

The Influence of Artificial Intelligence Utilization, Innovation Capability, and Marketing Capability on the Performance of Small and Medium-Sized Enterprises in Upper Northern Thailand

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ABSTRACT:

This study examined the influence of artificial intelligence (AI) utilization, innovation capability, and marketing capability on the performance of small and medium-sized enterprises (SMEs) in Upper Northern Thailand. Grounded in the resource-based view and dynamic capability theory, the study employed a quantitative, cross-sectional research design. Data were collected through structured questionnaires from 400 SME owners, entrepreneurs, and executives across eight provinces in Upper Northern Thailand. The data were analyzed using descriptive statistics, Pearson correlation analysis, path analysis, and bootstrap analysis to assess direct and indirect effects. The results revealed that AI utilization had significant positive effects on innovation capability ($\beta = .681$), marketing capability ($\beta = .327$), and firm performance ($\beta = .214$). Innovation capability positively influenced marketing capability ($\beta = .535$) and firm performance ($\beta = .281$), while marketing capability positively influenced firm performance ($\beta = .463$). Furthermore, AI utilization exerted a significant indirect effect on firm performance through innovation and marketing capabilities. The findings demonstrate that the organizational value of AI extends beyond its direct impact on performance and is substantially realized through complementary organizational capabilities. The study highlights the importance of integrating AI utilization with innovation and marketing capability development to enhance SME performance and provides practical implications for SME managers and policymakers seeking to strengthen competitiveness in an increasingly digital business environment.

Keywords: Artificial Intelligence Utilization; Innovation Capability; Marketing Capability; SME Performance

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1. Introduction

Small and medium-sized enterprises (SMEs) play a critical role in economic development by contributing to employment creation, income generation, innovation, entrepreneurship, and

regional growth. Despite their significant economic contributions, SMEs typically operate under greater resource constraints than large firms, particularly in relation to financial capital, advanced technologies, specialized human

resources, and managerial expertise. In an increasingly digital and competitive business environment, these limitations require SMEs to develop new technological and organizational capabilities that enable them to respond effectively to changing market conditions. Digital transformation has therefore become an important strategic issue for SMEs seeking to enhance efficiency, strengthen competitiveness, and achieve sustainable performance.

Among emerging digital technologies, artificial intelligence (AI) has gained particular importance because of its capacity to support learning, reasoning, prediction, pattern recognition, automation, data analysis, and decision-making. AI technologies enable organizations to process large volumes of information, identify meaningful patterns, generate predictive insights, automate operational activities, and improve managerial decision-making (Russell & Norvig, 2021). In business settings, AI has increasingly been applied to customer analytics, demand forecasting, inventory management, marketing personalization, customer relationship management, and strategic decision support. Consequently, AI is no longer viewed solely as an operational technology but increasingly as a strategic organizational resource capable of contributing to business transformation and competitive advantage.

For SMEs, the utilization of AI may be particularly valuable because it provides opportunities to compensate for traditional limitations in resources and managerial capacity. AI-based applications can improve decision quality, operational efficiency, customer understanding, market responsiveness, and data-driven management. Previous research has shown that AI-based transformation projects can contribute to business value and organizational performance when technological resources are effectively integrated into organizational processes (Wamba-Taguimdje et al., 2020). More recent research has also emphasized the growing importance of AI adoption among SMEs and its potential role in shaping the competitive position of smaller firms in increasingly digital markets (Schwaeke et al., 2025).

Nevertheless, the adoption or utilization of AI does not necessarily guarantee superior firm performance. The strategic value of technology depends substantially on an organization's ability to combine technological resources with complementary organizational capabilities. This issue is particularly relevant for SMEs, where the possession of advanced technologies alone may be insufficient unless firms are also able to transform technological resources into innovative products, improved processes, stronger market offerings, and enhanced customer value. Accordingly, the relationship between AI utilization and firm performance should not be understood solely as a direct technological effect. Instead, it is necessary to examine the organizational capabilities through which AI generates business value.

Innovation capability represents one of the most important mechanisms through which AI utilization may contribute to improved performance. Innovation capability refers to an organization's ability to develop and implement new ideas, products, services, processes, and organizational practices. In dynamic business environments, firms must continually transform knowledge and technological resources into commercially valuable innovations. Previous research has demonstrated that innovation capability is positively associated with both financial and operational performance, particularly among SMEs that rely on flexibility and adaptability to compete with larger organizations (Saunila, 2020). Innovation capability may therefore enable SMEs to use AI not merely for automation but also for experimentation, product development, service improvement, process redesign, and organizational renewal.

AI utilization may strengthen innovation capability by enhancing organizational access to information, accelerating data analysis, supporting knowledge discovery, and facilitating faster decision-making. These technological benefits may improve a firm's ability to recognize opportunities and develop new solutions. From this perspective, AI can be considered an enabling resource that supports innovation by

strengthening organizational learning and improving the ability to convert data into actionable knowledge. For SMEs, such capabilities are especially important because innovation can provide opportunities to differentiate products and services, respond to niche markets, and compete despite limited physical and financial resources.

However, innovation capability alone may not be sufficient to generate superior performance. Innovative products, services, and processes must also be effectively aligned with market demand and translated into customer value. Marketing capability therefore represents another important organizational mechanism linking AI and innovation to firm performance. Marketing capability reflects a firm's ability to understand customer needs, manage customer relationships, communicate value, develop appropriate offerings, and coordinate market channels. Firms with stronger marketing capabilities are better positioned to convert internal resources and innovations into market-based outcomes and competitive advantage (Vorhies & Morgan, 2005).

The relationship between innovation capability and marketing capability is particularly important in contemporary digital markets. Innovation enables firms to create new value propositions, whereas marketing capability enables those innovations to be positioned, communicated, and delivered effectively to customers. As a result, SMEs that successfully integrate innovation and marketing capabilities may be better able to convert technological investments into improved financial, customer, market, and overall organizational performance.

This study is theoretically grounded in the resource-based view (RBV) and dynamic capability theory. The RBV proposes that sustained competitive advantage depends on the possession and effective deployment of valuable organizational resources and capabilities (Barney, 1991). From this perspective, AI utilization may constitute a strategic technological resource, while innovation capability and marketing capability represent complementary

organizational capabilities that enable firms to extract value from technological investments. The strategic contribution of AI therefore depends not merely on access to technology but also on the ability of firms to integrate AI into organizational processes and capabilities.

Dynamic capability theory further explains how organizations adapt, integrate, and reconfigure resources in response to environmental change. Teece et al. (1997) argued that firms operating in dynamic environments require the ability to renew and reconfigure internal and external competencies. Subsequent developments of the theory emphasized the importance of sensing opportunities, seizing them, and transforming organizational resources to maintain competitiveness over time (Teece, 2007, 2018). In the context of this study, AI utilization may enhance the ability of SMEs to sense and interpret information, innovation capability may support the transformation of resources into new solutions, and marketing capability may facilitate the commercial exploitation of these solutions. The integration of these capabilities therefore provides a theoretically meaningful explanation of how AI utilization may contribute to firm performance.

Firm performance is also inherently multidimensional. Traditional performance measurement has often focused on financial outcomes; however, organizational performance may also encompass customer-related outcomes, market performance, and overall organizational effectiveness. Venkatraman and Ramanujam (1986) emphasized the importance of conceptualizing business performance beyond a narrow financial perspective, while Richard et al. (2009) highlighted the methodological complexity of measuring organizational performance across multiple dimensions. For SMEs, a multidimensional performance perspective is especially appropriate because improvements in technology, innovation, and marketing may first appear through customer satisfaction, market responsiveness, sales growth, or competitive position before being fully reflected in financial indicators.

The context of Upper Northern Thailand provides an appropriate setting for examining these relationships. The region includes Chiang Mai, Chiang Rai, Lamphun, Lampang, Mae Hong Son, Phayao, Phrae, and Nan and is characterized by diverse SMEs operating in trade, services, tourism, agriculture-related industries, creative businesses, and other locally embedded sectors. These firms increasingly operate within a digital economy while simultaneously facing resource limitations, technological challenges, intense competition, and changing consumer behavior. Understanding how SMEs in this regional context utilize AI and transform technological resources into organizational capabilities is therefore important for both academic and practical reasons.

Although prior research has examined relationships among AI, innovation, marketing capability, and organizational performance, these constructs have often been investigated separately. Studies have shown that AI can contribute to organizational performance (Wamba-Taguimdje et al., 2020), that innovation capability can support SME performance (Saunila, 2020), and that marketing capabilities can contribute to sustainable competitive advantage and firm performance (Vorhies & Morgan, 2005). However, less attention has been devoted to an integrated causal framework that simultaneously examines AI utilization, innovation capability, marketing capability, and SME performance.

This gap is important because focusing exclusively on the direct effect of AI utilization on performance may provide an incomplete explanation of how technological resources create organizational value. AI may improve performance directly through better decision-making and operational efficiency, but it may also generate indirect effects by strengthening innovation capability and marketing capability. An integrated examination of these relationships can therefore provide a more comprehensive understanding of the mechanisms through which AI contributes to SME performance.

Accordingly, this study investigates the influence of artificial intelligence utilization, innovation capability, and marketing capability on the performance of small and medium-sized enterprises in Upper Northern Thailand. Specifically, the study examines whether AI utilization influences innovation capability, marketing capability, and SME performance; whether innovation capability influences marketing capability and SME performance; whether marketing capability influences SME performance; and whether AI utilization exerts an indirect influence on SME performance through innovation capability and marketing capability. By integrating these direct and indirect relationships within a single causal framework, the study seeks to provide a more comprehensive explanation of how AI-related technological resources are transformed into organizational performance outcomes.

The study contributes to the literature in several ways. First, it extends the application of the resource-based view by conceptualizing AI utilization as a strategic technological resource whose organizational value depends partly on complementary internal capabilities. Second, it applies dynamic capability theory to explain how SMEs may transform AI-related resources into innovation and marketing capabilities. Third, it develops an integrated causal pathway in which AI utilization influences firm performance both directly and indirectly through innovation capability and marketing capability. Finally, it provides empirical evidence from SMEs in Upper Northern Thailand, a regional context that remains comparatively underrepresented in the international literature on AI-enabled business transformation.

2. Methodology

2.1 Research Design

This study employed a quantitative, cross-sectional research design to examine the direct and indirect relationships among artificial intelligence (AI) utilization, innovation capability, marketing capability, and the performance of small and medium-sized enterprises (SMEs) in Upper Northern Thailand. A quantitative

approach was considered appropriate because the study aimed to empirically test theoretically derived relationships among multiple constructs and estimate the magnitude and statistical significance of the hypothesized causal paths.

The conceptual model was grounded in the resource-based view and dynamic capability theory and specified AI utilization as an antecedent of innovation capability, marketing capability, and firm performance. Innovation capability and marketing capability were also modeled as explanatory mechanisms linking AI utilization to SME performance. Accordingly, the empirical analysis was designed to assess both direct and indirect effects among the study variables using correlation and path analysis.

Data were collected at a single point in time through a structured self-administered questionnaire completed by SME owners, entrepreneurs, executives, or organizational decision-makers. Because these respondents were directly involved in strategic and operational decision-making, they were considered appropriate key informants for evaluating their firms' utilization of AI, innovation capability, marketing capability, and organizational performance.

2.2 Population and Sample

The target population consisted of owners, entrepreneurs, executives, and decision-makers of SMEs operating in Upper Northern Thailand, comprising eight provinces: Chiang Mai, Chiang Rai, Lamphun, Lampang, Mae Hong Son, Phayao, Phrae, and Nan. Eligible respondents were required to hold managerial or decision-making responsibilities within their organizations, operate an SME located within the study area, have been in business for at least one year, and possess knowledge of or involvement in their firm's digital technology, AI, innovation, marketing, or organizational operations.

The final sample comprised 400 respondents. The sample size was considered adequate based on two complementary considerations. First, Krejcie and Morgan (1970) recommended a sample of approximately 384 observations for very large populations at a 95% confidence level

and a .05 margin of error. The use of 400 observations therefore exceeded this benchmark. Second, the sample size was considered sufficient for multivariate analysis and path modeling, for which adequate observations are necessary to obtain stable parameter estimates and sufficient statistical power (Hair et al., 2022).

Participants were recruited using purposive sampling in combination with convenience sampling. Purposive criteria were applied to ensure that respondents possessed relevant organizational knowledge and decision-making responsibilities, while convenience-based recruitment facilitated access to eligible SME respondents across the eight provinces. The inclusion criteria required respondents to be owners, executives, or individuals with decision-making authority; to represent SMEs operating in Upper Northern Thailand; to have operated their businesses for at least one year; and to have sufficient familiarity with organizational technology, AI, innovation, or marketing activities.

The selection of managerial-level respondents was important because the constructs investigated in this study involved strategic and organizational assessments that ordinary employees might not be able to evaluate accurately. Key informants were therefore expected to possess sufficient knowledge to provide informed assessments of organizational practices and performance.

2.3 Research Instrument and Measures

Data were collected using a **structured questionnaire** developed from established theoretical concepts and previous empirical studies related to AI utilization, innovation capability, marketing capability, and firm performance. The instrument consisted of two major components. The first section collected demographic and organizational information, including gender, age, educational level, organizational position, business type, length of business operation, number of employees, and average annual business revenue. The second section measured the four principal constructs included in the research model.

All construct items were assessed using a **five-point Likert-type scale**, with responses indicating the degree to which respondents agreed with statements describing organizational practices and outcomes. The use of Likert-type scaling provides a systematic approach for measuring attitudes and perceptions across multiple indicators (Likert, 1932).

Artificial Intelligence Utilization

AI utilization represented the extent to which SMEs applied artificial intelligence to support organizational and business activities. Based on the conceptualization adopted in the original study, the construct comprised four dimensions:

1. AI utilization for decision-making,
2. AI utilization for operations,
3. AI utilization for marketing, and
4. AI utilization for data analytics.

The items assessed the extent to which AI technologies were incorporated into managerial decision-making, operational activities, marketing-related processes, and organizational data analysis.

Innovation Capability

Innovation capability referred to the organization's ability to develop, adopt, and implement new ideas and improvements. The measurement framework included four dimensions:

1. product innovation,
2. process innovation,
3. service innovation, and
4. organizational innovation.

This multidimensional conceptualization reflects the broader view that innovation capability involves an organization's capacity to transform knowledge and resources into new products, services, processes, and organizational practices (Lawson & Samson, 2001).

Marketing Capability

Marketing capability represented the organization's ability to understand and respond to market needs, create customer value, and effectively manage market-oriented activities. Four dimensions were assessed:

1. marketing communication,
2. customer relationship management,
3. product development, and
4. marketing channel management.

The conceptualization was consistent with the view that marketing capabilities represent organizational competencies through which firms deploy marketing-related resources to create and sustain superior market outcomes (Vorhies & Morgan, 2005).

Firm Performance

SME performance was conceptualized as a multidimensional construct comprising:

1. financial performance,
2. customer performance,
3. market performance, and
4. overall organizational performance.

Performance was assessed using **subjective perceptual measures**, whereby respondents evaluated their firms' performance based on organizational outcomes and perceived business achievement. Subjective performance measurement is frequently used in SME research because privately held smaller firms may be unwilling or unable to provide audited or standardized financial information. Previous research has demonstrated the relevance of multidimensional and perceptual approaches to organizational performance assessment, particularly when objective financial data are inaccessible or incomparable across firms (Murphy et al., 1996; Richard et al., 2009; Venkatraman & Ramanujam, 1986).

2.4 Instrument Validity and Reliability

The questionnaire underwent a systematic process of content validation prior to full-scale data collection. The initial items were developed based on the study's theoretical framework, operational definitions, and relevant literature. The questionnaire was then submitted to three experts for an assessment of content validity and item relevance.

Content validity was evaluated using the Index of Item-Objective Congruence (IOC). The overall IOC value reported for the research instrument was 0.92, indicating a high degree of correspondence between the questionnaire items and the intended research constructs. Expert comments and recommendations were incorporated into the revision of the instrument before its final administration.

The internal consistency reliability of the instrument was evaluated using Cronbach's alpha coefficient. The overall questionnaire yielded a Cronbach's alpha coefficient of .895, demonstrating satisfactory internal consistency across the measurement instrument. The value substantially exceeded commonly accepted thresholds for research instruments, indicating that the questionnaire items provided a reliable measurement of the constructs examined in the study.

2.5 Data Collection

Data were collected from eligible SME owners, entrepreneurs, executives, and decision-makers operating across the eight provinces of Upper Northern Thailand. Before completing the questionnaire, prospective respondents were informed of the purpose of the study, the nature of their participation, and the intended use of the collected information.

Participation was voluntary, and respondents were informed that they had the right to decline participation or discontinue their responses without penalty. Confidentiality was maintained throughout the research process, and the results were reported only in aggregate form. No personally identifiable information was disclosed in the presentation of the findings.

Following data collection, all returned questionnaires were screened for completeness and consistency. Responses with insufficient or unusable information were excluded before statistical processing. Valid responses were subsequently coded and entered into statistical software for analysis.

2.6 Data Analysis

Data analysis was conducted in several sequential stages. First, descriptive statistics were employed to summarize respondent characteristics and describe the distributions of the principal study variables. Frequencies and percentages were used to summarize demographic and organizational characteristics, whereas means and standard deviations were calculated to describe respondents' assessments of AI utilization, innovation capability, marketing capability, and SME performance.

Second, Pearson's product-moment correlation coefficient was used to examine the direction and magnitude of bivariate relationships among the principal variables. Correlation analysis was conducted before the structural analysis to assess whether the constructs demonstrated theoretically consistent associations and to provide preliminary evidence regarding the relationships specified in the research model.

Third, path analysis was employed to test the hypothesized structural relationships among AI utilization, innovation capability, marketing capability, and firm performance. Standardized path coefficients (β) were used to estimate the magnitude and direction of each hypothesized relationship. The analysis examined the following structural paths: AI utilization to innovation capability; AI utilization to marketing capability; AI utilization to firm performance; innovation capability to marketing capability; innovation capability to firm performance; and marketing capability to firm performance.

The explanatory power of the structural model was evaluated by examining the proportion of variance explained in the endogenous constructs. Effect sizes were also considered to assess the relative contribution of predictor variables to the explanatory capacity of the model. These

procedures are consistent with recommendations for interpreting multivariate structural relationships and assessing the substantive contribution of predictors beyond statistical significance alone (Hair et al., 2022).

Finally, the study decomposed the relationships into direct, indirect, and total effects. The indirect influence of AI utilization on SME performance through innovation capability and marketing capability was specifically examined to determine whether these organizational capabilities functioned as mediating mechanisms. A bootstrap procedure was used to evaluate the statistical significance of the indirect effects. Bootstrap-based inference is particularly appropriate for mediation analysis because indirect-effect sampling distributions may deviate from normality, and resampling provides a more robust basis for estimating the statistical uncertainty surrounding mediated effects.

Statistical significance was evaluated at conventional probability levels, with the principal hypothesis tests interpreted on the basis of standardized coefficients and associated *p* values. The analytical strategy therefore enabled the study to determine not only whether AI utilization was directly related to SME performance but also whether its influence was transmitted through the sequential development of innovation and marketing capabilities.

2.7 Ethical Considerations

Ethical principles applicable to social science research were observed throughout the data collection process. All respondents received information concerning the purpose and procedures of the study and participated voluntarily. Respondents retained the right to decline or withdraw from participation, and their responses were treated confidentially.

The collected data were used exclusively for research purposes and were analyzed and reported at the aggregate level. No personal information capable of identifying individual respondents or participating organizations was disclosed. These procedures were intended to protect participant autonomy, privacy, and confidentiality throughout the research process.

3. Results

3.1 Descriptive Results

A total of 400 valid responses from SME owners, entrepreneurs, and executives operating in Upper Northern Thailand were included in the analysis. Descriptive statistics were initially examined to assess the overall levels of artificial intelligence (AI) utilization, innovation capability, marketing capability, and firm performance. The results indicated that respondents reported high overall levels across all four constructs. This suggests that the SMEs included in the study had generally incorporated AI into their organizational activities and demonstrated relatively strong innovation and marketing capabilities, together with favorable perceptions of organizational performance.

AI utilization was assessed across four dimensions: AI for decision-making, operations, marketing, and data analytics. Innovation capability comprised product, process, service, and organizational innovation, whereas marketing capability encompassed marketing communication, customer relationship management, product development, and marketing channel management. Firm performance was evaluated across financial, customer, market, and overall organizational performance dimensions. Overall, the descriptive findings indicated consistently favorable assessments across the principal constructs, providing preliminary evidence that AI utilization and complementary organizational capabilities were well established among the participating SMEs.

Given that the primary purpose of the present study was to examine the structural relationships among these constructs rather than differences in individual questionnaire items, subsequent analyses focused on the aggregate construct scores and the hypothesized direct and indirect relationships.

3.2 Correlations Among the Study Variables

Prior to path analysis, Pearson's product-moment correlation coefficients were examined to determine the direction and strength of the

relationships among AI utilization, innovation capability, marketing capability, and firm performance. The results showed that all four constructs were positively and significantly correlated at the .01 level. Thus, higher levels of AI utilization were associated with stronger innovation capability, stronger marketing capability, and higher firm performance. Innovation capability was also positively related to both marketing capability and firm performance, while marketing capability demonstrated a significant positive relationship with firm performance.

These results provided preliminary support for the hypothesized relationships and justified the subsequent path analysis. More importantly, the

positive pattern of relationships was consistent with the proposed causal framework, in which AI utilization functions as an antecedent technological resource, innovation and marketing capabilities serve as organizational capability mechanisms, and firm performance represents the ultimate organizational outcome. The original study reports that all interrelationships among the study variables were statistically significant at $p < .01$.

3.3 Path Analysis and Direct Effects

Path analysis was conducted to examine the direct effects specified in the research model. As presented in Table 1, all six hypothesized direct relationships were positive and statistically significant at the .01 level.

Table 1: Path Analysis of Direct Effects Among the Study Variables

Hypothesis	Structural Path	Standardized Coefficient (β)	p	Result
H1	AI Utilization $\rightarrow$ Innovation Capability	.681	$< .01$	Supported
H2	AI Utilization $\rightarrow$ Marketing Capability	.327	$< .01$	Supported
H3	AI Utilization $\rightarrow$ Firm Performance	.214	$< .01$	Supported
H4	Innovation Capability $\rightarrow$ Marketing Capability	.535	$< .01$	Supported
H5	Innovation Capability $\rightarrow$ Firm Performance	.281	$< .01$	Supported
H6	Marketing Capability $\rightarrow$ Firm Performance	.463	$< .01$	Supported

Note. β = standardized path coefficient. All direct effects were statistically significant at $p < .01$.

The results for H1 demonstrated that AI utilization had a strong positive effect on innovation capability ($\beta = .681, p < .01$). This was the largest standardized coefficient among the paths originating from AI utilization, indicating that greater organizational utilization of AI was strongly associated with enhanced innovation capability. Thus, H1 was supported.

For H2, AI utilization exerted a significant positive direct effect on marketing capability ($\beta = .327, p < .01$), indicating that SMEs with greater AI utilization tended to demonstrate stronger marketing capabilities. Therefore, H2 was supported.

The results for H3 showed that AI utilization also had a significant positive direct effect on firm performance ($\beta = .214, p < .01$). Although this direct coefficient was smaller than the effects of AI utilization on innovation and marketing capabilities, it confirmed that AI utilization independently contributed to SME performance. Accordingly, H3 was supported.

Regarding H4, innovation capability had a substantial positive effect on marketing capability ($\beta = .535, p < .01$). This finding indicates that SMEs with stronger capabilities to develop product, process, service, and organizational innovations were also more capable of

strengthening their market-oriented activities. H4 was therefore supported.

For H5, innovation capability positively and significantly influenced firm performance ($\beta = .281, p < .01$), demonstrating that innovation capability contributed directly to improved organizational outcomes. Thus, H5 was supported.

Finally, the results for H6 revealed that marketing capability exerted a significant positive effect on firm performance ($\beta = .463, p < .01$). Among the three variables with direct paths to firm performance, marketing capability demonstrated the strongest direct standardized effect, followed by innovation capability ($\beta = .281$) and AI utilization ($\beta = .214$). Accordingly, H6 was supported.

Collectively, these findings indicate that AI utilization contributes to SME performance through multiple pathways. Although AI utilization has a statistically significant direct effect on firm performance, its stronger

relationships with innovation capability and, subsequently, marketing capability suggest that the organizational value of AI extends beyond its immediate technological benefits.

3.4 Indirect Effect of AI Utilization on Firm Performance

The seventh research objective examined whether AI utilization exerted an indirect influence on firm performance through innovation capability and marketing capability. The decomposition of effects demonstrated that AI utilization had both direct and indirect effects on firm performance.

The standardized direct effect of AI utilization on firm performance was .214, whereas the reported aggregate indirect effect was .510. The indirect effect was therefore substantially greater than the direct effect, suggesting that a considerable proportion of the influence of AI utilization on SME performance operated through the development of organizational capabilities rather than exclusively through a direct pathway.

Table 2: Direct, Indirect, and Total Effects of AI Utilization on Firm Performance

Predictor	Outcome	Direct Effect	Indirect Effect	Total Effect
AI Utilization	Firm Performance	.214	.510	.724

Note. The total effect is presented as the sum of the reported direct and aggregate indirect effects ($.214 + .510 = .724$).

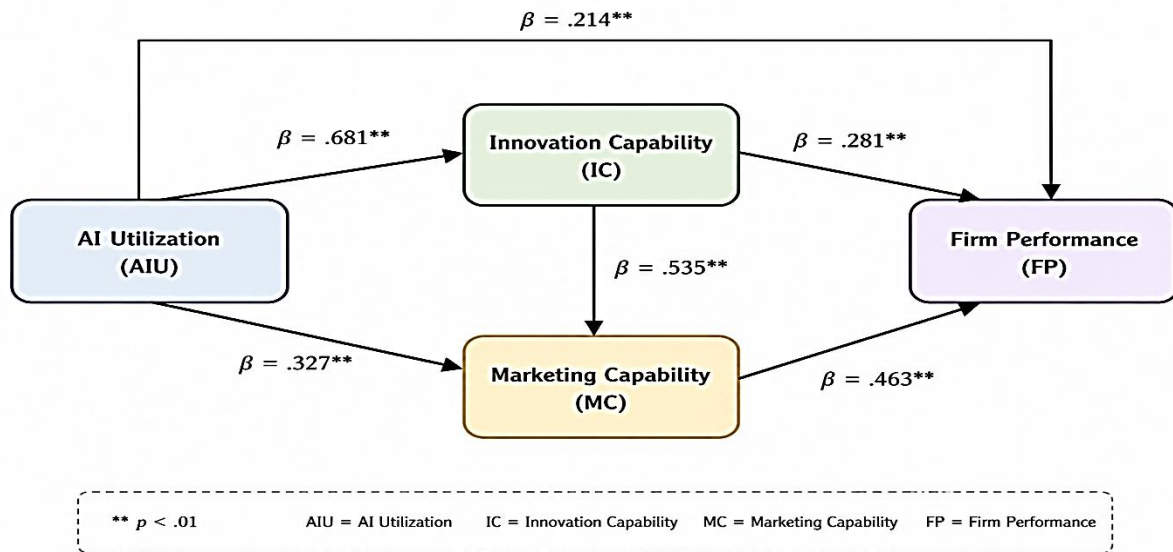
The findings therefore supported H7, which proposed that AI utilization indirectly influences SME performance through innovation capability and marketing capability. The magnitude of the reported indirect effect (.510) relative to the direct effect (.214) highlights the importance of complementary organizational capabilities in translating AI utilization into performance outcomes.

The structural relationships suggest several potential mediated pathways. AI utilization enhances innovation capability, which directly contributes to firm performance. AI utilization also strengthens marketing capability, which

subsequently improves firm performance. Furthermore, the significant relationship between innovation capability and marketing capability indicates a sequential mechanism in which AI utilization strengthens innovation capability, enhanced innovation capability contributes to marketing capability, and stronger marketing capability ultimately improves firm performance.

3.5 Structural Path Model

Figure 1 summarizes the structural relationships identified in the path analysis. All six direct paths included in the model were positive and statistically significant at the .01 level.



Note. $p < .01$. The aggregate indirect effect of AI utilization on firm performance through innovation capability and marketing capability was reported as .510.

Figure 1: Final Structural Model of AI Utilization, Innovation Capability, Marketing Capability, and SME Performance

Conceptually, the final structural model can be summarized as a capability-building process in which AI Utilization → Innovation Capability → Marketing Capability → Firm Performance, while simultaneously allowing direct paths from AI utilization to marketing capability and firm performance and from innovation capability to firm performance. The model therefore demonstrates that AI utilization is related to SME performance both directly and through interconnected organizational capability pathways.

Overall, the results supported all seven hypotheses. AI utilization had significant positive direct effects on innovation capability, marketing capability, and firm performance. Innovation capability positively influenced both marketing capability and firm performance, while marketing capability had the strongest direct effect on firm performance among the three immediate predictors. Most notably, the reported indirect effect of AI utilization on firm performance (.510) exceeded its direct effect (.214), demonstrating that innovation and marketing capabilities constitute important mechanisms through which AI utilization is translated into SME performance. These findings collectively address the study objectives by demonstrating

that the performance implications of AI utilization extend beyond its direct contribution and operate substantially through the development of complementary innovation and marketing capabilities.

4. Discussion

The present study investigated the direct and indirect relationships among artificial intelligence (AI) utilization, innovation capability, marketing capability, and the performance of small and medium-sized enterprises (SMEs) in Upper Northern Thailand. Overall, the findings supported all seven proposed relationships and provided empirical evidence that AI utilization contributes to SME performance through both direct and capability-mediated pathways. Specifically, AI utilization positively influenced innovation capability ($\beta = .681$), marketing capability ($\beta = .327$), and firm performance ($\beta = .214$). Innovation capability positively influenced marketing capability ($\beta = .535$) and firm performance ($\beta = .281$), while marketing capability had a substantial positive influence on firm performance ($\beta = .463$). Most importantly, the reported indirect effect of AI utilization on firm performance through innovation capability and marketing capability (.510) was greater than

its direct effect (.214). Taken together, these findings suggest that the organizational value of AI is not derived solely from the use of technology itself but is substantially realized through the development and deployment of complementary organizational capabilities.

4.1 AI Utilization and Innovation Capability

The first major finding was that AI utilization had a strong positive influence on innovation capability ($\beta = .681, p < .01$), supporting the first research objective and H1. This coefficient represented the strongest direct relationship originating from AI utilization in the proposed model. The result indicates that SMEs that utilize AI more extensively in decision-making, operations, marketing, and data analytics are more likely to demonstrate stronger capabilities in product, process, service, and organizational innovation.

This finding can be explained by the capacity of AI to enhance information processing, knowledge discovery, pattern recognition, prediction, and data-driven decision-making. AI enables organizations to process information that might otherwise exceed human analytical capacity and may therefore help SMEs recognize emerging customer needs, identify operational inefficiencies, anticipate changes in demand, and generate new solutions. In this sense, AI utilization does not merely automate existing activities; it can expand the informational and analytical foundation upon which innovation occurs.

The finding is consistent with the broader argument that organizational innovation capability depends on a firm's capacity to integrate and transform resources into new products, processes, services, and organizational practices. Lawson and Samson (2001) conceptualized innovation capability as an organizational capability that facilitates the continuous transformation of knowledge and ideas into innovations. Similarly, Saunila (2020) demonstrated the importance of innovation capability for SME success, particularly in relation to financial and operational performance.

From the perspective of the resource-based view (RBV), the finding suggests that AI-related resources can contribute to competitive advantage when they are effectively embedded within organizational capabilities. The RBV emphasizes that firm heterogeneity and competitive advantage arise from differences in valuable resources and capabilities (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). AI technology itself may increasingly become accessible to competing firms; therefore, the possession of AI tools alone may not constitute a sustainable source of differentiation. Rather, competitive value may emerge from how effectively firms integrate AI into organizational routines and use it to strengthen capabilities that competitors cannot easily replicate.

The result is also consistent with dynamic capability theory, which emphasizes the ability of organizations to integrate, build, and reconfigure competencies in response to rapidly changing environments (Teece et al., 1997). AI can potentially strengthen the information-processing foundation of dynamic capabilities by enabling firms to identify emerging opportunities and threats more effectively. In the terminology developed by Teece (2007), AI may support the firm's ability to *sense* changes in its environment, while innovation capability enables the organization to *seize* identified opportunities and transform resources into new value propositions. The strong coefficient between AI utilization and innovation capability observed in this study therefore provides empirical support for viewing AI as an enabling technological resource that can strengthen the adaptive and innovative capacity of SMEs.

4.2 AI Utilization and Marketing Capability

The second finding demonstrated that AI utilization had a significant positive influence on marketing capability ($\beta = .327, p < .01$), supporting the second research objective and H2. This result indicates that greater utilization of AI is associated with stronger capabilities in marketing communication, customer relationship management, product development, and marketing channel management.

AI technologies can strengthen marketing capability by enabling firms to analyze customer information, identify behavioral patterns, segment markets, personalize communication, anticipate customer preferences, and support more responsive marketing decisions. These functions are particularly relevant for SMEs, which often have fewer financial and human resources available for conventional market research and large-scale marketing operations. By using AI-enabled analytical tools, SMEs may be able to obtain deeper market insights while using their limited resources more efficiently.

The result is consistent with the conceptualization of marketing capability as the organizational ability to deploy market-related resources and knowledge in ways that create customer value and competitive advantage. Vorhies and Morgan (2005) demonstrated that superior marketing capabilities are important to sustainable competitive advantage, while Morgan et al. (2009) showed that marketing capabilities play a critical role in translating market orientation into firm performance. The present findings extend this reasoning by suggesting that AI utilization may function as a technological antecedent that strengthens such marketing capabilities.

From an RBV perspective, the finding further demonstrates the importance of resource complementarity. AI can provide technological and informational resources, but marketing capability determines whether firms can transform these resources into market intelligence and customer-oriented actions. Consequently, the value of AI may depend on whether firms possess organizational routines capable of interpreting and applying AI-generated information. This interpretation reinforces the argument that technological investment should not be treated independently from organizational capability development.

4.3 AI Utilization and Firm Performance

The third finding revealed that AI utilization had a significant positive direct influence on firm performance ($\beta = .214, p < .01$), supporting the third research objective and H3. This finding

indicates that AI utilization can directly contribute to improvements in organizational outcomes, including financial, customer, market, and overall performance.

This result is consistent with Wamba-Taguimdje et al. (2020), who demonstrated that AI-based transformation projects can generate business value and influence firm performance. AI may contribute directly to organizational performance through several mechanisms, including improved operational efficiency, reduced processing time, enhanced decision quality, more accurate forecasting, and improved responsiveness to customers and markets.

The finding is also relevant to the growing literature on AI adoption among SMEs. Schwaacke et al. (2025) highlighted the increasing adoption of AI within SMEs, suggesting that AI is becoming part of the new competitive environment facing smaller enterprises. The present findings provide additional empirical support for the proposition that AI utilization is positively associated with SME performance.

However, the magnitude of the direct effect ($\beta = .214$) was smaller than the reported indirect effect (.510). This distinction is theoretically important. It suggests that although AI can directly improve performance, its greater organizational value may emerge when technological resources contribute to the development of complementary capabilities. Thus, SMEs should not expect the acquisition or adoption of AI technology alone to automatically produce substantial improvements in performance. The ability to convert AI utilization into innovation and marketing capabilities appears to be an important part of the value-creation process.

This interpretation is consistent with the RBV, which emphasizes that resources generate sustained advantage not merely because firms possess them but because of the organizational capabilities through which they are deployed (Barney, 1991). It is also consistent with the dynamic capabilities perspective, which argues that firms operating in rapidly changing environments must continually reconfigure their resource bases rather than rely solely on static

resource ownership (Teece et al., 1997; Teece, 2007).

4.4 Innovation Capability and Marketing Capability

The fourth finding showed that innovation capability had a substantial positive influence on marketing capability ($\beta = .535$, $p < .01$), supporting the fourth research objective and H4. This result provides an important link within the proposed causal model because it demonstrates that innovation capability is not only related to performance directly but also contributes to the development of market-oriented organizational capabilities.

Innovation creates new or improved products, services, processes, and organizational practices. However, these innovations must ultimately be connected to customer needs and market opportunities if they are to create commercial value. Firms with strong innovation capabilities may be better positioned to develop differentiated products, redesign customer experiences, introduce new service offerings, and adapt their value propositions. These developments, in turn, can strengthen marketing communication, product development, customer relationship management, and channel management.

The magnitude of this relationship ($\beta = .535$) suggests that innovation and marketing capabilities should not be viewed as independent organizational competencies. Rather, they appear to operate as interconnected capabilities. Innovation generates potential value, while marketing capability facilitates the identification, communication, delivery, and capture of that value in the marketplace.

This finding is compatible with dynamic capability theory. Teece (2007) argued that organizational competitiveness requires interconnected processes of sensing opportunities, seizing them, and transforming organizational resources. Within the context of the present study, AI may contribute to sensing by enhancing access to and interpretation of information; innovation capability may facilitate the creation and transformation of new solutions;

and marketing capability may help firms seize commercial opportunities by aligning innovations with market demand. The significant innovation capability–marketing capability relationship therefore provides empirical support for a sequential capability-building interpretation of SME digital transformation.

4.5 Innovation Capability and Firm Performance

The fifth finding demonstrated that innovation capability had a significant positive influence on firm performance ($\beta = .281$, $p < .01$), supporting the fifth research objective and H5. This result confirms that SMEs capable of developing and implementing innovations are more likely to achieve stronger organizational outcomes.

The finding is consistent with Saunila (2020), who emphasized the importance of innovation capability for SME success from both financial and operational perspectives. SMEs typically operate with fewer resources than large organizations, making their ability to innovate and adapt especially important. Innovation can enable SMEs to differentiate their offerings, improve operational processes, develop new services, respond to emerging customer needs, and exploit specialized market opportunities.

The finding also aligns with Schumpeter's (1934) conceptualization of innovation as a fundamental mechanism of economic development and entrepreneurial change. In contemporary digital environments, innovation remains central to organizational competitiveness, but the sources and processes of innovation increasingly involve digital resources, data, and AI-enabled technologies.

From a dynamic capability perspective, the positive relationship between innovation capability and firm performance suggests that the ability to renew and reconfigure organizational resources contributes directly to organizational outcomes. This finding supports the argument of Teece et al. (1997) that firms require dynamic capabilities to respond effectively to changing environments. For SMEs operating in volatile and digitally evolving markets, innovation capability may therefore function as an important

mechanism for maintaining organizational relevance and competitiveness.

4.6 Marketing Capability and Firm Performance

The sixth finding revealed that marketing capability had a significant positive influence on firm performance ($\beta = .463, p < .01$), supporting the sixth research objective and H6. Notably, marketing capability demonstrated the strongest direct effect on firm performance among the three immediate predictors included in the model: marketing capability ($\beta = .463$), innovation capability ($\beta = .281$), and AI utilization ($\beta = .214$).

This finding emphasizes the importance of market-facing capabilities in converting organizational resources into performance outcomes. Although AI can generate information and innovation capability can create new products, services, and processes, firms ultimately require marketing capabilities to communicate and deliver value to customers. Marketing capability enables firms to understand customer needs, position products and services effectively, maintain customer relationships, manage distribution channels, and respond to changing market conditions.

The result is consistent with Vorhies and Morgan (2005), who identified marketing capabilities as important sources of sustainable competitive advantage. It also aligns with Morgan et al. (2009), who found that marketing capabilities play a critical role in explaining firm performance. The present study extends these findings to the context of SMEs utilizing AI by demonstrating that marketing capability represents a particularly important proximal predictor of performance.

This finding has an important implication for interpreting the overall model. AI utilization and innovation capability may generate potential organizational value, but marketing capability appears to play a central role in converting this potential into realized performance. In other words, technological sophistication and innovation may have limited economic value if firms cannot effectively connect their innovations with customers and markets.

4.7 The Indirect Influence of AI Utilization on Firm Performance

The seventh and theoretically most significant finding was that AI utilization indirectly influenced firm performance through innovation capability and marketing capability. The reported aggregate indirect effect was .510, exceeding the direct effect of .214 and supporting the seventh research objective and H7. The original study therefore indicates that the relationship between AI utilization and SME performance is explained substantially through complementary organizational capabilities rather than through a direct technological pathway alone.

This finding represents a central contribution of the study. Previous research has demonstrated that AI can influence firm performance (Wamba-Taguimdje et al., 2020), that innovation capability contributes to SME success (Saunila, 2020), and that marketing capabilities influence organizational performance (Morgan et al., 2009; Vorhies & Morgan, 2005). The present study integrates these previously related but often separately examined relationships into a unified capability-based framework.

The findings suggest a broader organizational mechanism in which AI utilization strengthens innovation capability, innovation capability strengthens marketing capability, and these capabilities contribute to firm performance. At the same time, the model recognizes additional direct relationships from AI utilization to marketing capability and firm performance and from innovation capability to firm performance. AI utilization therefore appears to operate through multiple, interconnected pathways rather than through a single linear mechanism.

The greater magnitude of the reported indirect effect compared with the direct effect is consistent with the theoretical proposition that technology creates organizational value when it is embedded within complementary capabilities. From an RBV perspective, AI can be interpreted as a strategic technological resource, while innovation capability and marketing capability represent complementary capabilities through which that resource is deployed (Barney, 1991;

Wernerfelt, 1984). From a dynamic capabilities perspective, these relationships reflect the organizational process of identifying opportunities, transforming resources, and exploiting market opportunities under changing environmental conditions (Teece et al., 1997; Teece, 2007, 2018).

Consequently, the findings challenge a purely technology-centric interpretation of AI-driven performance. For SMEs, investing in AI without simultaneously strengthening innovation processes and marketing competencies may limit the performance benefits of technological adoption. Conversely, firms that integrate AI-generated insights with their ability to innovate and respond to markets may be better positioned to translate technological investments into sustainable organizational outcomes.

4.8 Theoretical Contributions

The findings make several theoretical contributions. First, the study extends the resource-based view by demonstrating that AI utilization can be conceptualized as a strategically relevant technological resource, but its relationship with firm performance becomes more meaningful when complementary organizational capabilities are incorporated into the explanatory framework. This finding reinforces the RBV argument that competitive outcomes depend not simply on resource possession but on the firm's capacity to combine and deploy resources effectively (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984).

Second, the findings contribute to dynamic capability theory by identifying a capability pathway through which AI-related technological resources may be transformed into organizational outcomes. The empirical relationships among AI utilization, innovation capability, marketing capability, and firm performance are consistent with the view that firms must continually integrate and reconfigure resources to respond to environmental change (Teece et al., 1997; Teece, 2007). In particular, the strong relationship between AI utilization and innovation capability and the subsequent relationship between innovation and marketing capabilities illustrate

how technological resources may stimulate interconnected capability development.

Third, the study contributes to the emerging literature on AI and SMEs by moving beyond a simple AI → performance relationship. The findings demonstrate that examining only the direct effect of AI utilization may underestimate or incompletely explain its organizational value. The reported indirect effect suggests that innovation and marketing capabilities constitute important mechanisms linking AI utilization to SME performance. This capability-mediated perspective provides a more nuanced explanation of how AI may create business value.

Finally, the study contributes contextual evidence from SMEs in Upper Northern Thailand. Much of the strategic management and technology literature has historically been developed using evidence from larger organizations or more developed economic settings. Examining SMEs in a regional context provides additional insight into how resource-constrained firms may utilize AI and develop complementary capabilities to enhance organizational performance.

4.9 Practical and Managerial Implications

The findings also provide several practical implications for SME owners and managers. Most importantly, SMEs should approach AI investment as part of a broader organizational capability-development strategy rather than as an isolated technology acquisition. The results indicate that the direct influence of AI utilization on performance is positive, but the reported indirect influence through innovation and marketing capabilities is considerably larger.

Managers should therefore integrate AI into activities that enhance organizational learning, experimentation, product and service development, process improvement, and market responsiveness. AI-generated data and insights should be connected to innovation processes so that firms can translate information into new or improved value propositions.

At the same time, innovation investments should be coordinated with marketing capabilities. The strong effect of marketing capability on firm

performance ($\beta = .463$) indicates that SMEs need the capacity to understand customers, communicate value, manage relationships, and develop effective channels if they are to realize the commercial benefits of innovation. Accordingly, an integrated strategy linking AI utilization, innovation development, and marketing execution may offer SMEs a stronger pathway to improved performance than investments in any one capability in isolation.

For policymakers and SME-support organizations, the findings suggest that programs designed to promote AI adoption should extend beyond providing access to technology or technical training. Support initiatives should simultaneously strengthen SMEs' innovation management and marketing capabilities. Programs that combine digital skills, AI literacy, innovation development, customer analytics, and market strategy may therefore generate greater organizational benefits than technology-focused interventions alone.

4.10 Overall Interpretation

Overall, the findings provide empirical support for an integrated capability-based explanation of AI-enabled SME performance. AI utilization was positively associated with innovation capability, marketing capability, and firm performance; innovation capability contributed to both marketing capability and performance; and marketing capability emerged as the strongest immediate predictor of firm performance. Most importantly, the reported indirect influence of AI utilization on performance exceeded its direct influence, highlighting the central role of organizational capabilities in converting technological resources into business outcomes.

The central implication of the study is therefore that AI should not be understood as an independent driver of SME performance but as a strategic enabling resource whose value is amplified through innovation and marketing capabilities. This interpretation integrates the resource-based view and dynamic capability theory and provides a more comprehensive explanation of how SMEs may transform AI

utilization into sustainable organizational value in an increasingly digital competitive environment.

5. Conclusion

This study examined the influence of artificial intelligence (AI) utilization, innovation capability, and marketing capability on the performance of small and medium-sized enterprises (SMEs) in Upper Northern Thailand. The findings supported all hypothesized relationships, showing that AI utilization positively influenced innovation capability, marketing capability, and firm performance. Innovation capability also enhanced marketing capability and firm performance, while marketing capability exerted a strong positive effect on firm performance. Importantly, AI utilization also contributed indirectly to firm performance through innovation and marketing capabilities.

These findings indicate that the organizational value of AI extends beyond its direct technological effects. AI utilization can strengthen organizational learning, information processing, opportunity recognition, and innovation, while innovation capability can subsequently enhance marketing capability and improve the firm's ability to create and deliver customer value. Thus, AI should be viewed as a strategic technological resource whose performance benefits depend substantially on complementary organizational capabilities.

The findings also extend the resource-based view and dynamic capability theory by demonstrating that superior performance does not result from technology adoption alone. Rather, SMEs must effectively integrate and transform AI-related resources into innovation and market-oriented capabilities (Barney, 1991; Teece et al., 1997; Teece, 2007). From a managerial perspective, SME owners and managers should therefore integrate AI investments with initiatives that strengthen innovation processes, analytical competencies, customer intelligence, and marketing execution.

For policymakers and SME-support organizations, programs promoting AI adoption should combine technological support with

capability development in innovation, data-driven decision-making, and digital marketing.

This study is limited by its cross-sectional design, reliance on self-reported measures, and focus on SMEs in Upper Northern Thailand. Future research should employ longitudinal designs, incorporate objective performance indicators, examine other geographic and industry contexts, and investigate additional mediating and moderating factors.

Overall, the study demonstrates that AI utilization contributes to SME performance both directly and indirectly through innovation and marketing capabilities. SMEs seeking to maximize the benefits of AI should therefore adopt a capability-centered approach in which technological adoption is accompanied by continuous innovation and strong market-oriented capabilities.

Recommendations

Based on the findings, SMEs should adopt a strategic and capability-centered approach to AI utilization. Managers should integrate AI technologies into decision-making, operations, marketing, and data analytics while simultaneously strengthening innovation and marketing capabilities. Particular attention should be given to developing employees' AI literacy, analytical skills, organizational learning, and ability to transform AI-generated insights into innovative products, services, and processes.

SMEs should also strengthen marketing capabilities, particularly customer relationship management, market intelligence, marketing communication, product development, and digital channel management, as these capabilities play an important role in translating technological and innovative resources into improved firm performance.

Policymakers and SME-support organizations should develop integrated support programs that combine access to AI technologies with training in innovation management, data analytics, and

digital marketing. Financial and technical assistance should also be provided to resource-constrained SMEs to facilitate effective AI adoption.

Future studies should employ longitudinal designs, incorporate objective performance measures, and examine SMEs across different regions and industries. Additional mediating and moderating variables, such as organizational agility, digital capability, AI readiness, and competitive intensity, should also be investigated to provide a more comprehensive understanding of AI-driven SME performance.

Future Research Directions

Future research should extend the present findings by employing longitudinal designs to examine how AI utilization, innovation capability, marketing capability, and SME performance evolve over time and to provide stronger evidence of causal relationships. Studies should also incorporate objective performance indicators, such as revenue growth, profitability, productivity, market share, and innovation outcomes, alongside perceptual measures.

Future studies could replicate the proposed model across different regions, countries, industries, and firm sizes to assess the generalizability of the findings. Comparative studies between SMEs with different levels of AI adoption and digital maturity may also provide valuable insights. In addition, researchers should investigate other potential mediating mechanisms, including digital capability, absorptive capacity, organizational agility, and data analytics capability. Moderating factors such as AI readiness, technological turbulence, competitive intensity, organizational culture, and environmental dynamism should also be explored. Finally, future research could examine specific indirect pathways using bootstrap-based mediation analysis to provide a more detailed understanding of how AI utilization is translated into sustainable SME performance.

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Author Declaration

The authors declare that this manuscript is original, has not been previously published, and is not currently under consideration for publication elsewhere. All sources and contributions used in this study have been appropriately acknowledged and cited in accordance with academic and ethical standards.

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