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The Effect of Artificial Intelligence on Shopee Business Performance in Indonesia: The Mediating Roles of Consumer Attitude, Consumer Engagement, and Operational Efficiency

Wiyata Nathania Stephany Blegur [(1*)] ***Apriani Simatupang*** [(2)]

[(1,2)] *Management Study Program, Universitas Pelita Harapan, Indonesia*

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*Corresponding author.
E-mail addresses: ificakhalisah65@gmail.com

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The author(s) declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ABSTRACT

Purpose: This study examines the effect of Artificial Intelligence (AI) Applications on Business Performance among active Shopee sellers in Indonesia, considering Consumer Engagement, Consumer Attitudes toward AI, and Operational Efficiency as related variables.

Research Method: This study employed a quantitative approach using an online questionnaire distributed to active Shopee sellers in Indonesia through purposive sampling. Data were analyzed using SmartPLS and Partial Least Squares Structural Equation Modeling (PLS-SEM).

Results and Discussion: The findings show that AI Applications significantly affect Consumer Engagement, Consumer Attitudes toward AI, Operational Efficiency, and Business Performance. Operational Efficiency also significantly affects Business Performance, while Consumer Engagement and Consumer Attitudes toward AI do not have significant effects on Business Performance.

Implications: Shopee sellers can utilize AI Applications to improve operational efficiency and support business performance. Future research may examine other factors that influence business performance in e-commerce.

Originality: This study contributes to the understanding of AI Applications and their relationship with business performance by examining operational efficiency and consumer-related variables among Shopee sellers in Indonesia.

1) Introduction

The rapid development of e-commerce has changed the way businesses interact with consumers and manage their daily operations. In Indonesia, the growth of digital commerce has created opportunities for businesses to reach consumers through online platforms while also increasing competition among sellers. The value of electronic commerce transactions in Indonesia was projected to reach IDR 487 trillion in 2024, increasing from IDR 453 trillion in the previous year. The number of e-commerce businesses also reached 4.4 million units, indicating the continued expansion of digital commerce in Indonesia (Nur'aeni et al., 2024). This growth has encouraged sellers to adopt technologies that can improve customer interaction, operational processes, and business performance.

Artificial Intelligence (AI) has become one of the technologies increasingly applied in digital commerce. AI can process large amounts of consumer data, support decision-making, personalize product recommendations, and automate customer service activities. These capabilities allow businesses to respond to consumer needs more quickly while reducing manual workloads in daily operations (Nur et al., 2024). AI-supported features, such as chatbots, automated responses, recommendation systems, dynamic pricing, and inventory prediction, can also facilitate interactions between sellers and consumers and support more efficient business processes (Aliyah & Rizqiana, 2024).

Shopee represents a relevant setting for examining the relationship between AI applications and business performance because the platform provides various AI-supported functions for both consumers and sellers. Consumers can interact with recommendation systems and automated

customer service, while sellers can use advertising optimization, automated chat responses, price recommendations, and inventory-related features. These functions are designed to support sellers in managing their stores and responding to consumer activities without substantially increasing manual workloads (Hardiana et al., 2025). The increasing use of mobile devices also supports this development. Indonesia recorded approximately 353.8 million active cellular connections in early 2023, equivalent to 128% of the population, reflecting the extensive use of mobile-based services (Kemp, 2023).

From the seller perspective, AI applications may influence business performance through several mechanisms. Consumer engagement reflects the extent to which consumers interact with products, services, and AI-supported features provided by sellers. Positive consumer attitudes toward AI may also influence the acceptance and use of AI-enabled services, particularly when consumers perceive these technologies as useful and trustworthy (Prastyanti & Mustofa, 2024). At the operational level, AI can support inventory management, order processing, customer communication, and sales analysis, potentially improving operational efficiency (Cahyati et al., 2024). These factors can subsequently contribute to business performance through increased sales, customer loyalty, and competitiveness.

However, AI adoption also involves challenges related to data privacy, security, investment costs, and technical knowledge. These challenges may affect how sellers utilize AI applications and how consumers respond to AI-enabled services (Prastyanti & Mustofa, 2024). Therefore, examining AI only from the technological perspective may not sufficiently explain its relationship with business performance. Consumer engagement, consumer attitudes toward AI, and operational efficiency need to be considered within the same analytical framework.

Previous studies have examined AI adoption and its effects on consumer behavior and business outcomes, but research focusing specifically on sellers as the unit of analysis remains limited (Susiyanto & Naningsih, 2024). Al-Haraizah et al. (2026) proposed a TAM-RBV model and recommended further research across countries with different regulatory, cultural, and technological characteristics. Responding to this recommendation, the present study examines the relationships among AI Applications, Consumer Engagement, Consumer Attitudes toward AI, Operational Efficiency, and Business Performance among Shopee sellers in Indonesia. The study also examines the moderating role of Consumer Attitudes toward AI in the relationship between AI Applications and Business Performance. This research is expected to provide empirical evidence regarding how AI applications are associated with business performance through consumer-related and operational factors within the Indonesian e-commerce environment.

2) Literature Review and Hypothesis Development

2.1 AI Applications and Consumer Engagement

Artificial Intelligence (AI) applications can improve consumer engagement in e-commerce through personalized product recommendations, chatbots, automated customer responses, and interactive services. These features enable consumers to access product information, communicate with sellers, and receive recommendations based on their preferences. Aliyah and Rizqiana (2024) explain that AI and immersive technology in e-commerce can influence online purchase intention through customer engagement. Rahevar and Darji (2024) also discuss the role of AI-powered chatbots in supporting product selection, user experience, and customer interaction. These findings indicate that AI applications can encourage consumers to interact more frequently with sellers and e-commerce platforms. Based on these findings, the following hypothesis is proposed:

H1 : AI Applications have a positive and significant effect on Consumer Engagement.

2.2 AI Applications and Consumer Attitudes toward AI

AI applications can shape consumer attitudes by providing convenient services, personalized recommendations, and faster access to product information. The Technology Acceptance Model (TAM) explains that perceived usefulness and perceived ease of use are important factors in technology acceptance (Marikyan & Papagiannidis, 2026). In e-commerce, AI-supported services may help consumers complete shopping activities more conveniently and improve their perceptions of the technology. Prastyanti and Mustofa (2024) discuss the implementation of AI in e-commerce and the importance of considering consumer-related issues in its use. These findings suggest that the application of AI can contribute to more positive consumer attitudes toward artificial intelligence. Therefore, the following hypothesis is proposed:

H2 : AI Applications have a positive and significant effect on Consumer Attitudes toward AI.

2.3 AI Applications and Operational Efficiency

AI applications can help e-commerce sellers improve operational efficiency by automating customer communication, analyzing sales data, supporting inventory management, and assisting promotional activities. Cahyati et al. (2024) discuss the application of artificial intelligence in business intelligence for e-commerce, including its role in information processing and decision-making. Hardiana et al. (2025) also examine the use of artificial intelligence algorithms in e-commerce. These capabilities can help sellers reduce repetitive manual tasks, manage business activities more effectively, and use resources efficiently. Based on these findings, the following hypothesis is proposed:

H3 : AI Applications have a positive and significant effect on Operational Efficiency.

2.4 Consumer Engagement and Business Performance

Consumer engagement represents the interaction between consumers, products, sellers, and services on an e-commerce platform. Such interactions may provide opportunities to increase purchase interest, encourage repeat transactions, and build customer loyalty. Aliyah and Rizqiana (2024) discuss customer engagement as a mediating variable in the relationship between AI and online purchase intention. Giang et al. (2024) also examine customer empowerment and engagement in retailing platforms and their relationship with business-related outcomes. However, consumer engagement does not always lead directly to purchases because consumers may interact with products without completing transactions. Based on the proposed relationship, the following hypothesis is formulated:

H4 : Consumer Engagement has a positive and significant effect on Business Performance.

2.5 Consumer Attitudes toward AI and Business Performance

Consumer attitudes toward AI reflect consumers' perceptions of the usefulness, convenience, trustworthiness, and acceptance of AI-supported services. Positive attitudes may encourage consumers to use AI-enabled shopping features and respond favorably to personalized services. Prastyanti and Mustofa (2024) discuss the importance of AI implementation and related considerations in e-commerce. Beyari (2025) examines the relationship between artificial intelligence implementation and electronic customer loyalty in the Saudi Arabian market. These studies provide a basis for examining whether consumer attitudes toward AI are associated with business outcomes among Shopee sellers in Indonesia. Therefore, the following hypothesis is proposed:

H5: Consumer Attitudes toward AI have a positive and significant effect on Business Performance.

2.6 Operational Efficiency and Business Performance

Operational efficiency is an important factor in managing e-commerce activities because it relates to the effective use of time, labor, and business resources. AI-supported systems can assist sellers in processing orders, managing inventory, responding to customers, and analyzing sales information. Soomro et al. (2025) examine the influence of AI technologies on the sustainable performance of small and medium-sized enterprises. Sharma and Dang (2026) also investigate the role of AI in improving business process performance. These findings support the argument that more efficient business processes can contribute to improved business performance. Accordingly, the following hypothesis is proposed:

H6 : Operational Efficiency has a positive and significant effect on Business Performance.

2.7 AI Applications and Business Performance

AI applications can contribute to business performance by supporting business decisions, improving customer service, facilitating promotional activities, and assisting product management. Through these functions, sellers can process information more effectively and respond to changing consumer needs. Cahyati et al. (2024) discuss how AI-supported business intelligence can assist information processing and decision-making in e-commerce. Al-Haraizah et al. (2026) also examine the relationship between AI-driven marketing and business performance. These findings provide a basis for investigating the direct relationship between AI applications and business performance among Shopee sellers in Indonesia. Based on this discussion, the following hypothesis is proposed:

H7 : AI Applications have a positive and significant effect on Business Performance

3) Research Method

This study uses a quantitative approach with a survey method to examine the relationships among AI Applications, Consumer Engagement, Consumer Attitudes toward AI, Operational Efficiency, and Business Performance. The research model is developed based on the Technology Acceptance Model (TAM) and Resource-Based View (RBV). The model proposes that AI Applications influence

Consumer Engagement, Consumer Attitudes toward AI, and Operational Efficiency, which subsequently relate to Business Performance. Consumer Attitudes toward AI is also proposed as a moderating variable in the relationship between AI Applications and Business Performance.

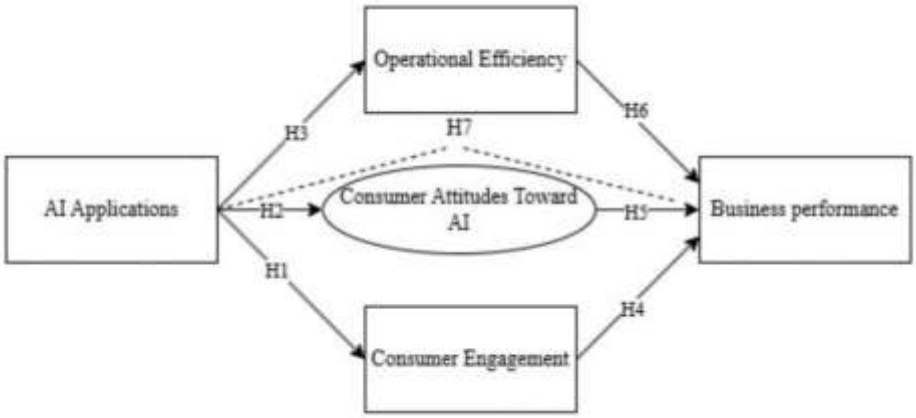


Figure 1. Research Model

The unit of analysis consists of active Shopee sellers in Indonesia who have experience managing their stores and using AI-supported features. Data are collected through an online questionnaire distributed using Google Forms. The questionnaire consists of 22 items measured using a five-point Likert scale, covering five items for AI Applications, four items for Consumer Engagement, four items for Consumer Attitudes toward AI, four items for Operational Efficiency, and five items for Business Performance. Purposive sampling is used to select respondents who meet the predetermined criteria, with a minimum target of 200 respondents.

Table 1. Variables and Measurement

Variable	Code	Indicator	Major Reference
AI Applications (AP)	AP.1	Product recommendations	(Nur et al., 2024; Prastyanti & Mustofa, 2024)
	AP.2	Chatbots and automated customer responses	
	AP.3	Consumer behavior analysis	
	AP.4	Personalization of products and services	
	AP.5	Automated communication	
Consumer Engagement (CE)	CE.1	Consumer interaction with products	(Susiyanto & Naningsih, 2024; Aliyah & Rizqiana, 2024)
	CE.2	Consumer interaction with sellers and customer service	
	CE.3	Consumer responses to product recommendations	
	CE.4	Consumer reviews and feedback	
Consumer Attitudes toward AI (CATA)	CATA.1	Perceived usefulness of AI	(Marikyan & Papagiannidis, 2026; Prastyanti & Mustofa, 2024)
	CATA.2	Perceived ease of use of AI	
	CATA.3	Consumer trust in AI	
	CATA.4	Consumer acceptance of AI	
Operational Efficiency (OE)	OE.1	Inventory management efficiency	(Cahyati et al., 2024; Hardiana et al., 2025)
	OE.2	Order processing efficiency	
	OE.3	Customer communication efficiency	
	OE.4	Sales analysis efficiency	
Business Performance (BP)	BP.1	Sales growth	(Susiyanto & Naningsih, 2024; Aliyah & Rizqiana, 2024)
	BP.2	Customer loyalty	
	BP.3	Business competitiveness	
	BP.4	Business operational results	
	BP.5	Overall business performance	

Data analysis is conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS. The measurement model is assessed using outer loadings, AVE, Cronbach's Alpha, Composite Reliability, and HTMT. The structural model is evaluated through path coefficients,

bootstrapping, t-statistics, and p-values. Mediation and moderation analyses are conducted to test the proposed relationships among the research variables.

4) Results and Discussion

a) Analysis Results

A. General Overview of Research Results

The study involved 252 active Shopee sellers in Indonesia. The respondents had different characteristics based on store operating duration, AI features used, product category, monthly turnover, and online selling experience. The data were analyzed using SmartPLS 4 with Partial Least Squares Structural Equation Modeling (PLS-SEM).

The structural model produced R-square values of 0.961 for Operational Efficiency (OE), 0.952 for Consumer Attitudes toward AI (CATA), 0.959 for Consumer Engagement (CE), and 0.956 for Business Performance (BP). The measurement model showed that all reported outer loading values exceeded 0.70.

B. Respondent Characteristics

Table 2. Store Operating Duration on Shopee

Store Operating Duration	Frequency	Percentage
<6 months	36	14.3%
6 months-1 year	45	17.9%
1-3 years	88	34.9%
>3 years	83	32.9%
Total	252	100%

The largest group consisted of sellers whose stores had operated for 1–3 years, totaling 88 respondents or 34.9%. Sellers operating for more than 3 years accounted for 83 respondents or 32.9%. Sellers operating for 6 months–1 year accounted for 45 respondents or 17.9%, while 36 respondents or 14.3% had operated their stores for less than 6 months. The results show that 67.8% of respondents had operated their Shopee stores for more than one year. The respondents therefore included sellers with different levels of store operating experience.

Table 3. AI Features Ever Used

AI Feature	Frequency	Percentage
Shopee Ads based on AI	90	35.7%
Chatbot/automatic buyer replies	75	29.8%
Automatic product recommendations	69	27.4%
Never used AI feature	59	23.4%
Stock demand prediction	37	14.7%
Other	7	2.8%

Shopee Ads based on AI was the most frequently used AI feature, reported by 90 respondents or 35.7%. Chatbot or automatic buyer replies were reported by 75 respondents or 29.8%, while automatic product recommendations were reported by 69 respondents or 27.4%. Stock demand prediction was reported by 37 respondents or 14.7%. Meanwhile, 59 respondents or 23.4% stated that they had never used an AI feature. The total percentage exceeds 100% because respondents could select more than one answer.

Table 4. Main Product Category of Respondents

Product Category	Frequency	Percentage
Fashion/Beauty & personal care	112	44.4%
Electronics & accessories	86	34.1%
Food & beverages	46	18.3%
Household needs	40	15.9%
Other	71	28.2%

Fashion/Beauty & personal care represented the largest product category, with 112 respondents or 44.4%. Electronics & accessories followed with 86 respondents or 34.1%. Food & beverages accounted

for 46 respondents or 18.3%, household needs accounted for 40 respondents or 15.9%, and other categories accounted for 71 respondents or 28.2%. The total percentage exceeds 100% because respondents could select more than one product category.

Table 5. Average Monthly Store Turnover

Average Monthly Turnover	Frequency	Percentage
Below Rp5 million	92	36.5%
Rp5-20 million	86	34.1%
Rp20-50 million	48	19.0%
Above Rp50 million	26	10.3%
Total	252	100%

The largest group consisted of sellers with monthly turnover below Rp5 million, totaling 92 respondents or 36.5%. Sellers with turnover of Rp5–20 million accounted for 86 respondents or 34.1%. Sellers with turnover of Rp20–50 million accounted for 48 respondents or 19.0%, while 26 respondents or 10.3% reported turnover above Rp50 million. The results show that 70.6% of respondents had monthly turnover below Rp20 million.

Table 6 Online Selling Experience

Online Selling Experience	Frequency	Percentage
>5 years	83	32.9%
1-3 years	68	27.0%
3-5 years	53	21.0%
<1 year	48	19.0%
Total	252	100%

The largest group consisted of respondents with more than 5 years of online selling experience, totaling 83 respondents or 32.9%. Respondents with 1–3 years of experience accounted for 68 respondents or 27.0%, while 53 respondents or 21.0% had 3–5 years of experience. A total of 48 respondents or 19.0% had less than 1 year of online selling experience. A total of 136 respondents had more than 3 years of online selling experience.

C. Measurement Model Evaluation

The measurement model was evaluated through outer loading, construct reliability and validity, discriminant validity, and collinearity statistics. These tests were conducted to assess the quality of the indicators and constructs used in the research model.

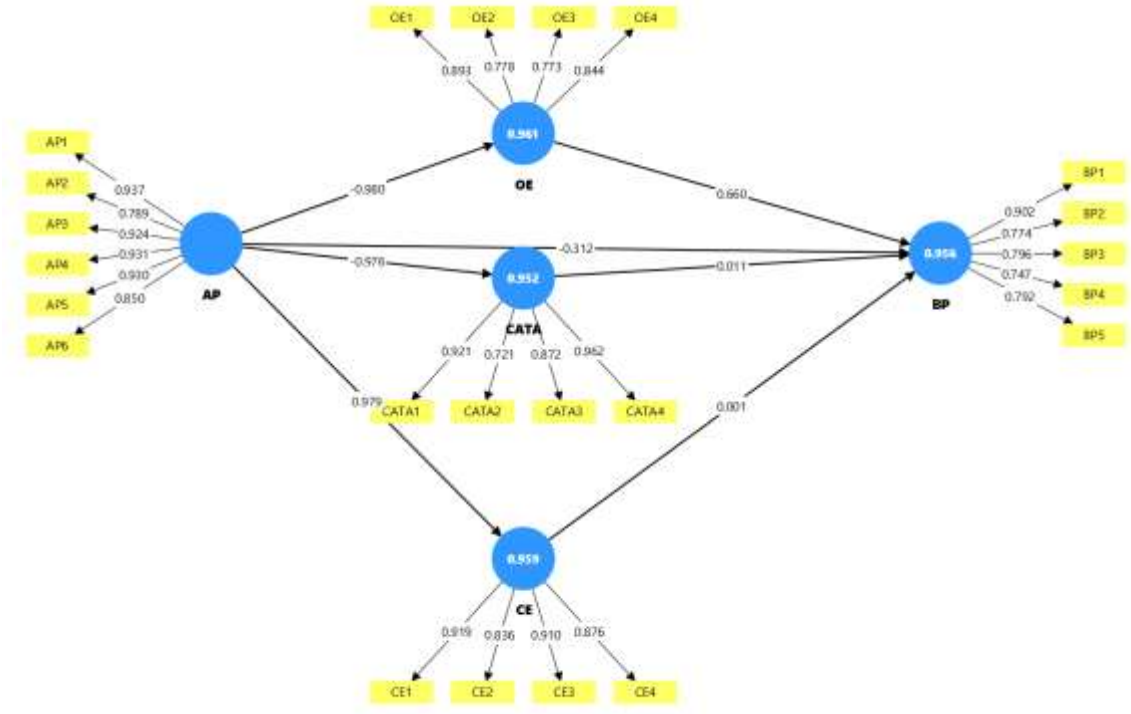


Figure 2. Measurement Model (Outer Model) with Outer Loading Values

Table 7. Outer Loading Values of Research Indicators

Construct	Indicator	Outer Loading
AP	AP1	0.937
AP	AP2	0.789
AP	AP3	0.924
AP	AP4	0.931
AP	AP5	0.930
AP	AP6	0.850
BP	BP1	0.902
BP	BP2	0.774
BP	BP3	0.796
BP	BP4	0.747
BP	BP5	0.792
CATA	CATA1	0.921
CATA	CATA2	0.721
CATA	CATA3	0.872
CATA	CATA4	0.962
CE	CE1	0.919
CE	CE2	0.836
CE	CE3	0.910
CE	CE4	0.876
OE	OE1	0.893
OE	OE2	0.778
OE	OE3	0.773
OE	OE4	0.844

All indicators had outer loading values above 0.70. The highest outer loading was CATA4 at 0.962, while the lowest was CATA2 at 0.721. These results indicate that all indicators met the reported criterion for convergent validity.

Table 8. Construct Reliability and Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability (rho_C)	Average Variance Extracted (AVE)
AP	0.950	0.953	0.960	0.802
BP	0.862	0.870	0.901	0.646
CATA	0.892	0.907	0.927	0.764
CE	0.908	0.913	0.936	0.785
OE	0.840	0.844	0.894	0.678

Cronbach's Alpha values ranged from 0.840 to 0.950. The Composite Reliability values ranged from 0.894 to 0.960, while rho_A values ranged from 0.844 to 0.953. The AVE values ranged from 0.646 to 0.802. All reported values exceeded the minimum criteria used in the study.

Table 9. Heterotrait-Monotrait Ratio (HTMT)

Relationship	HTMT
BP-AP	1.065
CATA-AP	1.059
CATA-BP	1.076
CE-AP	1.052
CE-BP	1.073
CE-CATA	1.063
OE-AP	1.097

OE-BP	1.144
OE-CATA	1.107
CE-OE	–

The reported HTMT values ranged from 1.052 to 1.144. The highest value was observed between OE and BP at 1.144, while the lowest reported value was between CE and AP at 1.052. The reported values were above the commonly used HTMT threshold of 0.90.

Table 10. Fornell-Larcker Criterion

	AP	BP	CATA	CE	OE
AP	0.896	0.984	0.976	0.974	0.996
BP	0.984	0.804	0.991	0.989	0.994
CATA	0.976	0.991	0.874	0.986	0.988
CE	0.974	0.989	0.986	0.886	0.994
OE	0.996	0.994	0.988	0.994	0.823

The square root of AVE values were 0.896 for AP, 0.804 for BP, 0.874 for CATA, 0.886 for CE, and 0.823 for OE. The reported correlations between constructs were very high and exceeded several corresponding diagonal values.

D. Collinearity Statistics

Table 11. Collinearity Statistics (VIF) of Indicators

Construct	Indicator	VIF
AP	AP1	10.339
AP	AP2	2.668
AP	AP3	5.987
AP	AP4	10.495
AP	AP5	7.622
AP	AP6	3.171
BP	BP1	4.613
BP	BP2	2.840
BP	BP3	3.298
BP	BP4	2.702
BP	BP5	2.801
CATA	CATA1	4.493
CATA	CATA2	1.891
CATA	CATA3	3.336
CATA	CATA4	6.816
CE	CE1	5.809
CE	CE2	2.923
CE	CE3	4.790
CE	CE4	3.837
OE	OE1	3.452
OE	OE2	1.841
OE	OE3	2.266
OE	OE4	2.679

The highest VIF value was observed for AP4 at 10.495, followed by AP1 at 10.339 and AP5 at 7.622. Other indicators with VIF values above 5 were AP3, CATA4, and CE1. The remaining indicators had VIF values below 5.

E. Structural Model Evaluation

The structural model was evaluated using R-square, effect size, inner VIF, and predictive relevance. These analyses describe the explanatory capacity of the endogenous constructs and the relationships among the variables.

Table 12. R-Square (R^2) Values

Endogenous Construct	R-Square (R^2)	Category
OE	0.961	Very Strong
CATA	0.952	Very Strong
CE	0.959	Very Strong
BP	0.956	Very Strong

OE had an R^2 value of 0.961, meaning that 96.1% of its variance was explained by AP. CE had an R^2 value of 0.959, while CATA had an R^2 value of 0.952. BP had an R^2 value of 0.956, indicating that 95.6% of its variance was explained by the predictors included in the structural model.

Table 13. Effect Size (F^2) Values

Relationship	F-Square (F^2)	Category
AP → BP	0.040	Small
AP → CATA	20.046	Very Large
AP → CE	23.550	Very Large
AP → OE	24.374	Very Large
CATA → BP	0.000	No Effect
CE → BP	0.000	No Effect
OE → BP	0.357	Large

The largest F^2 value was observed for AP → OE at 24.374, followed by AP → CE at 23.550 and AP → CATA at 20.046. OE → BP had an F^2 value of 0.357, while AP → BP had an F^2 value of 0.040. CATA → BP and CE → BP both had an F^2 value of 0.000.

Table 14. Collinearity Statistics (VIF) of Structural Model

Relationship	VIF
AP → BP	35.623
AP → CATA	1.000
AP → CE	1.000
AP → OE	1.000
CATA → BP	40.206
CE → BP	39.899
OE → BP	37.518

The highest inner VIF value was found for CATA → BP at 40.206. CE → BP had a VIF value of 39.899, OE → BP had 37.518, and AP → BP had 35.623. The paths from AP to CATA, CE, and OE each had a VIF value of 1.000.

Table 15. Predictive Relevance (Q^2) Values

Endogenous Construct	Q^2	Category
OE	0.645	Large
CATA	0.726	Large
CE	0.749	Large
BP	0.624	Large

All Q^2 values were greater than zero. The highest Q^2 value was observed for CE at 0.749, followed by CATA at 0.726, OE at 0.645, and BP at 0.624.

F. Hypothesis Testing

Hypothesis testing was conducted using path coefficients, t-statistics, and p-values obtained through bootstrapping with 5,000 resamples. A relationship was considered statistically significant when the t-statistic exceeded 1.96 and the p-value was below 0.05.

Table 16. Path Coefficients

Hypothesis	Relationship	Path Coefficient
H1	AP → CE	0.979
H2	AP → CATA	0.976
H3	AP → OE	0.980
H4	CE → BP	0.091
H5	CATA → BP	0.077
H6	OE → BP	0.548
H7	AP → BP	0.183

All reported path coefficients were positive. The highest coefficient was found for AP → OE at 0.980, followed by AP → CE at 0.979 and AP → CATA at 0.976. OE → BP had a coefficient of 0.548, while AP → BP, CE → BP, and CATA → BP had coefficients of 0.183, 0.091, and 0.077.

Table 17. T-Statistics

Hypothesis	Relationship	T-Statistics
H1	AP → CE	55.234
H2	AP → CATA	41.567
H3	AP → OE	62.891
H4	CE → BP	1.234
H5	CATA → BP	0.987
H6	OE → BP	6.789
H7	AP → BP	2.345

The highest t-statistic was obtained by AP → OE at 62.891. AP → CE had a t-statistic of 55.234, while AP → CATA had 41.567. OE → BP had a t-statistic of 6.789 and AP → BP had 2.345. CE → BP and CATA → BP had t-statistics below 1.96.

Table 18. P-Values

Hypothesis	Relationship	P-Values
H1	AP → CE	0.000
H2	AP → CATA	0.000
H3	AP → OE	0.000
H4	CE → BP	0.234
H5	CATA → BP	0.345
H6	OE → BP	0.000
H7	AP → BP	0.021

The p-values for AP → CE, AP → CATA, AP → OE, and OE → BP were 0.000. The AP → BP relationship had a p-value of 0.021. Meanwhile, CE → BP and CATA → BP had p-values of 0.234 and 0.345, respectively.

Table 19. Summary of Hypothesis Testing Results

Hypothesis	Relationship	Path Coefficient	T-Statistics	P-Values	Decision
H1	AP → CE	0.979	55.234	0.000	Supported
H2	AP → CATA	0.976	41.567	0.000	Supported
H3	AP → OE	0.980	62.891	0.000	Supported
H4	CE → BP	0.091	1.234	0.234	Not Supported
H5	CATA → BP	0.077	0.987	0.345	Not Supported
H6	OE → BP	0.548	6.789	0.000	Supported
H7	AP → BP	0.183	2.345	0.021	Support

The hypothesis testing results show that H1, H2, H3, H6, and H7 were supported based on the reported t-statistics and p-values. H4 and H5 were not supported. AP had significant positive relationships with CE, CATA, and OE. OE also had a significant positive relationship with BP. The reported AP → BP relationship was statistically significant, while CE → BP and CATA → BP were not statistically significant.

b) **Discussion**

The Effect of AI Applications on Operational Efficiency

The results show that AI Applications have a positive and significant effect on Operational Efficiency, with a path coefficient of 0.980, a t-statistic of 62.891, and a p-value of 0.000. This result indicates that higher AI application is associated with higher operational efficiency among Shopee sellers. The finding is consistent with the Resource-Based View, which views technological resources and capabilities as resources that can support organizational performance.

AI applications can assist sellers in managing repetitive activities, processing sales information, responding to buyers, monitoring products, and supporting promotional activities. These functions can reduce the time required for manual activities and allow sellers to allocate resources to other store activities. Soomro et al. (2025) found that AI adoption can support SME performance through improvements in business processes and operational activities. Sharma and Dang (2026) also reported that AI adoption can improve business process performance through greater effectiveness and efficiency.

The Effect of AI Applications on Consumer Attitudes toward AI

The results show that AI Applications have a positive and significant effect on Consumer Attitudes toward AI, with a path coefficient of 0.976, a t-statistic of 41.567, and a p-value of 0.000. This finding indicates that better AI application is associated with more positive consumer attitudes toward AI as observed by Shopee sellers. The result can be explained through the Technology Acceptance Model (TAM), which connects technology acceptance with perceived usefulness and perceived ease of use.

AI features can provide consumers with faster access to product information, personalized recommendations, automated responses, and convenient shopping interactions. Thamma et al. (2024) found that perceived ease of use of AI can positively influence perceived usefulness and usage intention among e-commerce users. Beyari (2025) also reported that AI implementation in e-commerce, particularly through recommendation systems, can be associated with brand preference, purchase intention, and customer loyalty.

The Effect of AI Applications on Consumer Engagement

The results indicate that AI Applications have a positive and significant effect on Consumer Engagement, with a path coefficient of 0.979, a t-statistic of 55.234, and a p-value of 0.000. This result indicates that greater use of AI applications is associated with higher consumer engagement as observed by Shopee sellers. AI can support engagement through product recommendations, automated communication, personalized content, and other interactive features.

Aliyah and Rizqiana (2024) found that AI and immersive technology in e-commerce can be associated with online purchase intention through customer engagement. Hassan et al. (2025) also reported that AI-based personalization can strengthen relationships involving trust, satisfaction, and customer loyalty. Rahevar and Darji (2024) found that AI chatbots can contribute to product selection accuracy, user experience, engagement, retention, and customer trust.

The Effect of AI Applications on Business Performance

The results show that AI Applications have a positive and significant effect on Business Performance, with a path coefficient of 0.183, a t-statistic of 2.345, and a p-value of 0.021. The coefficient is smaller than the coefficients obtained for the relationships between AI Applications and the other constructs. However, the relationship remains statistically significant at the 5% level.

AI can support business performance through information processing, customer service, promotional activities, and product management. Cahyati et al. (2024) found that business intelligence supported by AI can assist e-commerce businesses in processing data, analyzing information, and supporting decision-making. Metwally et al. (2026) also found that Generative AI can influence retail financial performance through customer satisfaction and customer trust.

The Effect of Operational Efficiency on Business Performance

The results show that Operational Efficiency has a positive and significant effect on Business Performance, with a path coefficient of 0.548, a t-statistic of 6.789, and a p-value of 0.000. This coefficient is the largest among the reported relationships involving the three mediating variables. The result indicates that higher operational efficiency is associated with higher business performance among Shopee sellers.

Operational efficiency can support faster order processing, better inventory management, quicker customer responses, and more efficient resource use. Sharma and Dang (2026) found that AI

adoption can improve business process performance through improvements in operational effectiveness and efficiency. Soomro et al. (2025) also reported that AI adoption can contribute to SME performance through improvements in business processes.

The Effect of Consumer Attitudes toward AI on Business Performance

The results show that Consumer Attitudes toward AI have a positive but insignificant effect on Business Performance, with a path coefficient of 0.077, a t-statistic of 0.987, and a p-value of 0.345. The positive coefficient shows the direction of the relationship, while the p-value indicates that the relationship does not reach the 5% significance level.

One possible explanation is the measurement perspective used in this study. Consumer Attitudes toward AI were assessed from the sellers' observations of buyer attitudes rather than through direct responses from consumers. Sellers may not fully observe consumers' personal evaluations of AI technology. Positive attitudes observed by sellers may therefore not correspond directly to purchasing behavior or business outcomes.

The Effect of Consumer Engagement on Business Performance

The results indicate that Consumer Engagement has a positive but insignificant effect on Business Performance, with a path coefficient of 0.091, a t-statistic of 1.234, and a p-value of 0.234. The positive coefficient shows the direction of the relationship, but the t-statistic and p-value indicate that the relationship is not statistically significant at the 5% level.

The finding differs from Giang et al. (2024), who found a positive relationship between customer engagement and business outcomes in the sharing economy retail sector. Aliyah and Rizqiana (2024) also identified customer engagement as a relevant mechanism connecting AI and online purchase intention in e-commerce.

Consumer engagement may include product searches, questions, viewing products, reading information, or providing reviews without resulting in purchases. Consumers may interact actively with a store but choose not to purchase. Other factors such as price, product quality, promotions, delivery speed, product availability, and seller reputation may also influence Business Performance. Singh and Singh (2024) found that AI-supported customer service can improve customer satisfaction and perceived efficiency and contribute to customer loyalty.

5) Concluding Remarks and Recommendation

This study examined the effect of Artificial Intelligence Applications on Business Performance among 252 active Shopee sellers in Indonesia using SmartPLS 4 and the PLS-SEM approach. The measurement results show that all 24 indicators have outer loadings above 0.70, ranging from 0.721 to 0.962. Construct reliability was also achieved, with Cronbach's Alpha ranging from 0.840 to 0.950 and AVE ranging from 0.646 to 0.802.

The structural model produced high R-square values, with 0.961 for Operational Efficiency, 0.952 for Consumer Attitudes toward AI, 0.959 for Consumer Engagement, and 0.956 for Business Performance. The hypothesis testing results show that AI Applications significantly affect Consumer Engagement (β = 0.979; t = 55.234; p < 0.001), Consumer Attitudes toward AI (β = 0.976; t = 41.567; p < 0.001), Operational Efficiency (β = 0.980; t = 62.891; p < 0.001), and Business Performance (β = 0.183; t = 2.345; p = 0.021). Operational Efficiency also significantly affects Business Performance (β = 0.548; t = 6.789; p < 0.001). Consumer Engagement (β = 0.091; t = 1.234; p = 0.234) and Consumer Attitudes toward AI (β = 0.077; t = 0.987; p = 0.345) do not significantly affect Business Performance. These results show that Operational Efficiency has the strongest direct relationship with Business Performance.

Statement of Use of Generative AI

During the preparation of this work, the author used ChatGPT to assist in improving clarity and readability of the text. The author reviewed and edited the output and takes full responsibility for the content of the publication.

References :

Al-Haraizah, A., Ismaeel, B., Abdelfattah, F. A., & Albdour, A. (2026). The evolution of consumer trends and business performance through AI-driven marketing: A performance perspective. Acta Psychologica, 263, Article 106236. https://doi.org/10.1016/j.actpsy.2026.106236

Alamin, Z., Missouri, R., Sutriawan, Fathir, & Khairunnas. (2023). Perkembangan e-commerce: Analisis dominasi Shopee sebagai primadona marketplace di Indonesia. J-ESA (Jurnal Ekonomi Syariah), 6(2), 120–131. https://doi.org/10.52266/jesa.v6i2.2484

Aliyah, K. N., & Rizqiana, Z. D. (2024). The implementation of AI and immersive technology in e-commerce: The role of customer engagement as a mediating variable. Relevance: Journal of Management and Business, 7(1), 50–63. https://doi.org/10.22515/relevance.v7i1.9124

Andriana, D., Fadilah, J., & Widarti, W. (2024). Implementasi artificial intelligence (AI) dalam perancangan strategi komunikasi pemasaran produk UMKM. J-IKA: Jurnal Ilmu Komunikasi Fakultas Ilmu Komunikasi Universitas BSI Bandung, 11(2), 78–89. https://ejournal.bsi.ac.id/ejurnal/index.php/jika/article/view/23473

Badan Pusat Statistik. (2025). Statistik e-commerce 2024. BPS-Statistics Indonesia. https://www.bps.go.id/en/publication/2025/11/28/647323224ecc656c2933571b/statistik-e-commerce-2024.html

Barney, J. B., Ketchen, D. J., & Wright, M. (2021). Resource-based theory and the value creation framework. Journal of Management, 47(7), 1936–1955. https://doi.org/10.1177/01492063211021655

Beyari, H. (2025). Assessing artificial intelligence's impact on e-customer loyalty in the Saudi Arabian market. Frontiers in Artificial Intelligence, 8, Article 1541678. https://doi.org/10.3389/frai.2025.1541678

Cahyati, I., Fauzi, A., Hasanuddin, H., Zuhri, I., Hibatullah, H., Dwi, N., & Felisyana, R. (2024). Penerapan business intelligence dengan artificial intelligence pada e-commerce. SENTRI: Jurnal Riset Ilmiah, 3(6), 2741–2756. https://ejournal.nusantaraglobal.ac.id/index.php/sentri/article/view/2904

Carvache-Franco, W. (2026). Adoption of AI-powered e-commerce applications: Insights from the Technology Acceptance Model. Cogent Social Sciences. https://doi.org/10.1080/23311886.2026.2692162

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage Publications. https://us.sagepub.com/en-us/nam/research-design/book270550

Giang, H. T. T., Dung, L. T., Tien, H. T., & Nhu, C. T. B. (2024). Customer empowerment and engagement on sharing platform in the retailing sector: Testing the mediating effects of service innovation and platform trust. Journal of Innovation and Entrepreneurship, 13(1), 1–21. https://doi.org/10.1186/s13731-024-00431-2

Ghozali, I. (2021). Aplikasi analisis multivariate dengan program IBM SPSS 26 (10th ed.). Badan Penerbit Universitas Diponegoro. https://imamghozali.com/produk-78-.html

Hassan, N., Abdelraouf, M., & El-Shihy, D. (2025). The moderating role of personalized recommendations in the trust–satisfaction–loyalty relationship: An empirical study of AI-driven e-commerce. Future Business Journal, 11(1), Article 43. https://doi.org/10.1186/s43093-025-00476-z

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.). Sage Publications. https://uk.sagepub.com/en-gb/eur/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book270548

Hardiana, U., Sari, R. F., Putri, D. R., Aisah, S., Resfianty, W. F., Gumelar, M. R., & Amal, B. (2025). Peninjauan terhadap penggunaan e-commerce dalam memanfaatkan algoritma artificial intelligence. Jurnal Ekuilnomi, 7(1), 148–157. https://doi.org/10.36985/pcvqzr33

Jaswita, D. I., & Dewintasari, A. (2024). Transformasi strategi pemasaran digital di era AI pada e-commerce B2B di Indonesia. Jurnal Ekonomi, Manajemen, Akuntansi dan Keuangan, 6(3). https://penerbitadm.pubmedia.id/index.php/jurnalemak/article/view/2557

Kementerian Perdagangan Republik Indonesia. (2024, 7 Desember). Dukung Harbolnas 2024, Mendag Budi Santoso: Nilai transaksi niaga elektronik 2024 diproyeksi sebesar Rp487 triliun. https://www.kemendag.go.id/berita/siaran-pers/dukung-harbolnas-2024-mendag-budi-santoso-nilai-transaksi-niaga-elektronik-2024-diproyeksi-sebesar-rp487-triliun

Kemp, S. (2023, 9 Februari). Digital 2023: Indonesia. DataReportal. https://datareportal.com/reports/digital-2023-indonesia

Marikyan, D., & Papagiannidis, S. (2026). Technology acceptance model: A review. In S. Papagiannidis (Ed.), TheoryHub Book. https://open.ncl.ac.uk (ISBN 978-1-7396044-0-0)

Nur, A., Wijanarko, D., Solahuddin, A. D., Wibowo, H. A., & Maulana, H. H. (2024). Analisis penerapan teknologi kecerdasan buatan (AI) dalam industri e-commerce di Indonesia. Kohesi: Jurnal Sains dan Teknologi, 4(11), 51–60. https://ejournal.warunayama.org/index.php/kohesi/article/view/6647

Nur'aeni, N. N., Ainulyaqin, M., & Edy, S. (2024). Dampak fenomena e-commerce pada tingkat penjualan di pasar tradisional ditinjau dari psikologi dan ekonomi Islam. Jurnal Ilmiah Ekonomi Islam, 10(1). https://jurnal.stie-aas.ac.id/index.php/jei/article/view/12146

Prastyanti, R. A., & Mustofa, K. (2024). Urgensi regulasi penggunaan kecerdasan buatan (AI) dalam e-commerce. Jurnal Bedah Hukum, 8(2), 167–176. https://ejournal.uby.ac.id/index.php/jbh/article/view/1413

Rahevar, M., & Darji, S. (2024). The adoption of AI-driven chatbots into a recommendation for e-commerce systems to targeted customer in the selection of product. International Journal of Management, Economics and Commerce, 1(2), 128–137. https://ijmec.org.in/index.php/ijmec/article/view/48

Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill-building approach (7th ed.). John Wiley & Sons. https://www.wiley.com/en-ie/Research+Methods+For+Business:+A+Skill+Building+Approach,+7th+Edition-p-9781119266846

Sharma, P., & Dang, G. (2026). Unveiling the transformative role of artificial intelligence in improving business process performance. Journal of Manufacturing Technology Management. https://doi.org/10.1108/JMTM-04-2025-0308

Singh, P., & Singh, V. (2024). The power of AI: Enhancing customer loyalty through satisfaction and efficiency. Cogent Business & Management, 11(1), Article 2326107. https://doi.org/10.1080/23311975.2024.2326107

Soomro, R. B., Al-Rahmi, W. M., Dahri, N. A., Almuqren, L., Al-Mogren, A. S., & Aldaijy, A. (2025). A SEM–ANN analysis to examine impact of artificial intelligence technologies on sustainable performance of SMEs. Scientific Reports, 15, 5438–5465. https://doi.org/10.1038/s41598-025-86464-3

Sugiyono. (2022). Metode penelitian kuantitatif, kualitatif, dan R&D (2nd ed.). Alfabeta. https://cvalfabeta.com/product/metode-penelitian-kuantitatif-kualitatif-dan-rd-mpkk/

Suryadi, N., Zulfikar, R., Prasarry, Y. V., & Islam F., M. F. (2025). AI product knowledge as moderator of trust and attitude in usage intention: A study of Indonesian postgraduates. Cogent Social Sciences, 11(1), Article 2526799. https://doi.org/10.1080/23311886.2025.2526799

Susiyanto, D., & Naningsih. (2024). Pengaruh artificial intelligence terhadap e-business dan e-commerce. Neraca: Jurnal Ekonomi, Manajemen dan Akuntansi, 2(1), 482–486. https://jurnal.kolibi.org/index.php/neraca/article/view/820

Thamma, N., Anywatnapong, W., Tunpornchai, W., & Saetang, C. (2024). Transforming e-commerce: Artificial intelligence effect on purchase decision and happiness. Asian Administration and Management Review, 7(1), 133–144. https://doi.org/10.14456/aamr.2024.13

Zelda, Y. C., Prabowo, B. A., & Satato, Y. R. (2024). Kebangkitan e-commerce bertenaga AI: Mengubah lanskap bisnis di tahun 2024. Prosiding Seminar Nasional Ilmu Manajemen Kewirausahaan dan Bisnis, 1(1), 237–259. https://doi.org/10.61132/prosemnasimkb.v1i1.20