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Smart Marketing: How AI and Machine Learning Elevate Customer Experience

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A B S T R A C T

This study investigates the impact of Artificial Intelligence (AI) and Machine Learning (ML) adoption on customer satisfaction among MSME resellers in Tokopedia and Shopee, focusing on Malang-based businesses. Using a quantitative approach, data were collected from 200 respondents via questionnaires in early 2025 and analyzed through linear regression. The tested variables include AI-powered recommendation systems and chatbot responsiveness. Findings show that AI and ML contribute significantly to customer satisfaction (65%), with recommendation systems accounting for 25% and chatbots 30%. Challenges include low digital literacy (45%) and limited capital (35%). The study contributes to understanding how smart marketing technologies enhance MSME competitiveness in Indonesia's e-commerce ecosystem

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INTRODUCTION

The rapid advancement of digital technology has significantly transformed the landscape of marketing. The application of Artificial Intelligence (AI) and Machine Learning (ML) provides opportunities for companies, including Micro, Small, and Medium Enterprises (MSMEs), to improve operational efficiency, personalize services, and understand consumer behavior more accurately. However, the implementation of these technologies among MSMEs—particularly in Malang, the site of this research—still faces various challenges, including limited digital literacy, infrastructure, and technological understanding.

Logically, AI and ML serve as tools to analyze customer data, deliver product recommendations, and design responsive marketing strategies. Phenomenologically, many MSMEs' experiences reveal that these advanced features remain underutilized. Business owners often rely only on basic e-commerce platform functionalities, without further exploring the potential of AI and ML. This phenomenon indicates a gap between the availability of digital tools and the readiness of users at the micro level.

Moreover, in the context of Indonesia's majority-Muslim population, there is a growing demand for Sharia-compliant business practices, especially for halal-certified MSMEs. The integration of Sharia principles in digital business operations is increasingly recognized as a strategic factor for gaining consumer trust (Author, 2024) . For halal-certified MSMEs, implementing AI and ML must align not only with efficiency and personalization goals but also with values such as transparency, ethical promotion, privacy, and fairness. Sharia-compliant digital marketing—free from deception (*gharar*), excessive exploitation (*ikhtikar*), and ambiguity (*jahalah*)—can enhance consumer confidence while maintaining religious and legal compliance. Hence, the ethical use of AI in accordance with Sharia principles becomes a crucial part of innovation in Islamic business management.

Previous studies further emphasize the urgency of this issue. Huang & Rust (2018) assert that AI can improve service efficiency but may reduce the personal touch in customer interactions. Davenport et al. (2020) Davenport et al. (2020) explain that AI has the capability to analyze data and predict market trends, yet its direct impact on customer loyalty remains underexplored. Wong and Wong & Marikannan (2020) as well as Maihani et al. (2023) demonstrate that AI and ML in e-commerce significantly enhance customer satisfaction and engagement. Todaro & Smith (2020) emphasize that AI-powered content personalization directly affects loyalty, although challenges related to privacy and content relevance persist. Zikry et al. (2024) even reveal that personalization has a greater influence on customer satisfaction than product recommendation alone.

Various studies have confirmed that technology-based marketing strategies, particularly those utilizing Artificial Intelligence (AI) and Machine Learning (ML), have a significant impact on customer loyalty and satisfaction. Andrea & Febrianta (2024) found that customers tend to be more loyal to brands that offer a more relevant and personalized shopping experience, which is

enabled by the use of AI. A study conducted by Dipta (2021) involving 116 Gojek users demonstrated that AI influences customer experience through four key dimensions: mechanical, analytical, intuitive, and empathetic. These dimensions highlight that AI not only improves efficiency but also contributes to a more meaningful and emotionally engaging shopping experience.

In the context of MSMEs, AI plays a crucial role in enhancing operational efficiency, shopping experience personalization, and sales growth within e-commerce platforms. However, Jarek & Mazurek (2019) pointed out that its adoption still faces challenges such as limited infrastructure, regulatory barriers, and low technological adoption rates among small business owners. Furthermore, Sholikan et al. (2023) reported that the application of AI and ML in marketing strategies can lead to a 30% increase in sales within just six months, as well as improvements in customer retention and loyalty. These findings reinforce the notion that adopting intelligent technologies in marketing not only optimizes operations but also enhances the competitiveness and sustainability of MSMEs in the digital economy.

This research offers a unique contribution by focusing on MSME resellers in Malang who utilize Tokopedia and Shopee as their primary e-commerce platforms. This represents a niche sample that has been rarely examined in the Indonesian context. Theoretically, this study enriches the discourse on the adoption of digital technology in MSME marketing strategies. In terms of novelty, the research empirically finds that Machine Learning has a stronger impact on customer satisfaction than AI—a significant insight that may contribute to both theoretical development and practical application.

Based on this context, the present study aims to analyze the influence of Artificial Intelligence and Machine Learning implementation in marketing strategies on customer satisfaction among MSMEs operating on Tokopedia and Shopee in Malang, and to identify challenges and strategies that can optimize the use of digital technology in enhancing the competitiveness of small enterprises.

LITERATURE REVIEW

AI-Driven Marketing Framework

(Davenport et al., 2020 ; Ge et al. 2020 ; Alam et al., 2025)

The AI-Driven Marketing Framework is a contemporary theoretical approach that explains how the integration of advanced technologies such as Artificial Intelligence (AI) and Machine Learning (ML) transforms modern marketing strategies. This theory posits that marketing decisions are no longer driven solely by human intuition and traditional segmentation but are now supported by the intelligent processing of big data, automated systems, and predictive algorithms.

The framework is built upon four key dimensions:

1. **Automation** – AI is used to automate various marketing functions, including customer service via chatbots, dynamic pricing, and real-time customer segmentation. Automation improves service speed and reduces operational burden.

2. **Personalization** – ML processes customer behavior and preferences to deliver tailored content, product suggestions, and communication, leading to more relevant and engaging customer experiences.
3. **Predictive Analytics** – AI can forecast future customer needs and behaviors by analyzing historical data, allowing businesses to proactively plan their marketing strategies.
4. **Engagement Optimization** – AI enhances customer interaction by enabling faster, more contextual, and responsive communication, thereby improving relationship quality.

In the context of this research, the AI-Driven Marketing Framework is highly relevant as it provides the theoretical basis for understanding how AI and ML features embedded in e-commerce platforms such as Tokopedia and Shopee may influence customer satisfaction. For MSMEs, AI-enabled product recommendations, smart chatbots, and customer behavior analytics offer strategic advantages in delivering more satisfying digital shopping experiences.

Several empirical studies support the application of this framework. Wong and Wong & Marikannan (2020) found that machine learning improved customer satisfaction by up to 40% through better product recommendations and personalized marketing. Maihani et al. (2023) revealed that AI implementation boosted customer engagement by 25%. Zikry et al. (2024) further observed that AI-based personalization had a stronger impact on user satisfaction than standard automation features. These findings affirm that AI and ML are not merely technical enhancements but serve as strategic tools to deliver superior customer value.

H1: The implementation of Artificial Intelligence (AI) in marketing positively affects customer satisfaction among MSME consumers on e-commerce platforms.

Expectation Confirmation Theory (ECT)

(Kotler & Keller, 2016)

The Expectation Confirmation Theory (ECT) is one of the most widely used models in consumer satisfaction studies. Developed by Richard L. Oliver, ECT suggests that customer satisfaction is a cognitive and emotional outcome that results from comparing pre-purchase expectations with the actual performance of a product or service. When the perceived performance matches or exceeds expectations (positive confirmation), customers feel satisfied. Conversely, when performance falls short (negative disconfirmation), dissatisfaction occurs.

ECT comprises four primary components:

1. **Expectation** – The preconceived standards or beliefs about a product or service before consumption.
2. **Perceived Performance** – The actual experience and evaluation of the product or service after usage.
3. **Confirmation/Disconfirmation** – The cognitive process of comparing expectations with performance to determine the level of satisfaction.
4. **Satisfaction** – The emotional response resulting from the confirmation or disconfirmation process.

In this study, ECT is applied to examine how Machine Learning (ML), when used in digital marketing strategies, contributes to customer satisfaction. Customers on e-commerce platforms expect convenience, accuracy, responsiveness, and personalization. When ML-driven features—such as intelligent product recommendations, personalized discounts, or streamlined checkout processes—successfully meet or surpass these expectations, customers are more likely to experience satisfaction through positive confirmation.

Empirical evidence supports the relevance of ECT in this context. Huang and Rust (2018) demonstrated that AI-driven personalization aligns closely with customer expectations and enhances satisfaction. Ge et al. (2021) reported that ML-based recommendation systems increase perceived value and satisfaction significantly. Todaro and Smith (2022) found that empathetic and context-aware AI applications contributed to customer satisfaction by offering personalized and relevant solutions rather than rigid automated responses.

In essence, ML influences perceived performance by shaping how customers experience service delivery. When this performance exceeds customer expectations, it leads to enhanced satisfaction—a critical outcome for MSMEs operating in competitive digital marketplaces.

H2: The application of Machine Learning (ML) in MSME digital marketing has a significant positive impact on customer satisfaction on Tokopedia and Shopee platforms.

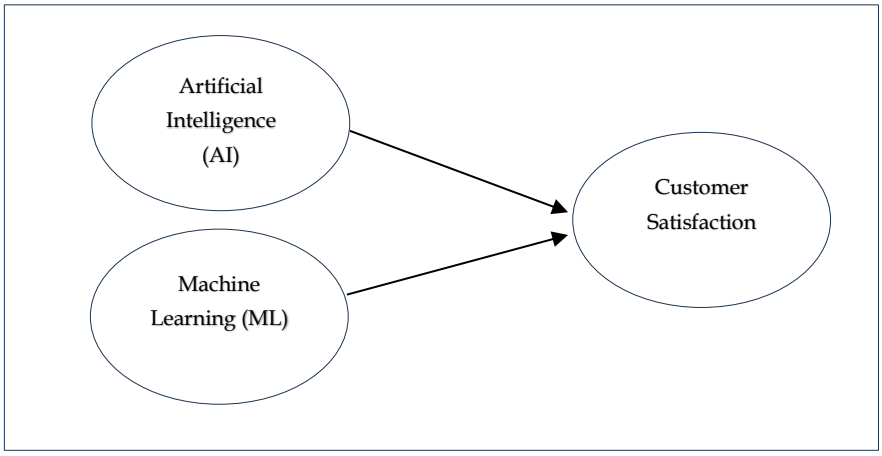

Figure 1. Conceptual Framework

The conceptual framework illustrated above presents the relationship between two independent variables—Artificial Intelligence (AI) and Machine Learning (ML)—and one dependent variable—Customer Satisfaction. This framework is designed to empirically test the extent to which the application of AI and ML in digital marketing strategies influences the satisfaction level of MSME customers on e-commerce platforms such as Tokopedia and Shopee.

The first independent variable, Artificial Intelligence (AI), is hypothesized to directly affect customer satisfaction through automated features such as chatbots, intelligent customer service, and predictive interactions. This relationship is tested through Hypothesis 1 (H1).

The second independent variable, Machine Learning (ML), focuses on data-driven personalization, such as product recommendation systems and behavior-based targeting. Its impact on customer satisfaction is evaluated through Hypothesis 2 (H2).

Together, both AI and ML are positioned to influence how customers perceive their online shopping experience. When applied effectively, these technologies are expected to increase personalization, responsiveness, and efficiency, thereby enhancing overall customer satisfaction.

This framework reflects the theoretical integration of the AI-Driven Marketing Framework and Expectation Confirmation Theory (ECT), supporting the investigation of how technological interventions can improve service experiences and outcomes in the MSME digital commerce environment.

METHODOLOGY

This study adopts a **quantitative research approach**, aiming to examine the influence of Artificial Intelligence (AI) and Machine Learning (ML) on customer satisfaction among MSME consumers using Tokopedia and Shopee platforms in Malang. The research design is empirical and explanatory, using survey methods to collect numerical data for statistical analysis.

Population and Sample

The population consists of customers who have made at least two purchases from MSMEs on Tokopedia and Shopee within the last six months in Malang. A **purposive sampling technique** was used to select **200 respondents** who matched the following criteria: (1) active users of e-commerce platforms, (2) had interacted with AI/ML-based features such as chatbots or product recommendations, and (3) were aware they were engaging with MSME sellers.

Data Collection:

Data were collected through an **online questionnaire** designed using a 5-point Likert scale (ranging from Strongly Disagree to Strongly Agree). The instrument consisted of closed-ended items adapted from previous validated scales measuring customer satisfaction, AI experience, and ML-driven personalization.

Data Analysis Tools:

The collected data were processed using **SPSS 23** software. The analysis included:

- **Descriptive statistics** (frequency, percentage) to profile respondents,
- **Validity and reliability testing** using Corrected Item-Total Correlation and Cronbach's Alpha,
- **Classical assumption tests** including multicollinearity, autocorrelation, heteroscedasticity, and normality,
- **Multiple linear regression analysis** to examine the effect of AI and ML on customer satisfaction,
- **t-test** and **F-test** to assess the significance of each variable,
- **Coefficient of Determination (R^2)** to measure the strength of the model.

This methodology ensures the reliability and validity of the findings and provides a strong empirical basis for evaluating the proposed hypotheses.

RESEARCH RESULT

Respondent Characteristics

This study involved 200 respondents who had made online purchases through Tokopedia and Shopee within the past three months. The respondents were specifically selected from MSME consumers in Malang, focusing on those in the culinary and fashion sectors who frequently interacted with AI-based recommendation features and ML-based personalization.

From a gender perspective, the majority of respondents were male (66.5%), while females accounted for 33.5%. This suggests that male consumers were more dominant in the e-commerce interactions observed in this study. In the context of AI and ML applications, shopping preferences between genders may vary, and this opens opportunities for systems to personalize shopping experiences based on gender-specific patterns.

In terms of age, most respondents were between 20 and 30 years old, with the 20–25 age group comprising 38.5% and the 26–30 age group making up 28%. These age segments generally demonstrate higher familiarity with digital technologies and are more likely to engage with AI and ML features, such as dynamic product recommendations, promotional personalization, and chatbot services.

Regarding education, the largest portion of respondents held a bachelor's degree (60.5%), followed by high school graduates (18.5%) and those with postgraduate education (16.5%). This reflects a relatively high level of digital literacy, which enables users to better understand and utilize advanced features in e-commerce platforms, such as AI-driven search and ML-based content personalization.

Shopping frequency data indicated that 78.5% of respondents had made more than two purchases in the last three months, while only 21.5% made exactly two. This shows that most participants were active online shoppers, frequently exposed to recommendation systems and automated features. Their responses provide valuable insights into the effectiveness of AI and ML in shaping customer satisfaction.

In terms of income, the majority of respondents (89.5%) earned below Rp 3 million per month, with 40.5% earning less than Rp 1.5 million. This demographic detail implies that affordability and price-based personalization—made possible through machine learning—are crucial for enhancing customer satisfaction. Providing personalized discounts or budget-sensitive recommendations could improve the perceived value of the shopping experience.

Finally, occupation data showed that 62% of respondents were students, followed by office workers (16%), other types of employment (13.5%), and entrepreneurs (8.5%). Students tend to be more adaptive to technological change and open to AI/ML-based features, which aligns with the study's focus on digital interaction and satisfaction in tech-mediated commerce.

These demographic findings suggest that the majority of respondents were digitally literate, active users of e-commerce, and open to technology-based

personalization. Therefore, platforms like Tokopedia and Shopee have a strong foundation to further optimize AI and ML applications for improving customer satisfaction—especially among younger, budget-conscious, and tech-savvy users.

Validity Testing

After the data collection process was completed, a validity test was conducted to ensure that all questionnaire items accurately measured the intended variables. The analysis was performed using **SPSS version 23**, employing the **Corrected Item-Total Correlation** method.

According to the established criteria, an item is considered valid if the corrected correlation coefficient (**r**) is **≥ 0.30**. The results indicated that **all 14 indicators used in the study met this threshold**, with *r* values ranging from **0.305 to 0.395**. Some key results include:

Table 1. Summary of Validity Test Results (Selected Indicators)

No.	Indicator	Corrected Item-Total Correlation (r)	Decision
1	Product quality satisfaction	0.346	Valid
2	Customer service satisfaction	0.315	Valid
3	Ease of finding products	0.376	Valid
4	Transaction and payment convenience	0.308	Valid
5	Willingness to repurchase	0.386	Valid
6	Willingness to recommend platform	0.312	Valid
7	Accuracy of product recommendations	0.325	Valid
8	Chatbot effectiveness	0.392	Valid
9	Speed of automated system response	0.312	Valid
10	System's ability to understand customer questions	0.342	Valid
11	Prediction accuracy based on shopping history	0.312	Valid
12	Relevance of recommendations to customer needs	0.305	Valid
13	Price adjustment efficiency	0.395	Valid
14	Speed and ease of checkout process	0.375	Valid

These results confirm that each indicator is **statistically valid** and appropriate for measuring the corresponding construct—whether related to AI features, ML-based personalization, or customer satisfaction dimensions. Therefore, the questionnaire instrument is suitable for use in further statistical analysis and hypothesis testing.

Reliability Testing

To ensure the consistency and trustworthiness of the research instrument, reliability testing was conducted using **Cronbach's Alpha** through SPSS version 23. According to reliability standards, a variable is considered reliable if the Cronbach's Alpha value is **≥ 0.70**.

The results of the test are as follows:

Table 2. Reliability Test Results (Cronbach's Alpha)

No.	Variable	Number of Items	Cronbach's Alpha	Reliability Category
1	Customer Satisfaction (Y)	6	0.824	Reliable
2	Artificial Intelligence (X1)	4	0.817	Reliable
3	Machine Learning (X2)	4	0.840	Reliable

These results confirm that all constructs in the questionnaire demonstrate strong internal consistency. Therefore, the instrument is statistically reliable and suitable for further analysis and hypothesis testing.

Hypothesis Testing

Hypothesis testing was conducted using multiple linear regression analysis to assess the effect of Artificial Intelligence (AI) and Machine Learning (ML) on customer satisfaction (Y). The regression equation produced is:
$Y=3.716+0.427X1+0.508X2Y = 3.716 + 0.427X_1 + 0.508X_2Y=3.716+0.427X1 +0.508X2$
This equation indicates that:

- An increase of one unit in AI usage (X_1) results in a 0.427 unit increase in customer satisfaction,
- An increase of one unit in ML usage (X_2) leads to a 0.508 unit increase in customer satisfaction,
- If both AI and ML are not applied, the baseline satisfaction score is 3.716.

The significance values for both independent variables were:

- AI (X_1) = 0.000
- ML (X_2) = 0.001

Both are below 0.05, indicating that each variable significantly influences customer satisfaction.

Additionally, Machine Learning exerts a stronger effect on customer satisfaction than AI, as reflected in its higher regression coefficient (0.508 vs. 0.427). This suggests that ML may serve as a more dominant factor in shaping customer satisfaction, although both technologies are statistically significant contributors.

Multiple Linear Regression Test

The results of the multiple linear regression analysis confirmed that both Artificial Intelligence (AI) and Machine Learning (ML) have a significant influence on customer satisfaction.
The regression equation is as follows:
$Y=3.716+0.427X1+0.608X2Y = 3.716 + 0.427X_1 + 0.608X_2Y=3.716+0.427X1 +0.608X2$

- If AI and ML are not used, the baseline customer satisfaction score is 3.716.
- Each additional unit of AI usage increases satisfaction by 0.427 units.
- Each additional unit of ML usage increases satisfaction by 0.608 units.

The significance levels for both variables were:

- AI (X_1): p = 0.005
- ML (X_2): p = 0.000

These values indicate that both variables significantly affect customer satisfaction. Furthermore, the standardized beta coefficient for ML (0.213) is higher than that of AI (0.196), showing that ML has a more dominant influence. Finally, the Variance Inflation Factor (VIF) value of 1.001 confirms no multicollinearity problem, ensuring the regression model is statistically valid and interpretable.

DISCUSSION

This study finds that the implementation of Artificial Intelligence (AI) and Machine Learning (ML) in marketing strategies has a positive impact on customer satisfaction. These findings reinforce a growing body of literature suggesting that digital technologies—particularly intelligent systems—can significantly enhance the quality of customer experience through automation, personalization, and data-driven engagement.

The results align with Huang and Rust, who assert that AI contributes to marketing efficiency by automating service processes. However, they also warn of the risk of depersonalization, a concern that also emerged in this study. While AI features, such as chatbots and recommendation systems, increase responsiveness and relevance, they sometimes fail to deliver the human warmth that is often expected in customer interaction. This finding suggests that customer engagement should be balanced between automation and meaningful, human-like interaction.

Davenport et al. emphasize AI's role in analyzing large-scale customer data and forecasting market trends, allowing businesses to craft more responsive and personalized marketing campaigns. The current research supports this view, as customers engaging with AI-powered features reported greater levels of satisfaction, especially when the technology could accurately predict preferences and offer relevant recommendations.

Furthermore, the findings echo Todaro and Smith's observation that AI-enhanced content personalization increases customer engagement. Yet, this study also underlines the need to deepen understanding of how personalization affects long-term customer loyalty—especially in MSME e-commerce, where competition is tight and customer retention is critical.

Ge et al. further support the study's findings by highlighting that AI-based recommendation systems play a major role in improving the customer experience, particularly in digital marketplaces. This is evident in the way ML-driven personalization helped respondents feel better understood and valued as consumers.

Additionally, studies by Tanwar and Wong & Marikannan show that ML enhances satisfaction by enabling more adaptive and individualized interaction patterns between customers and businesses. The present research affirms that machine learning contributes more significantly than AI to customer satisfaction,

likely because of its capacity to evolve based on behavioral data and past interactions.

Overall, this study contributes to the understanding that AI and ML are not just supportive tools but are strategic enablers in shaping customer satisfaction within the digital marketing landscape. However, challenges remain—particularly concerning data privacy, implementation cost, and ethical use of customer data. Therefore, while AI and ML technologies offer enormous potential, their integration into marketing must be supported by thoughtful strategies that prioritize transparency, value creation, and ethical considerations for long-term success.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that the integration of Artificial Intelligence (AI) and Machine Learning (ML) in digital marketing significantly influences customer satisfaction among MSMEs in Malang. AI and ML enhance marketing effectiveness by providing more efficient, personalized, and responsive customer interactions. These findings support previous studies which affirm that AI-driven systems can improve content personalization, automate customer engagement, and strengthen decision-making through data analysis.

However, while the overall impact of AI and ML on customer satisfaction is positive, the study reveals that personalized engagement remains a critical concern. Customers still expect relevance and responsiveness beyond automation—indicating that emotional intelligence and adaptive interaction must complement technological implementation. This supports the insights of Huang & Rust and Davenport et al., who argue that AI improves service efficiency but may reduce human-like connection and loyalty-building if not carefully managed.

In the specific context of MSMEs in Malang, AI and ML are proven to help businesses optimize their marketing strategies, improve customer retention, and deliver more relevant product recommendations. Yet, the research also uncovers practical challenges, including issues related to data privacy, high implementation costs, and limited digital literacy among business operators.

To fully realize the benefits of AI and ML in MSME marketing, the following strategic implementations are recommended:

1. Enhancing Digital Literacy for MSMEs

   In order to optimize AI application, MSME owners must be equipped with adequate training and education on how AI and ML work and how they can be implemented in practical business scenarios.

2. Balancing Automation with Human Interaction

   Although AI can automate many marketing functions, maintaining personal connection with customers is essential to sustain satisfaction and build long-term loyalty.

3. Managing Data Privacy and Security

   MSMEs must uphold customer trust by ensuring responsible data handling, complying with relevant regulations, and protecting personal information when applying AI-based systems.

4. Improving Access to Affordable AI Solutions
Stakeholders such as government agencies and tech providers should develop accessible and cost-effective AI tools that MSMEs can adopt without being burdened by high investment costs.
5. Ongoing Research and Technological Adaptation
MSMEs in Malang should continuously monitor technological trends and evaluate the effectiveness of AI-driven marketing strategies to ensure they remain aligned with evolving consumer behaviors and market demands.

With these targeted strategies, the application of AI and ML can serve not only as a digital innovation but also as a strategic pillar for enhancing MSME competitiveness, expanding market reach, and delivering improved customer satisfaction in a more sustainable and effective manner.

ADVANCED RESEARCH

Although this study provides valuable insights into the effect of Artificial Intelligence (AI) and Machine Learning (ML) on customer satisfaction in the context of MSMEs in Malang, it also has several limitations that must be acknowledged.

First, the study focuses solely on reseller-based MSMEs operating on Tokopedia and Shopee, which may limit the generalizability of the findings to other types of MSMEs or other e-commerce platforms such as Lazada, Bukalapak, or social commerce platforms like TikTok Shop and Instagram Shopping.

Second, this research relies exclusively on customer perception through self-reported survey data. While perception is central to satisfaction studies, it may not fully reflect actual behavior or long-term loyalty. Future research could combine perception-based data with behavioral analytics (e.g., purchase history, browsing behavior, or platform engagement logs) to gain deeper insights.

Third, the cross-sectional nature of the study captures customer responses at a single point in time. This limits the ability to observe how satisfaction and AI/ML influence evolve over time. Longitudinal or time-series studies are suggested to monitor dynamic changes in user experience and technology adaptation.

Finally, the study does not explore moderating or mediating variables, such as digital literacy, trust in AI, or consumer demographics, which may influence the relationship between AI/ML and satisfaction. Including such variables in future models would help deepen the theoretical understanding of customer-technology interaction.

Suggestions for Further Research:

- Expand the research sample to include MSMEs from other regions and platforms for broader generalization.
- Integrate quantitative and qualitative methods (e.g., interviews, focus groups) to explore user sentiments and contextual factors in greater depth.
- Investigate the role of AI ethics, privacy concerns, and transparency in shaping customer trust and long-term loyalty.

- Test mediating/moderating models, such as perceived value, user trust, or digital readiness, in the AI–satisfaction relationship.

By addressing these limitations, future research can build more robust models and contribute to the development of AI-driven strategies that are inclusive, ethical, and effective in improving customer satisfaction across diverse digital commerce contexts.

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