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E-commerce adoption and marketing performance: The role of artificial intelligence integration, innovation culture, and external pressure with O2O business adoption as a moderating by MSMEs in Indonesia

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This study will examine the effect of artificial intelligence (AI) integration, innovation culture, customer technological proficiency, competitive pressure, business partner pressure, and customer pressure on e-commerce adoption, as well as the effect of e-commerce adoption on marketing performance. As a novelty that is still little researched, the author adds the effect of e-commerce adoption on marketing performance with O2O (online to offline) business adoption as moderation. The quantitative-causal research paradigm can be applied to this research. A total of 206 MSMEs in Indonesia were included in the sample, which were selected using a questionnaire and a non-probability selection method known as purposive sampling. The study model was created, and hypothesis testing was conducted using the Structural Equation Modeling technique in Amos 26. The results show that AI integration, innovation culture, customer tech-savviness, and competitive pressure have a significant and positive effect on e-commerce adoption. Meanwhile, business partner pressure and customer pressure have no significant effect on e-commerce adoption. Then, e-commerce adoption has a positive and significant effect on marketing performance. Lastly, the correlation between e-commerce adoption and marketing performance is diminished by O2O business adoption.

Keywords: AI Integration; Business Partner Pressure; Competitive Pressure; Customer Pressure; Customer Tech-Savviness; Innovation Culture; E-commerce Adoption; Marketing Performance.

1. Introduction

Indonesia has the most significant number of micro, small, and medium enterprises (MSMEs) in ASEAN countries, where in 2024, the number of Indonesian MSMEs will be 65.6 million, followed by Thailand with 3.1 million and Malaysia with 1.2 million (INDEF, 2024). In Indonesia, MSMEs have a major role in GDP, non-oil and gas exports, job creation, and enhancing the caliber of human capital. Furthermore, MSMEs in Indonesia have the potential to employ 97% of the country's workforce, generate 60.3% of its GDP, and account for 14.4% of its exports. However, Indonesian MSMEs fall short of Singaporean MSMEs, which contribute 38.3% of exports, Thailand's 28.7%, Myanmar's 23.7%, and Vietnam's 18.7% (Riadi et al., 2022).

Since MSMEs provide such a significant contribution to the nation, they have long been a primary focus for policymakers worldwide (Gamidullaeva et al., 2020). In addition, MSMEs are very important in opening up employment opportunities, increasing welfare, and developing innovation (Anshari & Almunawar, 2022). Additionally, MSMEs boost economic growth, particularly in emerging nations (Gamidullaeva et al., 2020). If MSMEs continue to meet local and export market demands, they can employ the majority of the jobless and support sustainable growth (Tjahjadi et al., 2022). Many people believe that a country's labor market may benefit the most from MSMEs (Afriyie et al., 2019; Mendy & Rahman, 2019).

Along with the development of the era, many MSMEs are utilizing e-commerce. E-commerce research has been done a lot, which is divided into 3 (groups), namely e-commerce and technology, e-commerce and the business world, and e-commerce and the economy (Altemimi & Alasadi, 2022). Previous research shows that e-commerce and technology are inseparable entities (Kuruwitaarachci et al., 2020). Likewise, communication and information technology provide many benefits when used in e-commerce (Deshpande, 2021). Other studies show that e-commerce has dramatically helped the development of the business world (SMEs) (Pramono et al., 2021). Several studies also show that e-commerce contributes to the country's economy (Hossain et al., 2022; Li, 2020; S. Zhong et al., 2022), reduces the unemployment rate (Fitri et al., 2023), alongside advancing the utilization of information and communication technologies (Appiah-Otoo & Song, 2021).

The term "e-commerce" refers to a certain kind of business model that conducts goods purchase and sales on the internet (Bawack et al., 2022; Rosário & Raimundo, 2021) and provides product information to make it easier for consumers to buy (Maurlen & Pranoto, 2023; Sabari et al., 2022). E-commerce provides many benefits, including increased company competition, lower prices, reduced operational costs (Riadi et al., 2022), and save time (Ahmed et al., 2022; Hossain et al., 2022). Indonesia entered the top 10 e-commerce players growth with a growth of 30.5% and was ranked first, followed by Mexico, Thailand, Iran, Malaysia, Philippines, Peru, India, Israel, and Vietnam (Yonatan, 2024). The most commonly used e-commerce are Shopee (56.04%), Lazada (32.72%), Tokopedia (12.8%), and Tiktok (8.29%) (INDEF, 2024).

Due to the dependence on data analysis across several application areas, artificial intelligence (AI) has emerged as an essential e-commerce partner, given the proliferation of customer information accessible via the internet, big data platforms, and mobile devices, especially in the realm of marketing (Parisini, 2022). "Artificial intelligence" describes smart algorithms, systems, and computer programs (Salah & Ayyash, 2024). Machines that duplicate conduct that is considered intelligent human behavior and mimic certain features of human intelligence are examples of artificial intelligence (Davenport et al., 2020). Businesses in a variety of industries have recently reaped the benefits of marketing-related artificial intelligence (AI) by incorporating it into critical organizational processes. Automate data-driven operations to increase revenue and delight customers (Eriksson et al., 2020). AI in marketing boosts marketing teams' output and lowers expenses (Mishra & Pani, 2023). Along with influencing following customer activities and altering the whole customer experience, AI also provides insights into consumer behaviour that are crucial for customer transactions and retention (Gulati, 2021).

Previous studies have shown that AI, including chatbots, generative AI, AI assistants, and machine learning, Could potentially improve marketing results, customer satisfaction, internal process efficiency, and the ability of MSMEs to learn and develop (Abrokwah-larbi, 2023; Basri, 2020). Furthermore, prior studies have shown that e-commerce adoption is positively impacted by AI integration (Fonseka & Jaharadak, 2022). Therefore, AI integration is critical in influencing MSMEs e-commerce adoption (Salah & Ayyash, 2024).

A new paradigm known as innovation challenges traditional management techniques and approaches (Long et al., 2020). This occurs as a result of innovation pushing businesses to embrace novel concepts or methods (Chen & Viardot, 2019). Innovation carried out by the organization will give rise to new behaviour (Dameshifa et al., 2023). By adopting innovative, forward-thinking procedures, businesses may lessen the likelihood of adverse effects (Kneipp et al., 2019). Given this, it becomes crucial to combine innovation and e-commerce strategies in order to promote sustainable development globally (Faccia et al., 2023). The ability to innovate is closely linked to an innovation culture. This ability includes coming up with new ideas as well as knowing how to manage and improve existing technology (Purmono, 2024). According to a recent study, an innovative culture has a positive effect on MSMEs e-commerce adoption (Gu, 2023; Skare et al., 2023; S. Wang, 2023).

Technological improvements have permeated almost every aspect of life, requiring consumers to possess varying levels of technical ability, from the most fundamental to the most complex (Zaman et al., 2022). To be technologically competent, one must be able to use current technology effectively, have an intuitive understanding of technical processes, and be able to operate technical equipment, for example , computers (Apergis, 2019). It is believed that the knowledge,

skills, and capacities of users significantly contribute to the use of new technology (Satar, 2022). Researchers in this study suggest shifting viewpoints. From the perspective of MSMEs, the researcher seeks to reveal how customer technology skills impact the adoption process of e-commerce by MSMEs. Consequently, customer tech-savviness significantly influences the rate of e-commerce adoption among MSMEs (Salah & Ayyash, 2024).

Competitive pressure refers to the extent to which a corporation gives in to the demands of its competitors and adopts new technologies (Tong et al., 2022). Businesses that are feeling the heat from the competition are more likely to jump on the bandwagon when it comes to embracing new cutting-edge technological (Addy et al., 2023; Zhong & Moon, 2023). When businesses feel the heat from their rivals, they are more likely to respond swiftly and keep a careful eye on what they do next (Hasani et al., 2023). Therefore, competitive pressure positively correlates with and significantly influences e-commerce adoption (Salah & Ayyash, 2024).

Because a small company's survival could be dependent on its trade partners, and because of the sensitivity of small enterprises to the demands of those partners, Environmental factors, such as pressure from business partners, play a key role in encouraging MSMEs to use electronic commerce (Shanmugam et al., 2022). The term "business partner pressure" is used to characterize the amount of influence and pressure that partners exert on a corporation to use technology (Chu et al., 2019). Therefore, business partner pressure positively correlates with and significantly influences e-commerce adoption (Salah & Ayyash, 2024).

Customer pressure is the pressure that comes from customers to force a business to meet all customer demands (Zamrudi & Saputri, 2023). Customers have many problems and demands and need solutions from the products offered by the company (Heng & Afifah, 2020). With the development of the era, customers feel that it is only fitting for businesses to be run online, and all businesses should adopt e-commerce (Isa & Alenezi, 2022). This is done so customers can easily shop and transact (Eger et al., 2021). Prior research shows that customer pressure has a significant relationship with e-commerce adoption (Quoc et al., 2024).

The foundation of contemporary marketing is marketing performance, which includes a number of marketing initiatives to satisfy customers and provide advantages, as well as an understanding of, creation of, communication of, and delivery of value to consumers (Aziz, 2024). The performance of marketing is crucial to company success because of customer, market, and financial institution market strategies. Sales growth, market share, and market development are the primary foci of marketing performance studies (Santoso et al., 2024).

New to the e-commerce scene is the O2O (Online-to-Offline) business model, which takes the best of both worlds and uses them in a novel manner to boost a company's marketing, expand its client base, and boost its market share (Kang & Namkung, 2019). Previous research found that both positive and significant influences between the adoption of SME e-commerce on marketing performance, which is moderated by O2O business (Suryani et al., 2021).

In this study, the authors will test the relationship of artificial intelligence, innovation culture, customer tech-savviness, competitive pressure, business partner pressure, and customer pressure on e-commerce adoption which will then be tested as well as the relationship of e-commerce adoption to marketing performance. Furthermore, O2O Business Adoption is included as a moderating variable in this research, expanding the model's paradigm construct. It would be innovative to include O2O (Online to Offline) business adoption as a moderating between e-commerce adoption and marketing performance in the model. This is because previous researchers have not fully investigated it, especially in Indonesia. Therefore, the authors agree that more research is needed to examine this.

2. Literatur Review

2.1 Artificial Intelligence Integration

Artificial intelligence describes smart algorithms, systems, and computer programs (Salah & Ayyash, 2024). Automatons that can learn and do tasks normally performed by humans are an example of AI (Davenport et al., 2020). Integrating AI into marketing allows for more thorough predictive analysis, which is a major plus. Companies may use AI to forecast customer wants and requirements by analyzing trends in their behavior (Ziakis & Vlachopoulou, 2023). Personalizing

marketing material is another area where AI is crucial. Companies may improve the relevance and attractiveness of their commercials by using machine learning (Senyapa, 2024). Improving the efficiency of developing marketing communication materials has been greatly facilitated by AI-based content production procedures (Murár & Kubovics, 2023). Timely and relevant information is vital to catch customer attention in the fast-paced digital world (Gao et al., 2023). From a strategic point of view, AI is playing a more and bigger role in advertising. The use of artificial intelligence (AI) in marketing refers to the creation of digital assistants who can recall details about customers, rivals, and other businesses, and then recommend marketing strategies that will provide the greatest results (Huang & Rust, 2022).

2.3 Innovation Culture

This ability includes coming up with new ideas as well as knowing how to manage and improve existing technology (Purmono, 2024). one definition of innovation aptitude is the capacity to effectively use and enhance pre-existing information, skills, and technology in order to generate new ideas (Saleem et al., 2024). an organization's capacity to innovation culture is measured by its openness to new ideas, problem-solving strategies, and operational inventiveness (Salah & Ayyash, 2024). A company's innovation culture may be defined as its focus on drawing on a wide range of expertise and perspectives (Barreto et al., 2024)

2.4 Customer Tech-Savviness

Due to the pervasiveness of technology in modern life, customers are expected to possess varying degrees of technical skill, from basic to sophisticated (Zaman et al., 2022). In today's technological landscape, client tech-savviness refers to the degree to which consumers can comprehend and make good use of the tools at their disposal (Apergis, 2019).

2.5 Competitive Pressure

The amount of competition in the business sector is known as competitive pressure.(Soewarno et al., 2020). When businesses engage in constant rivalry with one another in the commodities market, they put themselves under competitive pressure to win the competition, grow their client base and market share, and ensure their own existence (Addison, 2021). Companies are more likely to seek out creative solutions when competitive pressure is strong, leading to greater levels of transformational adoption (Soewarno et al., 2020).

2.6 Business Partner Pressure

Business partner pressure occurs when a company's suppliers and customers exert a significant amount of influence and pressure on the company to embrace technology (Chu et al., 2019). Since e-commerce cannot exist apart from trade partners, firms that are small and medium-sized are more susceptible to pressure from these partners when it comes to implementing e-commerce (Mubarok et al., 2022).

2.7 Customer Pressure

Companies are compelled to modify their strategies, goods, and procedures in order to fulfill the wants and expectations of their consumers. This phenomenon is known as customer pressure (Quoc et al., 2024). Customers rely on the items given by the organization to address a multitude of challenges and requests (Heng & Afifah, 2020). firms are motivated to enhance their e-commerce capabilities by customer pressure, which encompasses numerous aspects such as customer expectations, trust, and satisfaction (Rofiqo et al., 2021).

2.8 E-commerce Adoption

A key component of contemporary company operations, particularly for MSMEs, is the e-commerce adoption (Hua et al., 2019). When businesses start using online platforms and technology for marketing, consumer interaction, and transactions, it's called e-commerce adoption. (Fonseka et al., 2022). The possibility of enhanced company performance is one of the key motivators for MSMEs to e-commerce adoption. According to research, small and medium-sized enterprises

(SMEs) may gain a competitive edge, expand their client base, and increase operational efficiency via e-commerce (Gao et al., 2023).

2.9 Marketing Performance

An essential statistic for assessing the efficacy and outcomes of marketing endeavors is marketing performance (Gangwani & Bhatia, 2024). An organization's growth and ability to compete depend on its ability to monitor marketing activities and make better decisions (Luo et al., 2024). Market share, customer happiness, total sales income, and return on investment are important marketing performance criteria (Gangwani & Bhatia, 2024).

2.10 O2O (Online to Offline) Business Adoption

New e-commerce models are popping up all the time, and one of them is the online-to-offline (O2O) business adoption. This model combines the best of both worlds, allowing businesses to improve in many ways, including expanding marketing capabilities, reaching a wider audience, and increasing market share (Kang & Namkung, 2019). In the context of business, O2O means combining online and offline activities (Kang & Namkung, 2019). One definition of O2O is the process by which consumers purchase goods and services either online or by going to the store to enjoy these services, with the core idea being that the outlet will send messages through the O2O platform containing information, services, discount offers, etc. in an effort to entice online users to visit the outlet (Suryani et al., 2021).

2.11 Artificial Intelligence Integration and E-commerce Adoption

Previous research shows that AI integration with e-commerce adoption has a powerful relationship (Fonseka & Jaharadak, 2022). Using AI such as chatbots, machine learning, AI assistants can increase the effectiveness and efficiency in operating a business so that it can generate greater profits, especially from the marketing aspect (Paschen et al., 2019). Other studies also state that artificial intelligence integration significantly and positively influences e-commerce adoption (Salah & Ayyash, 2024). Thus, artificial intelligence integration significantly affects the adoption of e-commerce. H1: Artificial Intelligence Integration positively correlates with and significantly influences E-commerce Adoption.

2.12 Innovation Culture and E-commerce Adoption

Based on earlier studies, e-commerce adoption is positively correlated with innovation culture (Gu, 2023; Salah & Ayyash, 2024; Skare et al., 2023; Wang & Esperança, 2023). A business can only innovate if it is capable of doing so (Idris, 2019 Innovation may boost efficiency and prospective value while making the most of already available resources (Wahyuda et al., 2023). Innovation in processes and production allows business actors to adopt e-commerce (Religia et al., 2023). One example of a collective innovation ability is the capacity to experiment with new things, like e-commerce, by developing novel goods, processes, management, and marketing (Hanaysha et al., 2022). Thus, It's safe to say that e-commerce adoption is strongly influenced by innovation culture. H2: Innovation Culture positively correlates with and significantly influences E-commerce Adoption.

2.13 Customer Teach-Savviness Integration and E-commerce Adoption

Prior research has shown, that e-commerce adoption and customer tech-savviness are positively and significantly correlated (Salah & Ayyash, 2024). Technological skills can enable customers to use technology or digital devices (Herrmann et al., 2022). Customers who master technology will undoubtedly be able to use e-commerce in transactions, making MSMEs adopt e-commerce (Yacob et al., 2021). Thus, customer tech-savviness is significantly affects e-commerce adoption. H3: Customer Tech-Savviness positively correlates with and significantly influences E-commerce Adoption.

2.14 Competitive Pressure and E-commerce Adoption

Previous research found that competitive pressure can encourage MSMEs to continue looking for new things in running their business, including e-commerce (Addy et al., 2023; Zhong & Moon, 2023). Businesses under pressure from competitors are more likely to respond swiftly and be aware of competition activity, which means they will embrace new technology more rapidly (Hasani

et al., 2023). Previous investigations have shown that competitive pressure has a significant and positive relationship with e-commerce adoption (Salah & Ayyash, 2024). Therefore, the affect of competitive pressure on e-commerce adoption is significant. H4:
Competitive Pressure positively correlates with and significantly influences E-commerce Adoption.

2.15 Business Partner Pressure and E-commerce Adoption

According to prior research, business partners' pressure to integrate technology into business processes jointly determines the of e-commerce adoption (Horani et al., 2023). MSMEs will feel pressured to use e-commerce because they depend on their business partners (Isa & Alenezi, 2022). Previous research states that business partner pressure positively and has a strong relationship with e-commerce adoption (Salah & Ayyash, 2024). As a result, e-commerce adoption is significantly affected by the pressure from business partners. H5: Business Partner Pressure positively correlates with and significantly influences El-commerce Adoption.

2.16 Customer Pressure and E-commerce Adoption

Prior studies have shown that customer pressure is a strong factor in e-commerce adoption (Pahlawansah et al., 2023). This concept has been supported by other research that has revealed a strong correlation between customer pressure and the rise of e-commerce adoption (Quoc et al., 2024). Therefore, customer pressure has an important part to play in the adopt of e-commerce. H6: Customer Pressure positively correlates with and significantly influences E-commerce Adoption.

2.17 E-commerce Adoption and Marketing Performance

In this case, the suitability of e-commerce products and the company's capacity to handle logistical issues determine how much e-commerce adoption by MSMEs improves their marketing performance (Cao et al., 2021). Therefore, MSMEs must carefully evaluate these considerations when using e-commerce as a marketing strategy, even though it offers several chances to increase marketing performance (Fonseka & Jaharadak, 2022). On the other hand, e-commerce may improve a business's marketing performance by differentiating itself in ways that are faster, easier, more efficient, and provide more real-time experiences (Wang, 2023). According to earlier studies, e-commerce adoption and marketing performance are positively and significantly correlated (Fonseka & Jaharadak, 2022; Gao et al., 2023; Salah & Ayyash, 2024). Consequently, the performance of marketing significantly influences by e-commerce adoption. H7: E-commerce Adoption positively correlates with and significantly influences Marketing Performance.

2.18 E-commerce adoption and marketing performance are moderated by O2O business adoption.

E-commerce adoption has been proven to influence how MSMEs business actors interact with customers to market their products, thereby increasing marketing performance (Salah & Ayyash, 2024). However, some studies suggest that when O2O business adoption is used as a moderating, the association between e-commerce adoption and marketing performance may be enhanced (Suryani et al., 2021). Previous research found that there is positive correlates with and significance between e-commerce adoption by MSMEs and marketing performance, which is moderated by O2O business adoption (Wang et al., 2020; Yao et al., 2023). Thus, e-commerce adoption significantly influences marketing performance, with O2O business adoption being a moderation. H8: E-commerce Adoption significant and positive influence on Marketing Performance, moderated by O2O (Online to Offline) Business Adoption.

3. Research Method

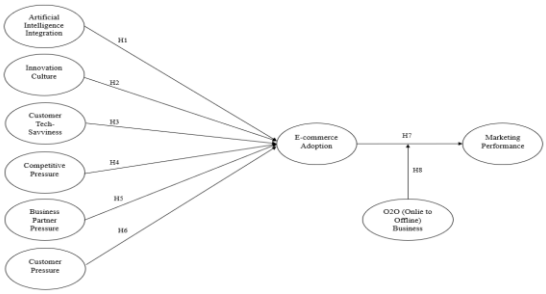

Figure 1. Research framework

The theoretical studies supplied the research framework that this study is built on, as illustrated in Figure 1. This study employed a quantitative-causal approach. An online structured questionnaire was used to gather data from the participants. A score of 1 signifies strongly disagree, 2 disagree, 3 somewhat agree, 4 agree, and 5 strongly agree; all are based on a 5-point Likert scale, which was used in the research. The sampling technique used in this research is a non-probability sampling technique in the form of purposive sampling. The survey includes all MSME in Indonesia that participate in online commerce approach that fulfilled the following criteria: 1) MSMEs with their headquarters in Indonesia; 2) The company has been in operation for at least two years; 3) MSMEs with an annual income of at least IDR 75 million; 4) They have embraced e-commerce as a business model; 5) They have a physical store; 6) They use artificial intelligence in their operations; 7) They have rivals and business partners. 206 respondents made up the study's sample size. The researcher used the viewpoint of Malhotra et al., (2020) to determine the sample size, stating that 200 respondents is the minimum number required for an SEM-based study.

Question items describing each variable were obtained from previous research. 4 items for the AI integration variable refer to previous research (Huang & Gursoy, 2024; Ku & Chen, 2024). 5 items for the innovation culture variable refer to research (Barreto et al., 2024; Nasution et al., 2021; Salah & Ayyash, 2024). 5 items for the customer tech-savviness variables refer to research (Salah & Ayyash, 2024). 6 items for the competitive pressure variable referring to research (Lee & Yoon, 2022; Quoc et al., 2024; Salah & Ayyash, 2024). 4 items for the business partner pressure variable refer to research (Kwarteng et al., 2024; Salah & Ayyash, 2024). 4 items for the customer pressure variable that refer to research (Quoc et al., 2024). 3 items for the e-commerce adoption variable refer to research (Salah & Ayyash, 2024). 4 items for marketing performance variables that refer to research (Aksoy, 2017; Gangwani & Bhatia, 2024; Salah & Ayyash, 2024). 4 items for the O2O business adoption variable refer to research (Chawla et al., 2024; Lee & Yoon, 2022).

Structural Equation Modelling (SEM) utilising the AMOS 26 statistical tool was used in this study to analyse and assess the research construct's measurement and structural models. Several metrics are used to evaluate the model fit test, such as: A few examples of these metrics include the Tucker Lewis Index (TLI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), Normal Fit Index (NFI), Root Mean Square Error of Approximation (RMSEA), Root Mean Square residual (RMR), goodness of fit index (GFI), chi-square ($\chi 2$), CMIN/DF, many others. To determine construct reliability, we look at the values of the tabulated CR and the average variance extracted (AVE). To determine validity, we utilise the value of the standardised loading factor (SLF), which must be equal to or greater than 0.50. The SEM analysis also uses a structural model to determine whether the investigation's hypothesis is accepted or denied. You may see the t-value for every coefficient by using SEM analysis. The hypothesis may be considered to have a causal link if, at a statistically significant level of α (typically $\alpha = 0.05$), the estimated t value is equal to or higher than the t table value (1.97) (Hair et al., 2022).

4. Results And Discussions

4.1 Results

Respondent Characteristics

Table 1 displays information on respondent characteristics for 206 respondents in total. Respondents dominated in the culinary category accounting for 35.44% of the respondents, followed by businesses located on Java Island (47.09%), those operating for more than three to five years (51.46%), those earning between 75 million and 100 million dollars annually (50.49%), Shopee (57.77%), and those using interactive artificial intelligence (AI) (Chatbots, ChatGPT, AI Assistant, and the like) (50%).

Table 1. Characteristics of respondents

Category	Item	F	%
Types of MSMEs	Agribusiness	5	2.43%
	Application	2	0.97%
	Architecture	2	0.97%
	Product Design	11	5.34%
	Electronic	10	4.85%
	Fashion	30	14.56 %
	Films, Animations and Videos	2	0.97%
	Games	2	0.97%
	Beauty	35	16.99 %
	Craft	7	3.40%
	Culinary	73	35.44 %
	Automotive	8	3.88%
	Publishing and Printing	6	2.91%
	Advertising	3	1.46%
	Art	10	4.85%
	Total	206	100%
Business Location	Jawa	97	47.09 %
	Sumatra	30	14.56 %
	Kalimantan	42	20.39 %
	Bali and Nusa Tenggara	16	7.77%
	Sulawesi	11	5.34%
	Maluku	6	2.91%
	Papua	4	1.94%
	Total	206	100%
Length of Business Operation	2 years until 3 years	48	23.30 %
	Above 3 until to 5 years	106	51.46 %
	Above 5 until to 10 years	40	19.42 %
	Above 10 years	12	5.83%
	Total	206	100%
Annual Income	75 million – 100 million	104	50.49 %
	Above 100 million – 150 million	56	27.18 %
	Above 150 million – 200 million	37	17.96 %
	Above 200 million	11	5.34%
	Total	206	100%
E-commerce Used	Shopee	119	57.77 %
	Tokopedia	58	28.16 %
	Lazada	22	10.68 %
	Open	7	3.4%
	Total	206	100%
	Shopee	119	57.77 %
Artificial Intelligence Used	Interactive AI (Chatbots AI, ChatGPT, AI Assistant, and the like)	103	50%
	Text AI (Copy.ai, Zia by Zoho, MarketMuse, Speech to Text AI, and the like)	28	13.59 %
	Functional AI (Tableau, Gong.io, Salesforce Einstein, and the like)	12	5.83%
	Visual/Generative AI (Design AI, Photoshop AI, Canva AI, Capcut	43	20.92 %

	AI, Computer Vision, Lumen5, Dall-E, and the like)		
	Machine Learning	20	9.71%
	Total	206	100%

Source: Questionnaire Data Processing Results (2024)

4.2 Measurement and Structural Models

What follows is a presentation of results pertaining to tests of validity and reliability as well as goodness of fit:

Table 2. Validity and reliability tests

	Items	SLF	CR	AVE
Artificial Intelligence Integration	I work with artificial intelligence most of the time.	0.915	0.931	0.785
	I use artificial intelligence to perform most of my MSMEs job functions.	0.884		
	I work with artificial intelligence to make big work decisions.	0.856		
	Artificial intelligence is essential to improve the performance of my MSMEs.	0.89		
Innovation Culture	I actively seek fresh ideas and welcome innovation recommendations for my SME.	0.911	0.942	0.794
	New technology can be swiftly adopted by my MSMEs.	0.873		
	My MSMEs can launch new products in the market.	0.877		
	The most crucial success factor in our business is to be innovative.	0.892		
	My MSMEs are able to implement new management techniques in response to changes in the environment.	0.903		
Customer Tech Savviness	My customers would rather read information online than in paper sources.	0.901	0.941	0.793
	Modern technology fascinates my consumers.	0.879		
	On the internet, what I need can be found with relative ease.	0.903		
	My customer is quite active on the internet.	0.904		
	My life would be dull if it weren't for technology.	0.867		
Competitive Pressure	I worry that customers will choose rivals if my MSMEs do not adopt e-commerce.	0.889	0.950	0.781
	E-commerce is strategically necessary to compete in the market.	0.902		
	It is crucial to embrace e-commerce in order to stay competitive in the industry.	0.884		
	My MSMEs won't be at a competitive disadvantage if e-commerce is implemented.	0.872		
	I fear that my MSMEs will lose the market if I do not use e-commerce in the digital transformation.	0.879		
	Competitive pressures have forced my MSMEs to pursue e-commerce.	0.877		
Business Partner Pressure	My leading MSMEs business partner asked for e-commerce implementation.	0.860	0.922	0.762
	Electronic commerce adoption has been requested by our business partners.	0.864		
	My MSMEs may lose business partners if e-commerce is not applied.	0.861		
	My MSMEs' business partners believe that businesses should be more digital.	0.908		
Customer Pressure	We are under a lot of pressure from our customers to start adopting e-commerce.	0.889	0.920	0.762
	Only by adopting e-commerce can our connection with major customers strengthen.	0.841		
	Electronic commerce is a must for our customers.	0.906		
	Our customers use e-commerce.	0.856		
E-commerce Adoption	Because it is fundamental to my company, I must use e-commerce technologies.	0.836	0.897	0.711
	My MSMEs' objective is to take advantage of e-commerce technologies.	0.834		

	I want to include e-commerce in my business routine.	0.861		
Marketing Performance	Revenue as a whole is enhanced by e-commerce.	0.888	0.928	0.775
	Increased customer satisfaction is a result of e-commerce.	0.857		
	Market share is increased by the usage of e-commerce technologies.	0.882		
	Return on Investment (ROI) is enhanced by the use of e-commerce technologies.	0.896		
O2O (Online to Offline) Business Adoption	I adopted the O2O service platform for my business.	0.941	0.948	0.901
	I actively utilize O2O service platforms in my business.	0.939		
	With an O2O business model, customers have an easier time deciding to buy a product when there is more information about it online.	0.959		
	I plan to use more online-to-offline (O2O) technology platforms for my business in the future.	0.958		

Source: Data Processing Results (2024)

The outcomes of the model-wide validity and reliability tests are shown in Table 2. All of the model's indicator variables have standardized loading factors (SLFs) greater than 0.50. Taking everything into account, this indicates that each component is legitimate and may evaluate the entire model structure. Typically, there is a pattern to the dependability test findings. The assumption is that all measurement tools are trustworthy and can precisely quantify the model's build. Proof of this assertion can be found in the fact that all the indicator instruments that were found had construct reliability (CR) values of 0.70 or higher and an average variance extracted (AVE) value of 0.50 or higher (Hair et al., 2022).

Table 3. Goodness of fit index

Goodness of Fit Index	Cut off Value	Results	
CMIN/DF	≤ 3.00	2,110	Good Fit
RMSEA	≤ 0.08	0.074	Good Fit
RMR	< 0.05	1,159	Bad Fit
NFI	≥ 0.90	0.835	Bad Fit
IFI	≥ 0.90	0.906	Good Fit
TLI	≥ 0.90	0.899	Bad Fit
CFI	≥ 0.90	0.905	Good Fit

Source: Results of Data Processing AMOS 26 (2024)

In Table 3, you can see the outcomes of the model fit test. Having run the model fit test, can say that our model fit criteria are just right. At least four measures show that the fit is good enough. If three or four measures show a degree of great fit or above the cut-off value, the research model may be regarded as fit and approved (Hair et al., 2022). The study may proceed with hypothesis testing because four indicators satisfy the Good Of Fit criterion, as shown by the model fit test findings.

4.3 Hypothesis Testing

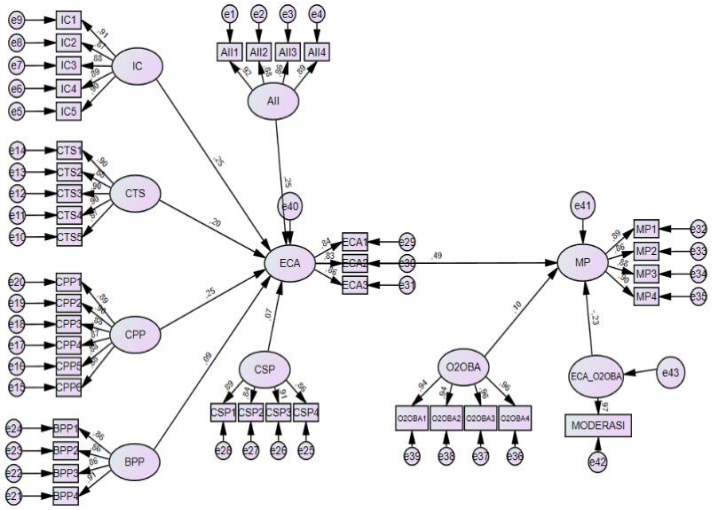

Figure 2. Full model structural test 1

Using this study framework, we tested for a causal association between the following variables:

Table 4. Hypothesis testing

Hypothesis	Path	Estimate	SE	CR	P
H1	*Artificial Intelligence Integration□E-commerce Adoption*	0.206	0.058	3,569	***
H2	*Innovation Culture□E-commerce Adoption*	0.183	0.051	3,593	***
H3	*Customer Tech-savviness□E-commerce Adoption*	0.152	0.053	2,851	0.004
H4	*Competitive Pressure□E-commerce Adoption*	0.200	0.054	3,676	***
H5	*Business Partner Pressure□E-commerce Adoption*	0.068	0.054	1,268	0.205
H6	*Customer Pressure□E-commerce Adoption*	0.057	0.056	1,008	0.314
H7	*E-commerce Adoption□Marketing Performance*	0.587	0.087	6,752	***
H8	*E-commerce Adoption_O2O Business Adoption□Marketing Performance*	-0.011	0.003	-3,563	***

Source: Results of Data Processing AMOS 26 (2024)

Based on the AMOS analysis results shown in Table 4, the t-value obtained for the artificial intelligence integration variable on e-commerce adoption is 3.569 (greater than 1.72). Also, the p-value is much lower than 0.001, indicating a value below 0.05 ($\alpha = 0.05$). So, we can conclude that the first hypothesis about the impact of AI integration on e-commerce adoption is correct. The second hypothesis was rejected with a p-value of less than 0.001 and a t-value of 3.593. So, innovation culture positively correlates with and significantly influences e-commerce adoption is shown by this. The t-value for the third hypothesis is 2.851 and the p-value was 0.047. Customer tech-savviness positively correlates with and significantly influences e-commerce adoption, as seen here. The results for the fourth hypothesis were 3.676 for the t-value and less than 0.001 for the p-value. This supports that competitive pressure positively correlates with and significantly influences e-commerce adoption. The results for the fifth hypothesis were t=1.268 and p=0.205. This demonstrates that e-commerce adoption is insignificantly affected by business partner pressure. The t-value for the sixth hypothesis is 1.008, and the p-value is 0.314. The results demonstrate that customer pressure has a small but favorable impact on e-commerce adoption. A t-value of 6.752 and a p-value lower than 0.001 were found for the seventh hypothesis. This lends credence to the idea that there are positive correlates with and significance between electronic commerce adoption and marketing performance. At last, the eighth hypothesis clarifies the findings from the test of how O2O (online to offline) business adoption moderates the relationship between e-commerce adoption, marketing performance, and O2O adoption. Since the p-value is less than 0.001, which is less than 0.05, and the t-value is -3.563, it is certain that the result is significant. The findings show that there is a negative and substantial influence on O2O business adoption acting as a moderator. This suggests that the correlation between e-commerce adoption and marketing performance might be diminished with the implementation of O2O business adoption.

5. Discussion

MSMEs that integrate artificial intelligence into their businesses tend to adopt digital-based businesses, including e-commerce. The integration of artificial intelligence will make it easier for MSMEs in many ways, such as getting materials for marketing activities faster, serving customers faster and easier through AI assistants, making business decisions faster and more accurately, and so on. All of this contributes to increasing the readiness of MSMEs to adopt digital platforms such as e-commerce because AI increases productivity and strengthens business competitiveness by facilitating access to advanced technologies previously only available to large companies. AI integration provides a solid foundation for MSMEs to thrive in a business world that is becoming more digital and unpredictable. This is backed by prior studies conducted by (Fonseka et al., 2022; Salah & Ayyash, 2024).

The culture of innovation that exists among MSMEs will make them adopt e-commerce. The culture of innovation will encourage MSMEs to continue to adapt to existing changes and create something new in their business operations. Currently, the innovation aspect that is a priority for MSMEs is digitalization because digitalization will make it easier for them to run their business. One form of innovation in digitalization by MSMEs is adopting e-commerce as part of their business. This is supported by previous research by (Gu, 2023; Salah & Ayyash, 2024; Skare et al., 2023; Wang & Esperança, 2023).

Customer tech-savviness will greatly encourage MSMEs to adopt e-commerce. Customer tech-savviness will make customers very oriented towards the use of digital things. They will have a lifestyle oriented towards digitalization, such as shopping online and doing everything with digital technology. This will encourage MSMEs to adjust to customer needs by adopting e-commerce so that customers can shop online. This is supported by previous research by (Salah & Ayyash, 2024).

MSMEs will be more likely to embrace e-commerce if they confront competitive pressure. High competitive pressure will make MSMEs continue to seek strategies to remain competitive and improve operational efficiency in the face of rapid market changes. When other competitors use e-commerce as a means of selling, MSMEs will feel pressured and eventually use e-commerce, too, to maintain their competitiveness. This is backed by prior studies conducted by (Addy et al., 2023; Amini & Javid, 2023; Salah & Ayyash, 2024; Y. Zhong & Moon, 2023).

MSMEs will not adopt e-commerce despite pressure from business partners and customer pressure. Pressure from business partners can be ignored because MSMEs usually have many business partners, so even if MSMEs do not meet the pressure from business partners to use e-commerce, MSMEs can establish business relationships with other partners. This is supported by previous research by (Isa & Alenezi, 2022). For customer pressure, although customers can drive adoption, other factors, such as technology readiness and innovation culture, are more influential. Pressure from customers is sometimes only directly proportional to the increase in e-commerce adoption, especially if the company needs more infrastructure to support it. This is supported by previous research by (Isa & Alenezi, 2022).

An important part of enhancing marketing performance is the adoption of e-commerce. When MSMEs adopt e-commerce, they will reach more comprehensive customers, streamline marketing costs, make it easier to serve customers and make it easier to carry out marketing strategies, such as promotions and advertising. Moreover, when integrated with e-commerce, MSMEs products will be personalized with customers so that customers will find it easier to find them. In addition, with the lifestyle of customers who currently like to shop online, MSMEs will get many customers. Thus, the marketing performance of MSMEs when adopting e-commerce increases significantly in terms of revenue, market share, and return on investment. This is backed by prior studies conducted by (Fonseka & Jaharadak, 2022; Gao et al., 2023; Salah & Ayyash, 2024).

Last but not least, doing business O2O reduces the strength of the link between e-commerce adoption and marketing performance. Although e-commerce adoption can improve marketing performance, the moderation of O2O business model can create additional complexity that reduces the effectiveness of marketing strategies. Currently, customers have a lifestyle of shopping online and do not need to visit the store directly because it will be more practical. This suggests that MSMEs need to carefully consider how they integrate e-commerce with other business models to maximize their marketing performance. Thus, although e-commerce has the potential to improve performance, the interaction with O2O business models may complicate the expected results. This finding contradicts earlier studies by (Suryani et al., 2021) and is a new finding of this study.

6. Conclusion

This research found that artificial intelligence integration, innovation culture, customer tech-savviness, and competitive pressure play a significant role in how MSMEs in Indonesia adopt e-

commerce. Business partner and customer pressure did not seem to have any effect on its adoption. Furthermore, this study demonstrates how e-commerce boosts marketing performance by expanding consumer reach and enhancing operational efficiency. On the other hand, the O2O business model has a negative moderating effect on this correlation, implying that the link between successful marketing and e-commerce adoption is diminished when O2O businesses adopt it. Contributing to our understanding of digital transformation in MSMEs, this research helps us understand the dynamics of e-commerce adoption and how it affects marketing performance. Theoretical work in marketing concerning e-commerce adoption and marketing success might benefit from these results when applied to MSMEs. By providing crucial data for developing a new theoretical framework or model, The findings of this investigation could potentially act as the basis for upcoming research on the topic. The results of this investigation support further research that may encourage further exploration of the various factors that influence e-commerce strategies across businesses.

The results of this investigation point to the fact that MSEMs has its focus to cultivating a culture of innovation and enhancing their technological capabilities to increase e-commerce adoption. By leveraging these insights, businesses can better align their marketing strategies with the demands of the digital marketplace, ultimately leading to improved performance.

For future research, exploring additional variables that may influence e-commerce adoption is recommended. In addition, future research can examine different objects, such as large-scale MSMEs, startups, and companies. Finally, in order to get more precise information, future research should think about expanding the sample size.

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