EEAJ 14 (3) (2025) 272-283

Economic Education Analysis Journal
SINTA 3 Accredited
https://journal.unnes.ac.id/sju/index.php/eeaj

Artificial Intelligence's Role in Enhancing MSMEs Revenue through Digital Promotion

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DOI: 10.15294/eeaj.v14i3.33854

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Article History

Received: 13 September 2025
Approved: 20 October 2025
Published: 31 October 2025

Keywords

Artificial Intelligence; Automation; Marketing Performance; Personalization; Ad Efficiency; Revenue

Abstract

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in the global economy but face challenges in effectively leveraging artificial intelligence (AI)-based digital marketing. This study aims to analyze the effects of automation, personalization (PER), and advertising efficiency (EFF) on marketing performance (MP) and their implications for MSME revenue (REV). Data were collected through a cross-sectional survey of 95 MSMEs in North Sumatra that have adopted AI-based digital promotions. The questionnaire consisted of 25 indicators covering five constructs: AUT (5 items), PER (5 items), EFF (5 items), MP (5 items), and REV (5 items). The analysis was conducted using SEM-PLS. The results indicate that AUT ($p = 0.000$), PER ($p = 0.011$), and EFF ($p = 0.000$) significantly influence MP but do not have a direct effect on REV ($p > 0.05$). In contrast, MP ($p = 0.000$) serves as a key mediator, channeling the benefits of AI-based strategies into revenue growth. The research model explains 51% of the variance in Marketing Performance and 29.8% of the variance in Revenue. These findings underscore that the impact of AI on MSME revenue is indirect, occurring through enhanced marketing effectiveness, customer engagement, and promotional innovation. The implications suggest that strengthening digital capabilities, visionary leadership, and adequate technological infrastructure are prerequisites for MSMEs to fully exploit AI potential. Therefore, an integrated AI-based marketing strategy can enhance both competitiveness and financial performance of MSMEs in the digital era.

How to Cite

HS, S.R., Purba, S.E.E., Watung, S.R., Tumiwa, R.A.F., & Langi, J.H.(2025). Artificial Intelligence's Role in Enhancing MSMEs Revenue through Digital Promotion. *Economic Education Analysis Journal*, 14 (3), 272-283.

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p-ISSN 2252-6544
e-ISSN 2502-356X

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of global economic development, contributing significantly to employment and Gross Domestic Product (GDP) in both developed and developing countries. Traditionally, MSMEs have relied on local networks and conventional marketing channels; however, the digital revolution has fundamentally transformed their business landscape. Over the past decade, MSMEs have increasingly adopted digital marketing practices, such as social media, search engine optimization (SEO), and online advertising, to reach broader audiences, enhance brand visibility, and drive sales growth (Loku, 2024; Sasongko et al., 2023). Platforms like Facebook and Instagram have become essential for MSMEs, enabling direct customer interaction, real-time feedback, and cost-effective promotional campaigns. While Facebook is effective for driving short-term sales, Instagram enhances customer engagement and brand performance (Fakhreldin & Miniesy, 2023).

In addition, MSMEs utilize Search Engine Optimization (SEO) and pay-per-click (PPC) advertising to increase online visibility and target niche markets, often with limited budgets yet achieving high returns on investment (Sasongko et al., 2023). The shift to digital marketing allows MSMEs to streamline operations, improve customer experience, and unlock new revenue streams, thereby driving overall business growth (Fakhreldin & Miniesy, 2023). Digital marketing has also democratized MSMEs' access to global markets, while introducing new complexities and competitive pressures that demand more sophisticated, data-driven promotional approaches.

AI adoption has been shown to positively impact MSME performance and revenue. A Salesforce (2024) reports that 91% of MSMEs implementing AI experienced revenue growth. This financial impact is further supported by Spittlehouse (2025) which states that AI can increase revenue by up to 34% through analytics that raise sales conversions by 15%, personalization that boosts repeat sales by 10%, and operational efficiency that reduces overhead costs by 9%. Moreover, AI significantly enhances effectiveness and productivity. Complete AI Training, (2025) notes a 40% increase in MSME productivity and a 60% increase in consumer engagement through targeted advertising.

Empirical evidence further demonstrates that AI-based digital promotion can provide tangible revenue and business performance gains for MSMEs. AI has been shown to increase click-through rates by 25% and revenue by approximately 10% (Singla et al., 2024), expand customer bases in emerging markets (Basri, 2020), automate content creation and hyper-personalize marketing (Bartelt & Röser, 2024) and enhance brand awareness and customer loyalty via social media (Beyari & Hashem, 2025). Consequently, AI adoption in digital promotion has become a key driver of MSME revenue growth, operational efficiency, and market competitiveness, although its impact varies by sector, region, and digital maturity.

Similar findings were reported by Huang & Rust (2018) who stated that the integration of AI into marketing activities can enhance customer satisfaction and service personalization, and by Dwivedi et al., (2021) who emphasized that AI adoption can strengthen competitiveness and digital business innovation. However, other studie such as Yang et al., (2024) indicate that AI does not always have a direct impact on revenue, but rather operates through the mediation of marketing performance. These contradictory findings suggest that the mechanisms through which AI influences MSME performance and revenue are not yet fully understood. Although AI in digital promotion has significant potential to increase MSME revenue, current research still has several limitations. Specifically, the relationship between AI indicators and marketing performance as a mediator of MSME revenue growth has been rarely examined. Cross-regional studies are also limited, making it difficult to generalize findings across

different market conditions and levels of digital maturity among MSMEs (Chotisarn & Phuthong, 2025; Mapila & Moloi, 2024)

Understanding the mechanisms through which AI influences MSME performance is crucial. Although automation, ad efficiency, and personalization are widely recognized as having the potential to enhance marketing operations, their direct relationship with revenue growth remains ambiguous. This has prompted a research focus on the mediating role of marketing performance as the channel through which AI-based strategies ultimately influence MSME revenue (Magableh et al., 2024). Therefore, this study aims to bridge this gap by empirically investigating how AI, based on automation, personalization, and ad efficiency, affects marketing performance, which in turn impacts MSME revenue, thereby providing a more comprehensive and contextual understanding of AI implementation in MSME digital promotion.

METHODS

This study employed a quantitative research design with descriptive and causal characteristics. The approach used was a cross-sectional survey, where data were collected at a single point in time through questionnaires. The research was conducted among MSMEs operating in various sectors in Simalungun Regency, Medan City, and Pematangsiantar City, North Sumatra Province. From this population, 95 MSMEs were purposively selected based on the study criteria, namely MSMEs that have implemented digital promotion and utilized artificial intelligence (AI)-based technology in their marketing activities.

The utilization of AI in digital promotion can be measured through several key indicators. Automation (AUT) (Kandeel et al., 2024; Krishna Priya et al., 2023) reflects the role of AI in automating marketing processes such as campaign management, ad scheduling, and real-time customer responses, which have been shown to enhance work efficiency. Personalization (PER) emphasizes AI's ability to deliver promotional content that is relevant and aligned with consumer preferences, thereby driving higher conversion rates, average order value, and customer loyalty (Gunawan. H. & Suroso, 2025). Ad Efficiency (EFF) reflects the extent to which AI can reduce customer acquisition costs and increase return on marketing investment (ROMI) through data-driven ad optimization (Taherdoost, 2023).

Marketing Performance (MP) was used to assess overall digital promotion performance, considering not only increased interaction and brand awareness but also the effectiveness of marketing strategies in supporting business growth (Wang & Zhou, 2024). Ultimately, Revenue (REV) served as the outcome indicator, demonstrating the extent to which AI implementation in digital promotion contributes to business revenue growth, either through increased sales or improved marketing cost efficiency (Mahakal, 2023; Musa et al., 2025; Xiao et al., 2024). The study population comprises all Micro, Small, and Medium Enterprises (MSMEs) in Medan City, Pematangsiantar City, and Simalungun Regency, North Sumatra Province. The sampling technique applied was purposive sampling, selecting of 95 MSMEs respondents based on specific criteria. The criteria for MSME respondents included: (1) MSMEs that have conducted digital promotion activities (using social media, marketplaces, or online advertising); and (2) MSMEs with experience using AI-based technology (such as chatbots, automated advertising, AI content generators, or recommendation systems) in their promotional activities. Data were collected using closed-ended questionnaires with a 5-point Likert scale to measure the research variables. Distribution was carried out both directly and online (via Google Forms) to facilitate access to MSMEs across the three research locations.

Data analysis was conducted using SEM-PLS. Convergent validity is considered satisfactory if the loading factor ≥ 0.70 and the Average Variance Extracted (AVE) ≥ 0.50, while Composite Reliability (CR) and Cronbach's Alpha must be ≥ 0.70 to indicate

good internal consistency. In addition, instrument validation was conducted, including the number of indicators for each variable, AVE values, and minimum loadings that meet the specified thresholds. Subsequently, the Structural Model (Inner Model) was tested to assess the relationships between variables through path coefficients, R-Square values, and t-statistics obtained via bootstrapping procedures. The significance criterion was set at $p < 0.05$ (Hair & Alamer, 2022).

Within the research framework, hypothesis testing was conducted to understand the extent to which AI technology, through the dimensions of Automation (AUT), Personalization (PER), and Ad Efficiency (EFF), contributes to Revenue (REV) and Marketing Performance (MP) in MSMEs. AI and automation are not merely tools for operational efficiency but also essential strategies for creating more personalized, responsive, and consistent customer experiences. By leveraging the AI-enabled customer journey, companies—including SMEs—can achieve long-term customer loyalty while simultaneously strengthening the impact of digital marketing on revenue (Rana et al., 2023).

Personalization (PER) powered by AI has been shown to improve conversion rates and average order value through product recommendations aligned with consumer needs (Sharabati et al., 2024). Meanwhile, Ad Efficiency (EFF) can reduce Customer Acquisition Cost (CAC) and increase Return on Marketing Investment (ROMI), indirectly strengthening the impact on MSME revenue (Soomro et al., 2025). From a marketing management perspective, research indicates that digital technology often does not directly impact revenue, but rather operates through improvements in Marketing Performance (MP), such as promotional effectiveness, customer satisfaction, and loyalty (Ardito et al., 2024). Therefore, MP is regarded as a mediating variable bridging the relationship between AI marketing technology utilization and the increase in MSME revenue. Proposed research model shows in Figure 1.

RESULTS AND DISCUSSION

Validity and Reliabilty Check

Confirmatory factor analysis is presented in Table 1 for the variables involving Automation (AUT), Personalization (PER), Ad Efficiency (EFF), Marketing Performance (MP), and Revenue (REV). Factor loadings, Cronbach's Alpha, Composite Reliability (C.R.), and Average Variance Extracted (AVE) were used to assess the measurement

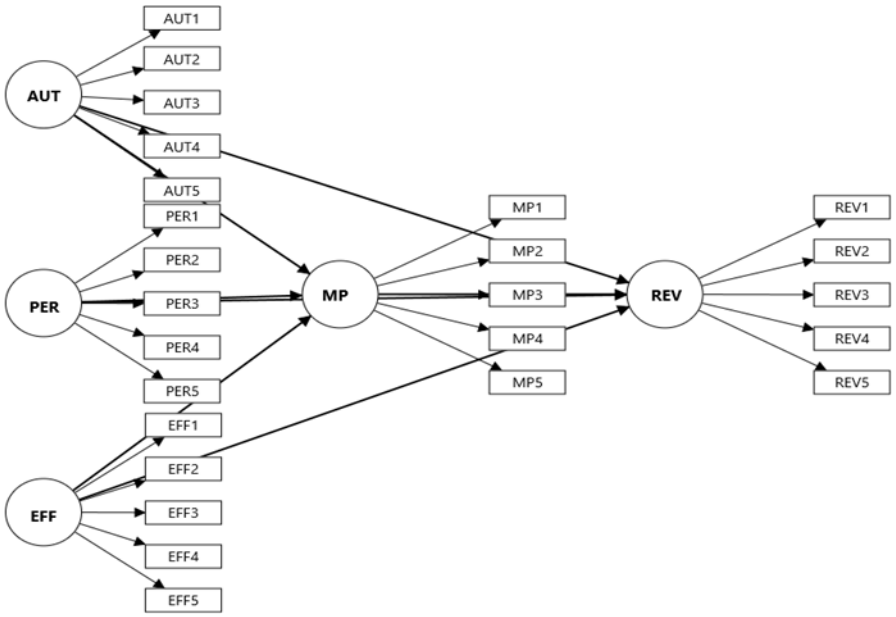

Figure 1. Proposed Research Model

Table 1. Validity and Reliabilty Test

Contruct	Items	Factor Loadings	Cronbach's Alpha	C.R	AVE
AUT	AUT1	0.887	0.942	0.945	0.811
	AUT2	0.902	-	-	-
	AUT3	0.883	-	-	-
	AUT4	0.908	-	-	-
	AUT5	0.921	-	-	-
PER	PER1	0.888	0.933	0.939	0.788
	PER2	0.866	-	-	-
	PER3	0.919	-	-	-
	PER4	0.885	-	-	-
	PER5	0.880	-	-	-
EFF	EFF1	0.861	0.917	0.934	0.749
	EFF2	0.893	-	-	-
	EFF3	0.885	-	-	-
	EFF4	0.868	-	-	-
	EFF5	0.818	-	-	-
MP	MP1	0.840	0.899	0.904	0.713
	MP2	0.850	-	-	-
	MP3	0.889	-	-	-
	MP4	0.793	-	-	-
	MP5	0.848	-	-	-
REV	REV1	0.880	0.912	0.921	0.740
	REV2	0.887	-	-	-
	REV3	0.843	-	-	-
	REV4	0.862	-	-	-
	REV5	0.828	-	-	-

Source: Processed Primary Data, 2025

of each construct. The fit and reliability of the instruments employed in this study provide a comprehensive overview of the consistency and convergent validity of the model. Factor loadings for each item ranged from 0.793 to 0.921, indicating strong correlations between the indicators and their respective constructs. Internal consistency was also excellent, as reflected by Cronbach's Alpha values ranging from 0.899 to 0.942. Moreover, convergent validity is evidenced by C.R. values between 0.904 and 0.945 and AVE values ranging from 0.713 to 0.811.

These results reinforce confidence in the obtained data and validate the methods used to measure variables related to automation, personalization, ad efficiency, marketing performance, and revenue. Accordingly, the research instruments were found to be reliable and valid for assessing the relationships among variables in the study model.

In more detail, the AUT construct exhibited very high factor loadings (0.883–0.921) with strong internal consistency (Cronbach's Alpha = 0.942, C.R. = 0.945, AVE = 0.811). The PER construct also demonstrated high reliability, with factor loadings ranging from 0.866 to 0.919 (Cronbach's Alpha = 0.933, C.R. = 0.939, AVE = 0.788). The EFF construct had factor loadings between 0.818

and 0.893 and displayed good reliability (Cronbach's Alpha = 0.917, C.R. = 0.934, AVE = 0.749). For the MP construct, factor loadings ranged from 0.793 to 0.889, with adequate internal consistency (Cronbach's Alpha = 0.899, C.R. = 0.904, AVE = 0.713). Finally, the REV construct showed factor loadings between 0.828 and 0.887, with strong reliability (Cronbach's Alpha = 0.912, C.R. = 0.921, AVE = 0.740). The cross-loading test indicated that each indicator has a loading factor > 0.70, suggesting that there are no cross-loading issues among the latent variables.

Structural Model

There are two commonly used approaches to assess validity in complex structures: discriminant validity and cross-validation. Discriminant validity can be evaluated using the HTMT (Heterotrait-Monotrait Ratio) criterion. Generally, a good HTMT value should be below the threshold of 0.85 or 0.90, indicating that a construct has adequate discriminant validity. Based on the results presented in Table 3, the correlations between constructs show that all HTMT values are below 0.85, ranging from 0.078 to 0.669. The highest value was observed between AUT and MP (0.669), which is still within the acceptable range, while the lowest value occurred between AUT and PER (0.078). This indicates that each construct in this study is clearly distinct from the others, and no serious multicollinearity issues were detected. In addition, the Goodness of Fit assessment using SRMR indicated a value of 0.071 for the estimated model, which is below the threshold of 0.08, suggesting that the structural model is adequate and fits the data well.

Therefore, it can be concluded that the measurement model used in this study meets the requirements for discriminant validity. The instruments employed were capable of measuring each construct (AUT, EFF, MP, PER, and REV) independently without excessive overlap. This strengthens the confidence that these constructs are valid for use in testing the structural model of the study.

Table 2. HTMT

	AUT	EFF	MP	PER	REV
AUT					
EFF	0.107				
MP	0.669	0.377			
PER	0.080	0.109	0.131		
REV	0.376	0.267	0.565	0.178	

Source: Processed Primary Data, 2025

Hypothesis Testing

In this study, hypothesis testing was conducted to analyze the effects of Automation (AUT), Personalization (PER), and Ad Efficiency (EFF) on Marketing Performance (MP) and their subsequent impact on Revenue (REV). Based on the data analysis, the results indicate that MP has an R^2 value of 0.511 (Adjusted R^2 = 0.495) and REV has an R^2 value of 0.298 (Adjusted R^2 = 0.267). This means that the independent variables in this study explain 51% of the variance in the Marketing Performance (MP) construct and 29.8% of the variance in the Revenue (REV) construct, while the remaining variance is influenced by factors outside the study model.

These findings reinforce the mediating role of Marketing Performance, which proves to be a crucial mechanism in bridging AI-based promotional strategies and revenue growth. In other words, the implementation of AI in digital promotion is more effective in

Table 3. Goodness of Fit Index- SRMS Model

	Original Sample	Sample Mean	95%	99%
Saturated model	0.061	0.056	0.067	0.102
Estimated model	0.071	0.057	0.069	0.088

Source: Processed Primary Data, 2025

enhancing revenue performance when it first positively influences marketing performance (Figure 2).

Table 4. R-Square Test

	R-square	R-square Adjusted
MP	0.511	0.495
REV	0.298	0.267

Source: Processed Primary Data, 2025

Based on the analysis, most of the hypotheses in this study were supported. AUT significantly affects MP (T = 9.689, p = 0.000) but does not have a significant effect on REV (T = 0.980, p = 0.327). This indicates that AI-based promotion automation primarily enhances marketing performance rather than directly impacting MSME revenue. EFF significantly influences MP (T = 4.309, p = 0.000) but is not significant for REV (T = 1.218, p = 0.223). This implies that digital ad efficiency strengthens promotional effectiveness, yet its contribution to revenue growth remains indirect. Furthermore, MP was found to significantly affect REV (T = 3.601, p = 0.000). These results confirm that marketing performance serves as an important mediator in channeling the effects of AI variables (AUT and EFF) on MSME revenue.

PER also significantly affects MP (T = 2.544, p = 0.011) but does not have a direct significant impact on REV (T = 1.200, p = 1.200). Overall, the findings demonstrate that Automation (AUT), Ad Efficiency (EFF), and Personalization (PER) influence marketing

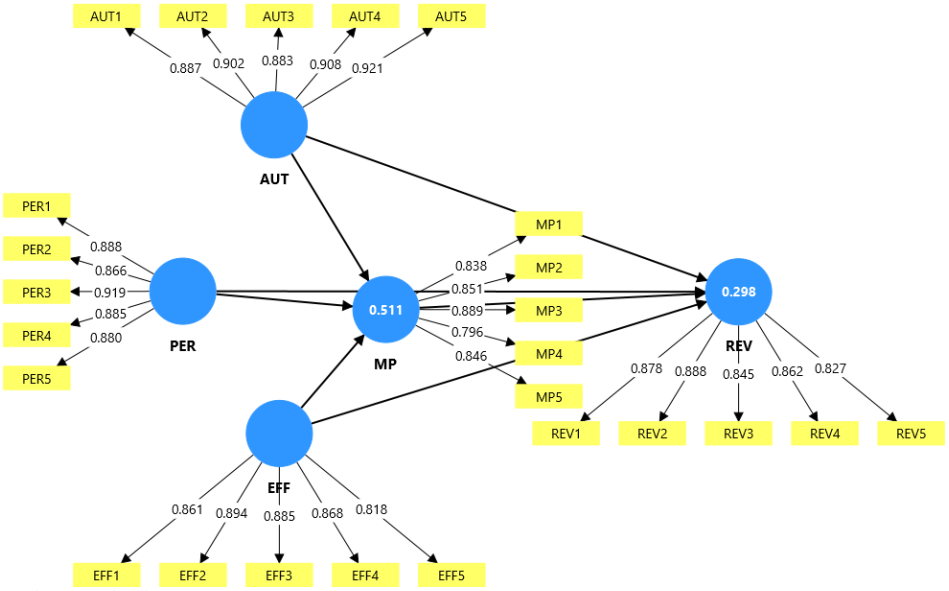

Figure 2. Path Analysis

Table 5. Hypotesis Testing Result

	Original Sample (O)	Sample Mean (M)	(STDEV)	T statistics	P values
AUT -> MP	0.606	0.604	0.063	9.689	0.000
AUT -> REV	0.107	0.110	0.109	0.980	0.327
EFF -> MP	0.315	0.316	0.073	4.309	0.000
EFF -> REV	0.107	0.108	0.088	1.218	0.223
MP -> REV	0.404	0.404	0.112	3.601	0.000
PER -> MP	0.187	0.188	0.073	2.544	0.011
PER -> REV	0.129	0.139	0.107	1.200	1.200

Source: Processed Primary Data, 2025

performance (MP) and revenue (REV). Specifically, MP acts as a mediator that strengthens the relationship between AI utilization in digital promotion and MSME revenue growth.

Discussion

The findings of this study confirm that marketing automation contributes significantly to enhancing MSME marketing performance. In line with Rana et al., (2023); Sharabati et al., (2024), and Silva et al., (2023)automation can create better customer experiences, save time, and support cross-channel communication consistency. However, as noted by (Mahmoud, 2020) implementation challenges remain, such as data limitations, resource constraints, and internal resistance. This indicates that the benefits of automation cannot be realized without visionary leadership, an integrated strategy, and organizational readiness to adapt. In other words, automation is effective only when viewed as part of a comprehensive digital transformation, rather than merely a technological implementation. Furthermore, this study highlights the importance of ad efficiency and personalization. Consistent with (Sasongko et al., 2023) and (Escoto, 2018) digital advertising has been shown to be more effective than traditional advertising, particularly in enhancing customer acquisition and MSME competitiveness.

The implementation of CRM systems and aligned campaigns Alhawamdeh et al., (2024) strengthens the relationship between advertising and financial outcomes. Nevertheless, personalization remains challenging both organizationally (campaign integration, managerial limitations) and technically (data integration, digital literacy). (Umami et al., 2024) emphasize the importance of a process-based approach, where a structured cycle, from understanding customer needs to evaluating impact—can enhance personalization effectiveness. Effective personalization thus requires not only technological capability but also organizational collaboration and flexibility.

In the context of AI-based marketing strategies, this study reinforces the argument that its impact on MSME revenue is not direct. Findings from Al Khasoneh et al., 2025); Awad & Ghonim (2025); Magableh et al., (2024) show that AI increases revenue primarily through mediating marketing performance, customer engagement, and innovation. Technologies such as chatbots and predictive analytics can improve conversion and customer experience, but financial benefits emerge only when marketing performance is enhanced first. This aligns with Li & Hingoro, (2025) who argue that customer engagement drives cognitive, emotional, and behavioral responses that accelerate revenue growth, especially for high-involvement products. In other words, AI functions more as a catalyst for innovation and efficiency, while financial outcomes depend on supportive organizational and marketing strategies.

The results of this study emphasize that marketing performance plays a central mediating role in linking AI-based digital promotion strategies to MSME revenue growth. Marketing performance has proven to be the main channel bridging the effects of automation, advertising, personalization, and AI on business outcomes (Al Htibat, 2024; Anyadighibe et al., 2024; Syaifullah, 2021). Automation contributes through increased operational efficiency, while personalization strengthens customer loyalty and repeat purchases, thereby driving revenue growth (Sutrisno et al., 2025). Additionally, digital advertising effectiveness improves promotional performance, although its impact on revenue is mostly indirect. These findings are supported by literature emphasizing that successful mediation of marketing performance depends on digital capabilities, organizational innovation (Magableh et al., 2024) and technological infrastructure, such as structured databases, cloud systems, and digital platforms (Le Dinh et al., 2025; Pérez-Campdesuñer et al., 2025b).

The empirical context in Indonesia, particularly in North Sumatra, further clarifies the relevance of these findings. According to the BPS Sumut (2024) most MSMEs in the re-

gion are still classified as micro-scale enterprises with limited utilization of technology and restricted access to digital facilities. This aligns with a report from (Ashari, 2025), which indicates that more than 90 percent of MSMEs in Indonesia have not yet optimized the use of artificial intelligence (AI) in their business activities. Furthermore, a study published in the (Aisyah et al., 2025) also revealed the low level of digital technology adoption within the marketing systems of MSMEs in North Sumatra. These conditions reinforce that the main challenges in improving MSME marketing performance lie not only in digital strategy implementation itself but also in human resource readiness, technological infrastructure, and digital literacy.

In synthesis, this discussion demonstrates that marketing performance serves as the pivotal mechanism bridging digital technology adoption and MSME revenue growth. Automation, ad efficiency, personalization, and AI significantly impact marketing performance, but their influence on revenue occurs only when supported by visionary leadership, organizational capabilities, and adequate technological infrastructure. Therefore, an integrated, innovation-oriented digital marketing strategy is key for MSMEs to maximize the potential of technology in enhancing competitiveness and financial performance.

The findings of this study consistently confirm that marketing performance functions as a key mediating variable, channeling the benefits of AI implementation into increased MSME revenue. AI-based marketing does not directly enhance income; rather, it operates through improvements in marketing performance. Therefore, developing organizational capabilities, adaptive leadership, and robust digital technology infrastructure is crucial for MSMEs to optimally leverage AI innovations to drive revenue growth. To implement these findings, concrete policy implications include mandating digital training programs focused on AI data analytics for MSMEs, as well as allocating subsidies for stable and affordable internet infrastructure in regions with low adoption levels, enabling MSMEs to effectively and efficiently implement AI tools.

CONCLUSION

The findings of this study indicate that the implementation of automation, ad efficiency, and personalization significantly enhances MSME marketing performance. This is reflected in the hypothesis testing results, where automation significantly affects marketing performance ($T= 8.894$; $p = 0.000$), as do ad efficiency and personalization, which are proven to significantly drive marketing performance ($T = 3.285$; $p = 0.001$). However, when tested against MSME revenue, automation does not have a significant effect ($T = 1.048$; $p = 0.295$), whereas ad efficiency and personalization show a significant, albeit relatively weaker, impact ($T = 2.115$; $p = 0.034$).

These findings confirm that marketing performance serves as the main mediator, channeling the benefits of AI implementation into increased MSME revenue. Accordingly, AI-based marketing strategies do not directly increase revenue but operate through enhancing marketing performance and fostering stronger customer engagement. However, this study has several limitations, including a limited sample size confined to certain areas in North Sumatra and the use of a quantitative approach that does not explore in depth the behavioral and organizational readiness aspects of AI adoption. Therefore, future research is recommended to expand the geographical scope and employ a mixed-methods approach to gain a more comprehensive understanding of the dynamics of MSMEs' digital adaptation. From a policy perspective, the findings highlight the importance of concrete strategies from local governments and MSME-supporting institutions in providing digital literacy training, AI implementation assistance, and access to affordable technological infrastructure. With policy support focused on strengthening digital capacity and fostering collaboration among MSME actors, government, and the private sector, the utili-

zation of AI innovations can be optimized to promote sustainable income growth and competitiveness among MSMEs.

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