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Entrepreneurial mindset: a systematic literature review and empirical study of MSMEs in the special region of Yogyakarta

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Article Info	Abstract
Keywords: artificial intelligence, business performance, entrepreneurial mindset, literature review, msme	The intersection of entrepreneurial mindset, artificial intelligence (AI), and business performance represents a dynamic research area, yet systematic syntheses of these relationships remain limited. This research aims to synthesize empirical evidence examining the connections between mindset development and AI adoption, while empirically evaluating their impact on MSME performance in Yogyakarta. Adopting PRISMA guidelines, a systematic literature review (SLR) analyzed 15 peer-reviewed articles published between 2019 and 2024. This was complemented by an empirical study of 51 MSME owners utilizing multiple linear regression analysis. SLR results indicate that AI integration catalyzes mindset development through cognitive enhancement and experiential learning. Empirical findings confirm that both entrepreneurial mindset and AI use are statistically significant predictors of business performance, collectively explaining 12.6% of the variance. Notably, entrepreneurial mindset exerts a stronger influence than AI adoption. These results imply that digital transformation is most beneficial when grounded in an entrepreneurial approach. Recommendations include integrating generative AI into curricula and fostering strategic AI literacy among practitioners to enhance business sustainability.

1. INTRODUCTION

The intersection of entrepreneurial mindset, artificial intelligence (AI), and entrepreneurship represents one of the most dynamic and rapidly evolving areas in contemporary business and organizational research. Entrepreneurial mindset, characterized by opportunity recognition, creative problem-solving, risk-taking propensity, and resilience, has become increasingly recognized as essential for navigating the complexities of modern business environments (Isabel et al., 2026). Simultaneously, artificial intelligence technologies, including machine learning, generative AI systems, and data analytics, are fundamentally reshaping how entrepreneurs identify opportunities, make decisions, and execute business strategies.

The convergence of these three domains is neither accidental nor superficial. As organizations undergo digital transformation, the traditional pathways to entrepreneurial



success are being disrupted and reimagined. Entrepreneurs must now not only possess the cognitive and affective characteristics associated with entrepreneurial mindset but also demonstrate competence in leveraging AI technologies to enhance their decision-making, accelerate innovation, and achieve competitive advantage (Rumangkit et al., 2025; Duong, 2026). This transformation is particularly pronounced in emerging economies where leapfrogging opportunities through AI adoption present unique pathways to economic development and social impact.

Despite growing scholarly attention to entrepreneurship in the digital age, a systematic synthesis of research examining the specific relationships between entrepreneurial mindset, AI adoption, and entrepreneurial outcomes remains limited. Most existing reviews treat these constructs in isolation, failing to capture the complex interactions and synergies that emerge when entrepreneurial cognition is coupled with AI-enabled tools and platforms. This systematic literature review addresses this critical gap by synthesizing empirical evidence from peer-reviewed journals published between 2019 and 2024, a period characterized by accelerated AI development, widespread institutional adoption, and increasing integration of these technologies into entrepreneurship education and practice.

To address this critical void, this study explicitly formulates the following research problem: How do entrepreneurial mindset and the adoption of AI technologies individually and synergistically influence the business performance of MSMEs, and what underlying theoretical mechanisms govern this relationship within the socio-economic context of the Special Region of Yogyakarta? Accordingly, the explicit objectives of this comprehensive mixed-method study are threefold: (1) to systematically identify and synthesize existing global empirical research examining the theoretical intersection of entrepreneurial cognition and AI adoption; (2) to empirically quantify the isolated and combined predictive impacts of entrepreneurial mindset and AI utilization on MSME business performance; and (3) to generate theoretically grounded, actionable recommendations for educators, policymakers, and MSME stakeholders to leverage digital transformation effectively in resource-constrained environments.

2. LITERATURE REVIEW AND HYPOTHESIS

Defining Entrepreneurial Mindset

Entrepreneurial mindset represents a multidimensional construct characterized by opportunity recognition, creative problem-solving, risk-taking propensity, and resilience (Daspit et al., 2023). The development and cultivation of this cognitive framework has become increasingly recognized as essential for navigating the complexities of modern business environments and achieving organizational success in volatile economic conditions (Grewatsch & Kleindienst, 2018). This distinctive cognitive orientation enables entrepreneurs to identify market gaps, conceptualize innovative solutions, and pursue ventures with calculated risk assessments (Daspit et al., 2023).

The conceptualization of entrepreneurial mindset extends beyond mere personality traits; it encompasses cognitive capabilities, affective characteristics, and behavioral dispositions that collectively enable individuals to recognize and exploit opportunities in

their business environments (Kuratko et al., 2021). Research suggests that entrepreneurs possessing a well-developed entrepreneurial mindset demonstrate superior abilities in identifying market opportunities, making strategic decisions, and mobilizing resources to create sustainable competitive advantages (Mawson et al., 2023).

AI Technologies in Business Contexts

Artificial intelligence technologies, encompassing machine learning, generative AI systems, and data analytics, are fundamentally reshaping how entrepreneurs identify opportunities, make decisions, and execute business strategies (Rashid & Kausik, 2024). The rapid advancement and widespread adoption of AI technologies have created unprecedented opportunities for organizations to augment human decision-making, automate routine processes, and generate data-driven insights that enhance competitive positioning (Rashid & Kausik, 2024).

AI adoption represents a critical dimension of digital transformation, enabling entrepreneurs to leverage advanced computational capabilities for market analysis, customer engagement, and operational optimization (Tursunbayeva & Chalutz-Ben Gal, 2024). The integration of generative AI tools, including ChatGPT and other large language models, has created new pathways for entrepreneurs to access strategic insights, enhance creativity, and accelerate innovation cycles (Fui-Hoon Nah et al., 2023).

Mechanisms of AI Impact on Entrepreneurial Outcomes

The intersection of AI adoption and entrepreneurial success operates through multiple pathways. Research demonstrates that AI enhances entrepreneurial outcomes by improving decision-making accuracy and efficiency (Mumi et al., 2025). When integrated with human judgment in high-uncertainty contexts, AI serves as a cognitive augmentation tool rather than a replacement for human expertise (An, 2025).

AI's transformative impact on entrepreneurship extends to enhanced scalability, accelerated innovation cycles, and improved competitive advantage (Ştefan et al., 2025). Digital platforms and AI-driven tools enable entrepreneurs to optimize processes, reduce operational costs, and expand market reach with greater efficiency (Cao, 2025). However, research also identifies potential downsides, noting that excessive dependence on AI may paradoxically limit creativity and constrain entrepreneurial vision (Cui et al., 2026).

Cognitive Pathways Linking Mindset and AI Adoption

The relationship between entrepreneurial mindset and AI adoption operates through cognitive pathways that influence how entrepreneurs perceive, evaluate, and implement technology. AI literacy significantly enhances entrepreneurial mindset and digital entrepreneurial intention, which in turn drive digital entrepreneurial hustle and venture success (Duong, 2026a). The development of AI self-efficacy and competency shapes perceived desirability and feasibility of ventures, sequentially influencing attitudes and entrepreneurial intentions (Nguyen et al., 2025).

Entrepreneurial cognition, encompassing mental models, belief systems, and decision-making heuristics, significantly predicts AI adoption intentions, particularly in emerging

market contexts (Mostafiz et al., 2025a). When coupled with ecosystem resource mobilization and entrepreneurial bricolage, this relationship strengthens substantially, demonstrating the contingency of AI adoption on broader entrepreneurial and contextual factors.

AI-Entrepreneurship Dynamics in Developing Economies

The intersection of AI adoption and entrepreneurial mindset demonstrates distinctive patterns in emerging market contexts that warrant separate scholarly attention. Emerging markets present unique leapfrogging opportunities through AI adoption, offering pathways to economic development and social impact distinct from developed-economy patterns (Choudhary et al., 2024; Rumangkit et al., 2025). In emerging economies such as Nigeria, Bangladesh, and other developing contexts, technological exposure and AI knowledge enhance strategic thinking and cognitive adaptability, though within contexts characterized by significant digital infrastructure constraints and resource limitations (Adebayo et al., 2023).

Entrepreneurial bricolage, the practice of recombining available resources in novel ways to create value, emerges as a particularly salient mechanism in emerging market contexts where formal institutional support and access to advanced technologies remain limited (Aaouid et al., 2024). The contingency role of innovation ecosystem resource mobilization strengthens the entrepreneurial cognition-AI adoption relationship substantially, demonstrating that emerging market entrepreneurs possess distinctive capabilities for leveraging constrained resources effectively.

Research Gaps in Geographic Representation

A critical analysis of existing literature reveals significant geographic imbalances in research attention and representation. While emerging markets are relatively well-represented in existing scholarship, research in Africa (beyond Nigeria), Latin America, and Middle Eastern contexts remains sparse. These geographic gaps represent important research opportunities, given the potential for AI to serve as a development tool in resource-constrained environments and the distinctive institutional and market contexts characterizing these regions.

The mechanisms through which AI influences entrepreneurship may vary substantially across regions with different institutional, educational, and technological infrastructures, suggesting that geographic diversity in future research represents a critical priority for advancing theoretical understanding and practical application of AI-entrepreneurship relationships.

Methodological Limitations and Longitudinal Research Needs

A comprehensive analysis of existing research reveals several significant methodological limitations that constrain causal inference and limit understanding of dynamic processes. Nearly all included studies employ cross-sectional designs, limiting the ability to establish causal relationships or understand temporal dynamics. Longitudinal research tracking entrepreneurs over time would clarify whether AI exposure causes mindset

development or whether entrepreneurs with existing growth mindsets are more likely to adopt AI technologies, a critical distinction for both theory development and practical application.

Insufficient research attention has been directed toward investigating negative and contingent effects of AI integration. Only limited scholarship has explicitly investigated potential downsides of AI integration, such as creativity limitation through over-dependence or contexts where AI adoption may hinder entrepreneurial mindset development. More research examining boundary conditions, potential harms, ethical implications, and situations where AI may constrain entrepreneurial potential represents an important scholarly priority.

Hypotheses

Based on the theoretical frameworks, empirical evidence, and identified research relationships discussed in the literature review, the following hypotheses guide this study:

H₁: Entrepreneurial Mindset has significant impact to Business Performance

This hypothesis is deeply anchored in the Resource-Based View (RBV). The RBV asserts that a firm's competitive advantage stems from internal, inimitable assets. The entrepreneurial mindset, encompassing cognitive agility, resilience, and unique opportunity recognition, serves as an intangible human resource that competitors cannot copy or easily substitute. Because this cognitive framework enables rapid adaptation and strategic resource mobilization in uncertain environments, it acts as a direct, internal antecedent to superior business performance, operational efficiency, and venture survival (Ercantan et al., 2024; Lopes et al., 2021).

H₂: The Use of AI has significant impact to Business Performance

This hypothesis is grounded in the synthesis of the Technology-Organization-Environment (TOE) framework and Dynamic Capabilities Theory. The adoption of AI represents a technological reconfiguration that allows an organization to process vast amounts of environmental data, automate operational inefficiencies, and accelerate innovation cycles. By transforming raw market data into actionable strategic intelligence, AI tools enhance the firm's dynamic capability to sense and seize market opportunities rapidly, thereby generating a statistically significant positive effect on overall business performance metrics, including sales growth and competitive positioning (Le-Dinh et al., 2025; Sánchez-Rodríguez et al., 2025).

H₃: Entrepreneurial Mindset and The Use of AI together have significant impact to Business Performance

This hypothesis relies on the advanced application of Dynamic Capabilities Theory. The theory dictates that the mere possession of a ubiquitous technological resource (such as commercially available AI) does not inherently generate sustained competitive advantage because it lacks the VRIN characteristics. Instead, it is the synergistic combination of human strategic intent (Mindset) and technological capability (AI) that creates an irreplaceable dynamic capability. The entrepreneurial mindset acts as the foundational driver, providing

the necessary vision, ethical boundaries, and strategic direction to deploy AI effectively. Therefore, while both variables will jointly drive performance, the cognitive orientation (mindset) must inherently exert a stronger influence than the technological tool itself (Siaw & Ali, 2024; Yan & Ahmad, 2025).

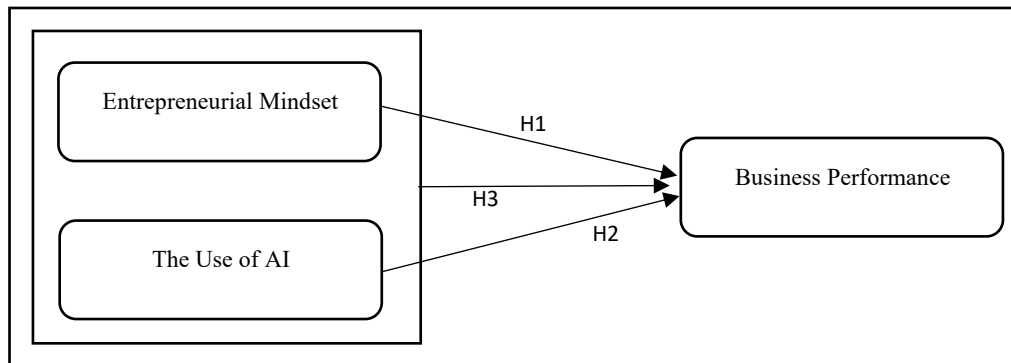


Figure 1. Research Framework
(Source: Researchers, 2026)

The visual research framework operationalizes the theoretical models into a testable path diagram. The model posits two independent variables which is Entrepreneurial Mindset (X1) and The Use of AI (X2) that projecting direct causal pathways to the dependent variable, Business Performance (Y). The arrows representing H1 and H2 isolate the direct predictive power of human cognition and technological adoption, respectively. The overarching integration of H3 signifies the multiple linear regression environment, visually demonstrating that true business performance in the digital economy is a composite outcome of both internal human resources (RBV) and dynamically integrated technological tools (Dynamic Capabilities).

3. RESEARCH METHOD

This study adopts a rigorous mixed-method research design to ensure both the global breadth and local depth of the findings. The research is bifurcated into two distinct phases: an exhaustive Systematic Literature Review (SLR) to map the global theoretical landscape, followed by a quantitative empirical study designed to test these theories within the specific socio-economic context of MSMEs in the Special Region of Yogyakarta, Indonesia.

The systematic literature review phase was executed in strict adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Chedrawi et al., 2026; Chen et al., 2025; Zournatzidou, 2025). This structured approach ensures methodological transparency, minimizes selection bias, and allows for study reproducibility. Comprehensive Boolean search strings were deployed across three premier academic databases: Scopus, IEEE Xplore, and Web of Science. The search strategy utilized targeted keyword clusters capturing dimensions of cognition ("Entrepreneurial Mindset", "Entrepreneurial Cognition", "Entrepreneurial Intention"), firm typology ("Entrepreneur*", "Startups", "SME*"), and technology ("Artificial Intelligence", "Machine Learning", "Generative AI", "AI Adoption").

The formulation of highly specific inclusion and exclusion criteria is a paramount methodological requirement within the PRISMA framework. These criteria are not arbitrary; they are meticulously designed to control for external variables that could systematically bias the synthesis and weaken the analytical conclusions.

Inclusion Criteria Justification

To be eligible for synthesis, studies were required to be peer-reviewed journal articles published in the English language between the years 2019 and 2024. The temporal boundary of 2019–2024 is highly deliberate. This specific five-year window encapsulates the exact period of hyper-acceleration in AI commercialization, specifically the mainstream release of generative AI models (e.g., GPT architectures) that fundamentally altered the accessibility of AI for small-scale entrepreneurs. Including studies prior to this period would skew the data toward theoretical computer science rather than applied entrepreneurial strategy. Furthermore, studies had to explicitly operationalize both AI adoption and an entrepreneurial construct (cognition, mindset, or performance) as measured variables.

Exclusion Criteria Justification

Studies were categorically excluded if they focused entirely on massive, multinational corporate entities. This exclusion is theoretically justified by the Resource-Based View; the adoption dynamics and financial capabilities of a multi-billion-dollar corporation are fundamentally incomparable to the "resource poverty" experienced by MSMEs, and conflating the two would yield invalid conclusions. Additionally, preprints, non-peer-reviewed white papers, opinion pieces, and secondary literature reviews were stringently excluded. As noted in systematic review methodology, the inclusion of non-peer-reviewed data introduces severe risks of unvalidated claims, while including other literature reviews creates a "double-counting" echo chamber that artificially inflates the significance of certain data points. By strictly enforcing these boundaries, the resulting synthesis guarantees the highest degree of internal validity and scholarly rigor.

In this research, we also presented empirical study ([Ahmed, 2024](#)) that conducted to 51 owners of Micro, Small, and Medium Enterprises (MSMEs) in Special Region of Yogyakarta (DIY). The empirical phase of the research utilized a cross-sectional quantitative survey design. The target population comprised active owners and senior managers of Micro, Small, and Medium Enterprises operating within the Special Region of Yogyakarta, Indonesia. Primary data was captured via a structured questionnaire. The instrument measured three core constructs: Entrepreneurial Mindset (assessing opportunity recognition, risk-taking propensity, resilience, and creative problem-solving), The Use of AI (assessing general AI adoption, marketing analytics, operational automation, and decision support), and Business Performance (assessing sales growth, operational efficiency, innovation, and competitive advantage). Responses were structured as binary (Yes/No) inputs to facilitate clean, dichotomous variable measurement, which were subsequently analyzed using multiple linear regression.

To extract the primary data, the study deliberately eschewed random probability sampling in favor of a highly targeted purposive sampling technique, resulting in a sample of 51 MSME owners. In quantitative research, random sampling is traditionally lauded for broad population generalizability. However, in specialized organizational studies, particularly those examining advanced technological integration in emerging markets, purposive sampling is methodologically superior for achieving true analytical rigour (Etikan, 2016; Junus et al., 2023; Shen et al., 2024).

The theoretical justification for this choice is multi-faceted. First, the MSME ecosystem in Yogyakarta is vast, with estimates suggesting tens of thousands of registered micro-entities. However, the vast majority of these entities operate entirely in the informal, traditional sector with zero digital footprint and no strategic managerial hierarchy. Employing a random sampling technique across this entire population would result in an overwhelmingly high non-response bias and yield massive amounts of "zero-value" data regarding AI adoption, fatally skewing the regression model.

Therefore, purposive sampling was strategically deployed to identify "information-rich cases". The selection criteria mandated that respondents must be the primary strategic decision-makers (owners/managers) who possess ultimate authority over technological adoption and business direction. Furthermore, the sample was restricted to enterprises that have survived beyond the initial nascent stage (establishing a track record of business performance) and have actively attempted some form of digital or AI integration. By meticulously selecting a highly representative subset of digitally aware entrepreneurs, purposive sampling dramatically enhances the credibility, transferability, dependability, and confirmability of the data. This ensures that the statistical outputs are derived from practitioners who genuinely experience the theoretical phenomena under investigation, thereby yielding deep, valid, and highly relevant insights that a randomized broad-net approach would completely obscure.

4. RESULT AND DISCUSSION

The execution of the PRISMA search protocol initially identified a massive corpus of 2,847 potentially relevant records across the selected databases, reflecting the intense global scholarly interest in the intersection of digital technology and business strategy. The initial database search yielded a substantial pool of 2,847 potentially relevant records, reflecting the intense and accelerating scholarly attention directed toward this interdisciplinary intersection. Following the systematic removal of 1,734 duplicate records and 289 automated ineligible hits, 923 unique records remained for abstract and title screening.

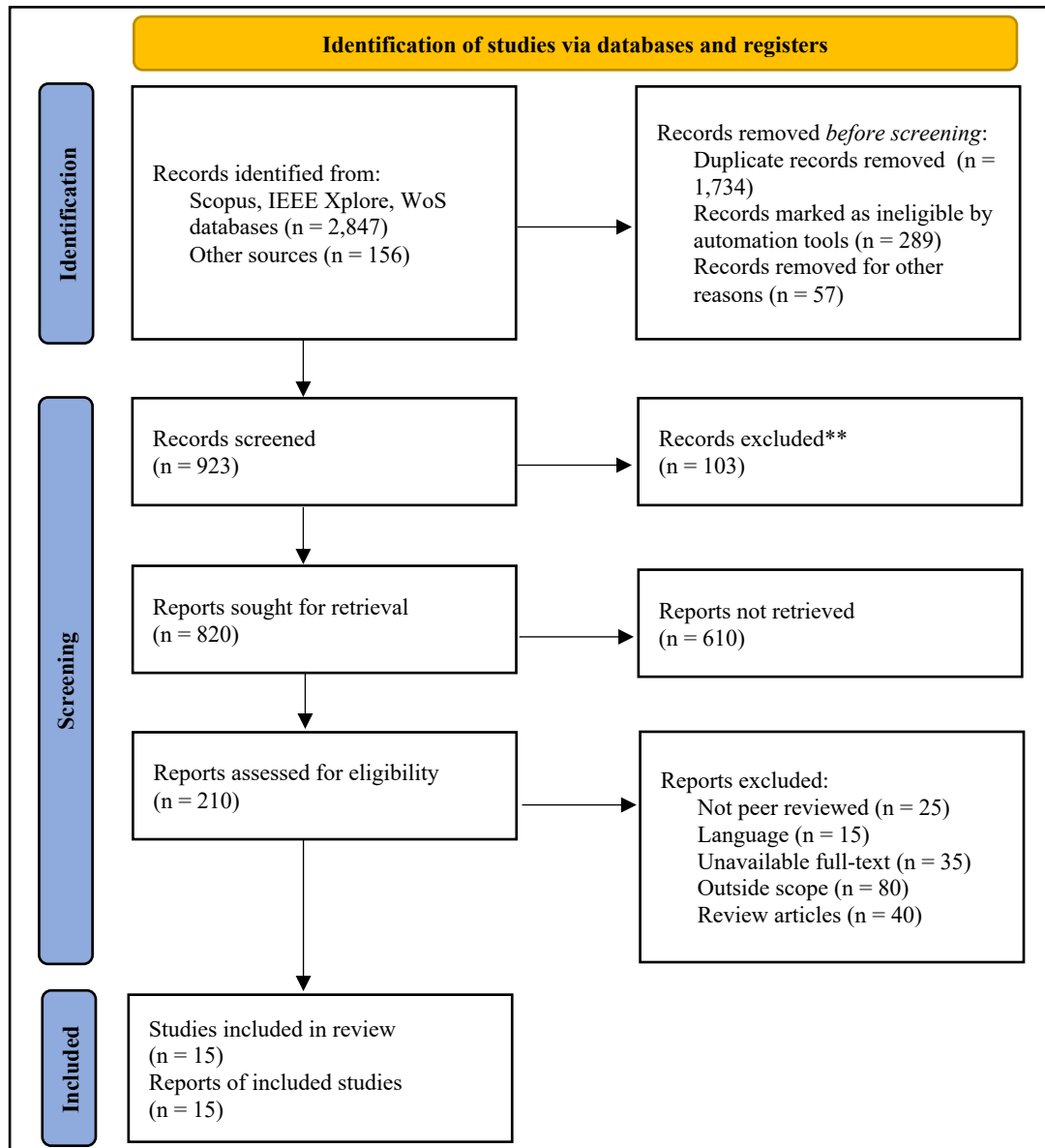


Figure 1. PRISMA Flowchart
 (Source: Researchers, 2026)

The included studies (n=15) demonstrated substantial heterogeneity across multiple dimensions, reflecting the diverse approaches scholars have adopted in investigating this topic. Studies employed quantitative approaches using structural equation modeling and regression analysis (n=7, 46.7%), qualitative methodology including interviews and case studies (n=2, 13.3%), mixed methods (n=4, 26.7%), and systematic literature reviews (n=2, 13.3%). Data collection timeframes ranged from 2020 to 2025, with approximately 60% of publications occurring in 2023–2025, indicating accelerating scholarly attention to this intersection.

Research design characteristics are visualized in Figure 2 displays publication year distribution, geographic clustering, methodological approaches, and frequency of key constructs studied. Thematic clusters identified across the 15 studies are presented in Figure 3 revealing six dominant research areas spanning AI-enabled entrepreneurial education,

entrepreneurial cognition and AI adoption, digital transformation and mindset development, AI-driven decision-making and performance, generative AI in business models, and emerging market contexts. The following table presents extracted data from the 15 included studies, organized by author(s), publication year, and key research findings/outcomes:

Table 1. Authors and Research Findings

Author(s), Year	Research Findings / Outcomes
Duong (2026a)	AI literacy significantly enhances entrepreneurial mindset and digital entrepreneurial intention, which in turn drive digital entrepreneurial hustle. Mediation analysis revealed that entrepreneurial mindset does not directly predict digital entrepreneurial intention, suggesting complexity in digital entrepreneurial behavior formation among university students
Ahmed et al. (2025)	Experiential learning combined with generative AI tools increased entrepreneurial mindset scores by 35.48% among postgraduate students (n=92). AI integration enabled 47.8% of variance explanation in entrepreneurial mindset development through enhanced ideation support and formative feedback mechanisms.
Duong (2026b)	AI self-efficacy, competency, and knowledge significantly shape perceived desirability and feasibility of international entrepreneurship, influencing attitudes and intentions. Polynomial regression analysis (n=336 students) revealed that global mindset positively moderates while tariff uncertainty negatively moderates the attitude-intention relationship.
Sánchez et al. (2026)	AI enhances entrepreneurial confidence by optimizing processes and reducing risks, though excessive dependence may limit creativity. Balanced human-AI integration recommended for education.
Rastogi & Pandita (2025)	AI-driven tools, digital platforms, and online collaborative environments significantly contribute to entrepreneurial mindset development in first-year university students. Digital literacy gaps and resistance to AI adoption identified as key barriers to effective technology integration.
Al-Mamary (2025)	There are significant effects of AI capabilities on decision-making, innovation, risk mitigation, and competitive advantage in venture success. Automation and customer experience effects non-significant, indicating context-dependent AI implementation outcomes.
Sarumi (2024)	AI's transformative impact on entrepreneurship through enhanced decision-making, scalability, and innovation. Digital platforms (ChatGPT, Sephora Virtual Artist) exemplified practical AI applications in entrepreneurial contexts.
Odugbesan et al. (2025)	Technological exposure and AI knowledge significantly enhance strategic thinking and cognitive adaptability. Strategic thinking mediates the relationship between technology engagement and adaptive capabilities.
Duong (2025a)	AI innovation enhances both inbound and outbound open innovation. Congruence between inbound and outbound open innovation strengthens entrepreneurial performance, while incongruence weakens it.
Mostafiz et al. (2025b)	Entrepreneurial cognition significantly predicts AI adoption intentions in ICT sector firms. Relationship strengthened when coupled with ecosystem resource mobilization; bricolage principle crucial in overcoming resource constraints in emerging economies.
Setyawati et al. (2026)	Combination of entrepreneurship education and digital mindset strengthens online business readiness. AI technology utilization for marketing, data analytics, and automated store management emerged as critical competencies gap.
Habacha & Menyaoui (2025)	AI use in learning activities significantly enhances students' creativity and entrepreneurial mindset, fostering intrapreneurial culture. Institutional support positively moderates these relationships, maximizing AI's potential in innovation-supportive environments.
Noegroho et al. (2024)	There are weak relationships between entrepreneurial mindset, AI use, creativity, and startup success, suggesting additional factors beyond these variables influence business success.
López-Solís et al. (2025)	AI improves accuracy and efficiency when combined with human judgment. Integration of GAI with human expertise critical in high-uncertainty contexts; balance between artificial intelligence and human capital essential.
Duong (2025b)	Global mindset combined with high AI valuation strengthened entrepreneurial intentions in technology evaluation. Feasibility particularly affected by imbalances between human capability and technology valuation; mediation through opportunity perception confirmed.

Using the modified MMAT criteria, the 15 included studies demonstrated generally strong methodological quality. Quantitative studies (n=7) exhibited appropriate analytical techniques (mostly SEM/PLS), clearly stated hypotheses, and adequate sample sizes (ranging from n=92 to n=1,061). Qualitative/mixed-methods studies (n=6) provided rich contextual data and employed recognized analysis techniques (thematic analysis, content analysis). Systematic reviews (n=2) followed established protocols, though with some variation in rigor of search strategies. No studies were excluded based on quality, though quality variation was noted and considered in synthesis.

The mechanisms through which AI enhances mindset appear to operate through multiple pathways: direct cognitive enhancement (improved ideation, accelerated problem-solving), motivational effects (enhanced self-efficacy through tool-enabled task completion), and experiential learning (immersive engagement with realistic business scenarios) (Leslie, 2025). However, another research found that excessive dependence on AI may paradoxically limit creativity and entrepreneurial vision (Cui et al., 2026).

Research on international entrepreneurship intentions revealed that AI self-efficacy and competency shape perceived desirability and feasibility of ventures, which sequentially influence attitudes and entrepreneurial intentions (Duong, 2026a). Mostafiz and colleagues' research in Bangladesh's ICT sector showed that entrepreneurial cognition predicts AI adoption, but this relationship is substantially strengthened when coupled with ecosystem resource mobilization and entrepreneurial bricolage, a finding particularly salient in emerging economies where formal institutional support is limited (Mostafiz et al., 2025b). While most studies document positive AI-mindset relationships, important heterogeneity and boundary conditions emerged, there are significant effects of AI on decision-making, innovation, and risk mitigation but non-significant effects on automation and customer experience, suggesting domain-specific and context-dependent implementation outcomes (Al-Mamary, 2025). Noegroho and colleagues' regression analysis (n=150 student entrepreneurs) reported surprisingly weak relationships between entrepreneurial mindset, AI use, creativity, and startup success, implying that factors beyond mindset and AI literacy influence venture viability (Noegroho et al., 2024).

These studies, as show in thematic clusters figure, examine pedagogical integration of AI, including generative AI tools (ChatGPT, DeepSeek), AI-driven simulations, and virtual mentorship platforms, in developing entrepreneurial competencies. Consistent findings emphasize that technology-enhanced, experiential learning approaches significantly improve entrepreneurship education outcomes. Kolb's Experiential Learning Theory can combine with AI scaffolding, achieved superior mindset development compared to traditional pedagogy (Villarroel et al., 2025). This cluster's work suggests that AI's pedagogical value extends beyond content delivery to include iterative feedback, personalized learning pathways, and enhanced engagement.

Systematic examination of the 15 included studies reveals several significant gaps warranting future investigation:

1. Limited Longitudinal Research; nearly all included studies employ cross-sectional designs (n=12, 80%), limiting causal inference. Longitudinal research tracking entrepreneurs over time would clarify whether AI exposure causes mindset

development or whether entrepreneurs with existing growth mindsets are more likely to adopt AI.

2. Insufficient Diversity in Geographic Contexts; while emerging markets are well-represented (n=8 studies, 53.3%), research in Africa (aside from Nigeria), Latin America, and Middle Eastern contexts remains sparse. The mechanisms through which AI influences entrepreneurship may vary substantially across regions with different institutional, educational, and technological infrastructures.
3. Underexplored Negative and Contingent Effects; only Sánchez Gonzales and colleagues explicitly investigated potential downsides of AI integration (limiting creativity through over-dependence) (Sánchez et al., 2026). More research examining boundary conditions, potential harms, ethical implications, and situations where AI may hinder entrepreneurial mindset development would advance nuanced understanding.
4. Limited Investigation of Different AI Modalities; most studies address "AI" as a general construct without distinguishing between different AI types (narrow AI tools, generative AI, predictive analytics). Future research should examine whether different AI modalities influence entrepreneurial mindset through distinct mechanisms.
5. Insufficient Research on Implementation Fidelity and Scaling; while intervention studies document positive effects in controlled settings, research on scaling AI-enhanced entrepreneurship education across institutions and geographic regions remains limited. Understanding barriers to implementation scaling would enhance practical value.
6. Underexplored Individual Differences; most studies treat entrepreneurial populations as relatively homogeneous. Research examining how personality traits, cognitive styles, prior experience, and demographic characteristics moderate AI-mindset relationships would enhance personalization of educational and developmental interventions.

Results of the empirical study for 51 MSMEs' owner or manager present in tables below:

Table 2. Characteristics of MSME's owner/manager

Parameter	Characteristics	Number (Percentage)
Gender	Male	27 (52.94)
	Female	24 (47.06)
Marital Status	Single	34 (66.67)
	Married	17 (33.33)
Age	≤ 25 years	14 (27.45)
	26 – 35 years	27 (52.94)
	36 – 45 years	8 (15.69)
	> 45 years	2 (3.92)
Years of work experience	≤ 5 years	32 (62.75)
	6 – 10 years	13 (25.49)
	11 – 15 years	3 (5.88)
	≥ 16 years	3 (5.88)

Education	≤ High School	20 (39.22)
	Undergraduate	22 (43.14)
Firm Age	≥ Master	9 (17.64)
	≤ 1999	5 (9.80)
	2000 – 2005	9 (17.65)
	2006 – 2011	15 (29.41)
Nature of Business	≥ 2012	22 (43.14)
	Sales	30 (58.82)
	Service	21 (41.18)

The overall model is statistically significant, as indicated by the F-value of 2.765 with a p-value of 0.022. Since the p-value is less than the standard significance level of 0.05, we can conclude that the independent variables (Entrepreneurial Mindset and The Use of AI) jointly have a significant effect on Business Performance. Entrepreneurial Mindset variable shows a positive and highly significant impact on Business Performance ($\beta = 0.379$, $p = 0.000$). This suggests that for every one standard deviation increase in Entrepreneurial Mindset, Business Performance is predicted to increase by 0.379 units. The high level of significance reinforces that an entrepreneurial mindset is a critical driver for performance in the studied sample. The Use of AI variable also demonstrates a positive and significant influence on Business Performance ($\beta = 0.093$, $p = 0.016$). While the effect size is smaller than that of the Entrepreneurial Mindset, it remains statistically significant ($p < 0.05$), confirming that the adoption of AI contributes positively to the performance of the business.

Table 3. Simple Multiple Regression Effects of Entrepreneurial Mindset and The Use of AI to Business Performance

Variable	Business Performance	
	β	<i>p-value</i>
Entrepreneurial Mindset	0.379	0.000
The use of AI	0.093	0.016
R^2	0.126	
Adjusted R^2	0.080	
F-value	2.765	
	$p = 0.022$	

The estimated regression equation for the model is:

$$Y = \beta_0 + 0.379(X_1) + 0.093(X_2)$$

Where:

- Y : Business Performance
- X_1 : Entrepreneurial Mindset
- X_2 : The Use of AI
- β_0 : Constant

The R^2 value of 0.126 indicates that the variables Entrepreneurial Mindset and The Use of AI explain 12.6% of the total variance in Business Performance. The remaining 87.4% of the variance is likely explained by other factors not included in this current model. The Adjusted R^2 of 0.080 suggests that when adjusting for the number of predictors in the model,

the explanatory power is slightly lower, which is common in models with a limited number of independent variables. Ultimately, the 12.6% variance systematically explained by these two variables serves as a powerful empirical mandate: sustainable competitive advantage in the 21st-century MSME sector is forged precisely, and exclusively, at the intersection where profound human psychological resilience meets applied artificial intelligence (Yan & Ahmad, 2025).

Theoretical implications of the research is the accumulated evidence suggests modifications to existing theoretical frameworks. Social Cognitive Theory, widely applied in these studies, may require extension to incorporate AI as an agentic force influencing self-efficacy beliefs and outcome expectations. Entrepreneurial Cognition Theory might be enhanced by explicitly modeling how external tools (including AI) interact with mental models and heuristics to shape opportunity recognition and venture decisions. The Technology Acceptance Model, employed in several included studies, appears insufficiently nuanced to capture the complex relationships between technology characteristics, user cognitions, organizational contexts, and entrepreneurial outcomes.

5. CONCLUSION AND SUGGESTION

This systematic literature review synthesizes empirical evidence from 15 peer-reviewed studies examining the intersection of entrepreneurial mindset, artificial intelligence, and entrepreneurial outcomes. The accumulated evidence demonstrates that AI integration represents a potentially powerful catalyst for entrepreneurial mindset development, particularly when embedded in experiential learning, supported by institutional structures, and complemented by human judgment and creativity. However, this relationship is contingent upon multiple contextual factors including organizational support, ecosystem resources, individual cognitive characteristics, and implementation fidelity.

This research provides empirical evidence that both Entrepreneurial Mindset and the Use of AI are statistically significant predictors of Business Performance within the studied MSME sample. The analysis demonstrates that while both factors positively contribute to business outcomes, Entrepreneurial Mindset exerts a stronger influence, underscoring its role as a fundamental driver of performance. The adoption of Artificial Intelligence also serves as a positive contributor to performance, albeit with a smaller effect size. Collectively, the model confirms that digital transformation, when supported by an entrepreneurial approach, is beneficial for business sustainability. However, the R^2 value of 0.126 indicates that these two variables explain 12.6% of the variance in business performance, suggesting that other internal management practices or external environmental factors are also critical in determining success.

Recommendations for educators and educational institutions is integrating generative AI thoughtfully into entrepreneurship curricula. Combine AI tools with experiential learning approaches, problem-based learning, and authentic business challenges. For entrepreneurs and business leaders can cultivate strategic AI literacy. Develop understanding of AI capabilities and limitations to make informed decisions about technology adoption and implementation. Policymakers must support AI literacy development in entrepreneurship

ecosystems. Fund programs developing AI competencies among entrepreneurs, particularly in emerging markets facing resource constraints. Future research should prioritize examination of individual differences and personalization approaches enhancing AI-entrepreneurship training effectiveness.

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Appendix

Table 4. Questionnaire

Dimensions	Questions	Sources
Entrepreneurial Mindset		
Opportunity Recognition	Do you actively seek out new market opportunities to expand your business?	(Odugbesan et al., 2025)
Risk-Taking Propensity	Are you willing to take calculated risks to improve your business performance?	(Odugbesan et al., 2025)
Resilience	Do you view business challenges or failures as learning experiences for future growth?	(Noegroho et al., 2024)
Creative Problem-Solving	Do you constantly look for innovative ways to solve daily business problems?	(Sarumi, 2024)
The use of AI		
General AI Adoption	Do you currently utilize any artificial intelligence tools in your business operations?	(Mostafiz et al., 2025b)
Marketing & Analytics	Do you use AI or digital tools for marketing, data analytics, or customer insight?	(Mostafiz et al., 2025b)
Operational Automation	Have you implemented AI to automate routine tasks (e.g., inventory)?	(Mostafiz et al., 2025b)
Decision Support	Do you rely on AI-generated insights or data to assist in your strategic decision-making?	(Mostafiz et al., 2025b)
Business Performance		
Sales & Growth	Has your business experienced growth in sales revenue or profits over the past year?	(López-Solís et al., 2025)
Operational Efficiency	Have you observed an improvement in operational efficiency or reduced process costs recently?	(Noegroho et al., 2024)
Innovation	Have you successfully introduced new products, services, or improved your business offerings recently?	(Sarumi, 2024)
Competitive Advantage	Do you believe your business currently holds a strong competitive advantage in its target market?	(Odugbesan et al., 2025)