothesis test obtained from this study.

Table 10. Hypothesis Test Results

No	Hypothesis	T statistics	P values	Information
1	IntegrationAI-> KinMarketing	3,771	0,000	**Accepted**
2	IntegrasiAI -> AdopEcom	4,232	0,000	**Accepted**
3	KecTekPlggan -> KinMarketing	2,200	0,029	**Accepted**
4	KecTekPlggan -> AdopEcom	2,350	0,018	**Accepted**
5	BudInovasi -> KinMarketing	2,350	0,019	**Accepted**
6	BudInovasi -> AdopEcom	2,020	0,043	**Accepted**
7	AdopEcom -> KinMarketing	2,000	0,045	**Accepted**
8	OriKewira x AdopEcom -> KinMarketing	2,700	0,007	**Accepted**

Source: Data Processed by the Author, 2025

Based on table 10, the results of the hypothesis test are as follows:

1. Integration of AI to Marketing Performance for MSMEs in Kendal Regency.
   Based on the results of the analysis, a *T-Statistics value* of 3.771 was obtained with *a P-Values* of 0.000 < 0.05. This shows that AI Integration has a positive and significant

effect on Marketing Performance for MSMEs in Kendal Regency. Thus, the first hypothesis is accepted.

2. AI Integration for *E-commerce* Adoption for MSMEs in Kendal Regency.
   The test results showed a T-Statistics value of 4.232 with *a P-Values* of 0.000 < 0.05. This means that AI Integration has a positive and significant influence on the Adoption *of E-commerce* for MSMEs in Kendal Regency. Thus, the second hypothesis is accepted.
3. Customer Technology Proficiency on Marketing Performance for MSMEs in Kendal Regency.
   The *T-Statistics* value of 2,200 with *a P-Values* of 0.029< 0.05 shows that Customer Technology Proficiency has a positive and significant effect on MSME Marketing Performance. Therefore, the third hypothesis is accepted.
4. Customer Technology Proficiency in *E-commerce* Adoption for MSMEs in Kendal Regency.
   From the results of the analysis, a *T-Statistics value* of 2.350 was obtained with *a P-Values* of 0.018 < 0.05. This proves that Customer Technology Proficiency has a positive and significant effect on *E-commerce Adoption.* Thus, the fourth hypothesis is accepted.
5. Innovation Culture to Marketing Performance for MSMEs in Kendal Regency.
   Hypothesis testing showed a *T-Statistics* value of 2.350 *with a P-Values of 0.019 < 0.05*. These results prove that the Innovation Culture has a positive and significant effect on the Marketing Performance of MSMEs. Thus, the fifth hypothesis is accepted.
6. Innovation Culture for *E-commerce* Adoption for MSMEs in Kendal Regency.
   The results of the analysis showed a *T-Statistics* value of 2.020 with *a P-Values* of 0.043 < 0.05. This means that the Culture of Innovation has a positive and significant effect on *E-commerce* Adoption. Therefore, the sixth hypothesis is accepted.
7. Adoption *of E-commerce* on Marketing Performance for MSMEs in Kendal Regency.
   The *T-Statistics* value of 2,000 with *a P-Values* of 0.046 < 0.05 shows that *E-commerce Adoption* has a positive and significant effect on the Marketing Performance of MSMEs. Thus, the seventh hypothesis is accepted.
8. E-commerce *Adoption* of MSME Marketing Performance Moderated by Entrepreneurial Orientation
   Based on the results of the moderation test, a *T-Statistics value* of 2,700 was obtained with *a P-Values* of 0.007 < 0.05. This shows that the moderation variable of Entrepreneurial Orientation strengthens the influence of *E-commerce* Adoption on MSME Marketing Performance. Thus, the eighth hypothesis is accepted.

The Influence of AI Integration on *E-commerce Adoption*.

The study found that Artificial Intelligence (AI) integration has a positive and significant effect on the adoption of e-commerce by MSMEs in Kendal Regency**.** This result is indicated by the *T-Statistics* 4,232 and *P-Values* by 0.000, which means less than 0.05. These results show that the use of AI technology encourages business actors to more optimally use digital platforms in promotional activities, customer service, and business transactions. These results show that the use of AI technology encourages business actors to more optimally use digital platforms in promotional activities, customer service, and business transactions. Based on descriptive data, respondents felt the most benefit of AI in automating

customer question responses (58% agreed). This shows that MSMEs see AI as a practical tool to improve daily operational efficiency and improve interactions with customers. These findings indicate that the main motivation of MSMEs in adopting AI is to simplify processes and improve customer service, which is an important foundation in adoption

The Influence of Customer Technology Proficiency on Performance Marketing

This study shows that customer technology proficiency has a positive and significant effect on the marketing performance of MSMEs in Kendal Regency. This finding is indicated by a T-Statistics value of 2.200 and a P-Value of 0.029, which means less than 0.05. These results indicate that the higher the digital literacy of customers, the greater their contribution to the effectiveness of marketing strategies carried out by MSME actors. These findings indicate that the higher the digital literacy of customers, the greater their contribution to the effectiveness of marketing strategies carried out by MSME actors. Based on descriptive data, respondents most agreed that their customers did not hesitate to shop at MSMEs through the platform *e-commerce* because they feel they have enough technological knowledge (70% agree). This shows that customers' technological prowess is one of the main drivers that makes them feel comfortable and confident in conducting digital transactions, which ultimately has a positive impact on the marketing performance of MSMEs.

The results of this study confirm that customer technology proficiency is one of the important external factors in improving marketing performance. Theoretically, these findings enrich the literature related to digital marketing in MSMEs, while practically providing implications for MSME actors to adjust their marketing strategies to customers' digital literacy levels, for example through the use of social media. *platform e-commerce*, and interactive digital services.

CONCLUSION

Based on the results of the study, it can be concluded that AI integration, customer technology savviness, and innovation culture have positive and significant influences on e-commerce adoption and marketing performance in MSMEs in Kendal Regency. Notably, the integration of AI and innovation culture directly affect marketing performance and e-commerce adoption. Similarly, customer technology savviness also has a significant positive impact on both aspects. Furthermore, e-commerce adoption itself has proven to have a positive and significant effect on marketing performance. Interestingly, entrepreneurial orientation was found to be a variable that strengthens the relationship between e-commerce adoption and marketing performance, suggesting that MSMEs with strong entrepreneurial orientation will benefit more from e-commerce adoption in improving their marketing performance.

REFERENCES

Abed, S. S. (2020). Social commerce adoption using TOE framework: An empirical investigation of Saudi Arabian SMEs. *International Journal of Information Management, 53,* 102118. https://doi.org/10.1016/j.ijinfomgt.2020.102118

Akter, S., Sultana, S., Mariani, M., Fosso, S., Spanaki, K., Dwivedi, Y. K., & Jourdain, P. A. (2023). Advancing algorithmic bias management capabilities in AI-driven marketing

analytics research. *Industrial Marketing Management, 114,* 243–261. https://doi.org/10.1016/j.indmarman.2023.08.013

Alarifi. (2022). Factors of e-business adoption in small and medium enterprises. *Human Behavior and Emerging Technologies.*

AlBar, A. M., & Hoque, M. R. (2019). Factors affecting the adoption of information and communication technology in small and medium enterprises: A perspective from rural Saudi Arabia. *Information Technology for Development, 25*(4), 715–738.

Apergis, E. (2019a). Who is tech savvy? Exploring the adoption of smartphones and tablets: An empirical investigation. *Journal of High Technology Management Research, 30*(2), 100351. https://doi.org/10.1016/j.hitech.2019.100351

Apergis, E. (2019b). Who is tech savvy? Exploring the adoption of smartphones and tablets: An empirical investigation. *Journal of High Technology Management Research, 30*(2), 100351. https://doi.org/10.1016/j.hitech.2019.100351

Ariansyah, K., Ruth, E., Sirait, E., Agung, B., & Suryanegara, M. (2021). Drivers of and barriers to e-commerce adoption in Indonesia: Individuals' perspectives and the implications. *Telecommunications Policy, 45*(8), 102219. https://doi.org/10.1016/j.telpol.2021.102219

Atkinson, E. (2024). *Technological savviness as a mediator of older adults' reported likelihood of adoption and endorsement of autonomous vehicles* [Doctoral dissertation, Michigan State University].

Basri, W. (2020). Examining the impact of artificial intelligence (AI)-assisted social media marketing on the performance of small and medium enterprises: Toward effective business management in the Saudi Arabian context. *International Journal of Computational Intelligence Systems, 13*(1), 142–152. https://doi.org/10.2991/ijcis.d.200127.002

Chen, J., Zhou, W., & Frankwick, G. L. (2023). Firm AI adoption intensity and marketing performance. *Journal of Computer Information Systems, 65*(2), 172–189. https://doi.org/10.1080/08874417.2023.2277751

Creswell, J. W. (2021). *A concise introduction to mixed methods research.* SAGE Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches.* SAGE Publications.

Cunningham, J. A., Damij, N., Modic, D., & Olan, F. (2023). MSME technology adoption, entrepreneurial mindset and value creation: A configurational approach. *Journal of Technology Transfer, 48*(5), 1574–1598. https://doi.org/10.1007/s10961-023-10022-0

Darwin, M. (2020). Pengaruh strategi communication dalam marketing 4.0 terhadap purchase decision melalui brand advocacy pada e-commerce Shopee. *Jurnal Ilmiah Manajemen, Ekonomi, & Akuntansi (MEA), 4*(2), 375–396.

Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science, 48*(1), 24–42.*

Dwivedi, Y. K., Rana, N. P., Janssen, M., Lal, B., Williams, M. D., & Clement, M. (2017). An empirical validation of a unified model of electronic government adoption (UMEGA). *Government Information Quarterly, 34*(2), 211–230.

Elhajjar, S. (2024). Unveiling the marketer's lens: Exploring experiences and perspectives on AI integration. *Asia Pacific Journal of Marketing and Logistics.* Advance online publication. https://doi.org/10.1108/APJML-04-2024-0485

Faccia, A., Liesl, C., & Roux, L. (2023). Innovation and e-commerce models, the technology catalysts for sustainable development: The Emirate of Dubai case study.

Fadda, N. (2018). The effects of entrepreneurial orientation dimensions on performance in the tourism sector. *New England Journal of Entrepreneurship, 21*(1), 22–44. https://doi.org/10.1108/NEJE-03-2018-0004

Fitriati, T. K., Purwana, D., & Buchdadi, A. D. (2020). The role of innovation in improving small medium enterprise (SME) performance. *International Journal of Innovation, Creativity and Change, 11*(2), 232–250.

Fonseka, K., & Jaharadak, A. A. (2022). Impact of e-commerce adoption on business performance of SMEs in Sri Lanka: Moderating role of artificial intelligence. *International Journal of Social Economics, 49*(8), 1175–1195. https://doi.org/10.1108/IJSE-12-2021-0752

Franke, G., & Sarstedt, M. (2019). Heuristics versus statistics in discriminant validity testing: A comparison of four procedures. *Internet Research, 29*(3), 430–447. https://doi.org/10.1108/IntR-12-2017-0515

GoodStats. (2023a). Menilik perkembangan e-commerce 2021–2026. https://goodstats.id/article/menilik-perkembangan-e-commerce-2021-2026-T5K3o

GoodStats. (2023b). Berapa besar kontribusi UMKM atas PDB Indonesia? https://goodstats.id/article/berapa-banyak-kontribusi-umkm-atas-pdb-indonesia-iZgHK

Gu, F., Gao, J., Zhu, X., & Ye, J. (2023). The impact of digital inclusive finance on SMEs' technological innovation activities: Empirical analysis based on the data of new third board enterprises. *PLOS ONE, 18*(11), e0293500.

Gu, J. (2023). What drives SMEs to adopt e-commerce? The joint role of testosterone and absorptive capacity. *Asia Pacific Journal of Marketing and Logistics, 35*(1), 90–107.

Haenlein, M., Kaplan, A., Tan, C.-W., & Zhang, P. (2019). Artificial intelligence (AI) and management analytics. *Journal of Management Analytics, 6*(4), 341–343. https://doi.org/10.1080/23270012.2019.1699876

Hair, J. F., Astrachan, C. B., Moisescu, O. I., Radomir, L., Sarstedt, M., Vaithilingam, S., & Ringle, C. M. (2021). Executing and interpreting applications of PLS-SEM: Updates for family business researchers. *Journal of Family Business Strategy, 12*(3), 100392.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24.