Artificial Intelligence Adoption in SMEs: Linking Adoption Conditions to Entrepreneurial Competitiveness

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Abstract: Artificial intelligence (AI) is increasingly transforming how small and medium-sized enterprises (SMEs) operate, innovate, and compete. However, AI adoption remains uneven because SMEs often face limitations in technological capability, managerial expertise, financial resources, and access to skilled employees. This theoretical paper develops an integrated framework explaining both the conditions shaping AI adoption and how adoption may contribute to entrepreneurial competitiveness. Drawing on the Technology–Organisation–Environment (TOE) framework and a resource-based perspective, the paper synthesises recent literature on AI adoption, SME digital transformation, organisational capability, and competitiveness. The framework proposes a two-stage process. First, perceived benefits, digital/AI capability, top management support, resource constraints, and competitive pressure shape the extent to which SMEs integrate AI into organisational activities. Second, AI adoption can contribute to entrepreneurial competitiveness through improved innovation, market responsiveness, decision making, operational efficiency, and opportunity identification. The paper argues that adoption alone does not automatically generate competitive advantage. Competitive value depends on SMEs' ability to combine AI with complementary organisational knowledge, capabilities, and managerial commitment. By linking adoption conditions with strategic outcomes, the framework moves beyond research focused primarily on adoption intention and provides a basis for future empirical examination of how SMEs translate AI investment into competitive value.

Keywords: Artificial intelligence adoption, SMEs, Entrepreneurial competitiveness, Digital/AI capability, Technology–organisation–environment framework

1. Introduction

Artificial intelligence (AI) is increasingly reshaping how firms compete, make decisions, engage customers, and develop products and services. For small and medium-sized enterprises (SMEs), AI offers potential benefits such as greater efficiency, improved decision making, stronger customer responsiveness, and enhanced innovation capability. However, SMEs often face tighter financial constraints, weaker technological infrastructure, fewer specialised employees, and limited managerial capacity.

Recent research shows that SME technology adoption is influenced by technological, organisational, and environmental conditions. The Technology–Organisation–Environment (TOE) framework has therefore been widely used to explain why SMEs adopt emerging technologies. Perceived benefits and technological capability influence whether firms recognise value and possess the competence to implement AI, while top management support, resource availability, and competitive pressure further shape adoption decisions (Omrani et al., 2024).

AI adoption remains challenging because SMEs frequently encounter shortages of digital skills, inadequate infrastructure, resource limitations, and uncertainty regarding returns on investment (Jaciow et al., 2026; Yesuf & Fields, 2025). Leadership engagement and clear perceptions of strategic value can encourage adoption, but competitive pressure may have limited influence where internal capabilities are weak (Jaciow et al., 2026).

Recent research also shows that AI can support SME innovation, efficiency, responsiveness, and opportunity recognition (Saleem et al., 2023; Yesuf & Fields, 2025). However, much of the literature focuses on adoption intention or isolated adoption drivers. Recent Gulf-region research, for example, examines determinants of AI adoption intention rather than how adoption subsequently contributes to competitive outcomes (Thomas et al., 2025). Emerging work further suggests that AI creates strategic value only when combined with complementary organisational and dynamic capabilities (Sánchez-Rodríguez et al., 2025).

This reveals a conceptual gap between explaining why SMEs adopt AI and explaining how adoption is translated into competitive value. This paper addresses that gap through a two-stage conceptual framework. First, TOE explains how perceived benefits, digital/AI capability, top management support, resource constraints, and competitive pressure shape adoption. Second, a resource-based perspective explains how AI adoption may contribute to entrepreneurial competitiveness when combined with complementary organisational capabilities. The paper therefore links adoption antecedents with strategic outcomes and shifts attention from technology uptake alone towards the organisational conditions required to convert AI adoption into competitive value.

2. Literature Review

2.1 AI Adoption in SMEs and the Continuing Relevance of TOE

Artificial intelligence is becoming an important component of SME digital transformation, supporting automation, customer engagement, forecasting, decision making, and innovation. Yet adoption remains uneven because SMEs often operate with fewer specialised employees, weaker technological infrastructure, and tighter financial constraints than larger firms (Omrani et al., 2024; Yesuf & Fields, 2025).

The Technology–Organisation–Environment (TOE) framework remains useful for explaining these differences. Although it predates contemporary AI, its underlying logic is still relevant because firms must perceive value, possess appropriate capabilities, commit resources, and respond to external pressures before adoption can occur. Recent SME research continues to identify technological capability, leadership engagement, resource availability, and competitive conditions as important influences on digital transformation and AI integration (Omrani et al., 2024; Jaciow et al., 2026; Rasdi & Baki, 2025).

TOE is therefore used here not to explain AI technology itself, but to organise the conditions under which SMEs are able and willing to integrate AI into organisational activities.

2.2 Technological Conditions: Perceived Benefits and Digital/AI Capability

Perceived benefits are important because SMEs are unlikely to commit scarce resources to AI unless managers expect meaningful business value. Potential benefits include improved productivity, faster decision making, stronger forecasting, better customer insight, and innovation (Omrani et al., 2024; Jaciow et al., 2026).

However, recognising benefits is insufficient if firms lack implementation capability. Digital/AI capability includes technological knowledge, employee skills, data infrastructure, and organisational routines required to use AI effectively. Zhang et al. (2024) emphasise the importance of digital capability in SME transformation, while Sánchez-Rodríguez et al. (2025) argue that AI creates greater strategic value when combined with broader organisational and dynamic capabilities. Adoption therefore depends on both perceived value and the capability to act on that value.

2.3 Organisational Conditions: Top Management Support and Resource Constraints

Top management support is especially important in SMEs because strategic decisions are often concentrated among owners and senior managers. Leadership can facilitate AI adoption through investment, experimentation, training, resource allocation, and strategic direction (Omrani et al., 2024; Jaciow et al., 2026; Zhang et al., 2024).

At the same time, SMEs frequently face constraints in finance, infrastructure, skilled labour, data quality, and implementation expertise. Yesuf and Fields (2025) identify these as recurring barriers, while Rasdi and Baki (2025) highlight both internal and external obstacles to effective AI integration.

Organisational readiness therefore reflects the interaction of managerial commitment and available resources. Strong leadership may encourage adoption but cannot fully compensate for insufficient capability or infrastructure.

2.4 Environmental Conditions: Competitive Pressure

Competitive pressure may encourage SMEs to adopt AI when rivals use intelligent technologies to reduce costs, improve customer service, accelerate innovation, or respond more rapidly to markets. TOE research generally treats such pressure as an important environmental influence on technology adoption (Omrani et al., 2024).

However, recent AI-specific evidence suggests that competitive pressure does not automatically produce adoption. Jaciow et al. (2026) show that its influence may be limited when SMEs lack the internal capability or managerial readiness to respond. Competitive pressure should therefore be viewed as a contextual stimulus whose effect depends partly on organisational readiness.

2.5 From AI Adoption to Entrepreneurial Competitiveness

Explaining adoption is only the first stage of the framework. The more strategic question is whether AI enables SMEs to create competitive value. AI can potentially improve operational efficiency, customer responsiveness, innovation, decision quality, forecasting, and opportunity identification (Saleem et al., 2023; Yesuf & Fields, 2025). Soomro et al. (2024) similarly show that digital technology adoption can contribute to SME value creation.

Yet adoption does not automatically generate competitive advantage. Firms may introduce AI tools without embedding them effectively in routines, decisions, or innovation processes. Sánchez-Rodríguez et al. (2025) emphasise that competitive benefits depend on firms' ability to combine AI with dynamic capabilities, while Nguyen et al. (2026) conceptualise AI capability as encompassing infrastructure, analytical skills, routines, and decision-making processes.

A resource-based perspective therefore complements TOE. TOE explains why adoption occurs, whereas the resource-based perspective helps explain why some SMEs create more value from adoption than others. AI becomes strategically valuable when combined with firm-specific knowledge, managerial capabilities, routines, and complementary resources.

Entrepreneurial competitiveness can consequently be understood as the SME's ability to use AI to innovate, respond to market change, improve decision quality and efficiency, and exploit emerging opportunities.

2.6 Literature Synthesis and Conceptual Gap

The literature indicates that AI adoption in SMEs is shaped by technological, organisational, and environmental conditions, while the competitive benefits of adoption depend on complementary organisational capabilities.

The conceptual gap therefore lies between explaining what leads SMEs to adopt AI and explaining how adoption is converted into entrepreneurial competitiveness. Integrating TOE with a resource-based perspective connects these two stages and provides the basis for the conceptual framework developed in the following section.

3. Conceptual Framework and Propositions

This paper proposes a two-stage conceptual framework explaining the conditions that shape AI adoption in SMEs and how adoption may contribute to entrepreneurial competitiveness. The framework integrates the Technology–Organisation–Environment (TOE) perspective with a resource-based perspective. TOE explains the technological, organisational, and environmental conditions surrounding adoption, while the resource-based perspective explains why the strategic value generated from AI may differ across firms.

The first stage concerns the conditions for AI adoption. Within the technological context, perceived benefits reflect the extent to which SME managers believe AI can improve efficiency, decision making, customer responsiveness, and innovation. Because SMEs operate under resource constraints, clear perceptions of business value are important in justifying AI investment (Omrani et al., 2024; Jaciow et al., 2026).

Proposition 1 (P1): Greater perceived benefits of AI are associated with stronger AI adoption in SMEs.

Digital/AI capability includes the infrastructure, data resources, employee skills, and organisational routines required to integrate AI into business activities. Recent research increasingly treats AI as an organisational capability rather than merely a technological tool (Sánchez-Rodríguez et al., 2025; Nguyen et al., 2026).

Proposition 2 (P2): Stronger digital and AI capabilities facilitate greater AI adoption in SMEs.

Within the organisational context, top management support can facilitate adoption through investment, experimentation, training, resource allocation, and strategic direction (Omrani et al., 2024; Zhang et al., 2024).

Proposition 3 (P3): Stronger top management support facilitates greater AI adoption in SMEs.

Resource constraints operate in the opposite direction. Limited finance, skilled labour, technological infrastructure, and data capabilities can restrict implementation even where AI benefits are recognised (Yesuf & Fields, 2025; Rasdi & Baki, 2025).

Proposition 4 (P4): Greater resource constraints inhibit AI adoption in SMEs.

Competitive pressure represents the environmental condition. Rivals' use of AI may encourage adoption, but external pressure alone may be insufficient where internal readiness is weak (Jaciow et al., 2026).

Proposition 5 (P5): Competitive pressure encourages AI adoption, but its influence depends on SMEs' capacity to respond to external market signals.

The second stage concerns the conversion of AI adoption into entrepreneurial competitiveness. AI may support innovation, market responsiveness, decision quality, operational efficiency, and opportunity identification (Saleem et al., 2023; Yesuf & Fields, 2025). However, these benefits depend on how effectively AI is embedded within organisational knowledge, routines, managerial processes, and complementary capabilities.

From a resource-based perspective, technology creates greater strategic value when combined with firm-specific resources and capabilities. Sánchez-Rodríguez et al. (2025) and Nguyen et al. (2026) similarly emphasise that complementary organisational and dynamic capabilities are necessary to translate AI adoption into innovation and competitive advantage.

Proposition 6 (P6): AI adoption contributes to entrepreneurial competitiveness when SMEs combine AI with complementary organisational capabilities that enable innovation, responsiveness, efficiency, decision quality, and opportunity exploitation.

The framework therefore treats AI adoption as a two-stage process: technological, organisational, and environmental conditions shape adoption, while competitive outcomes depend on firms' ability to integrate AI with complementary capabilities. The propositions are theoretical relationships intended for future empirical examination.

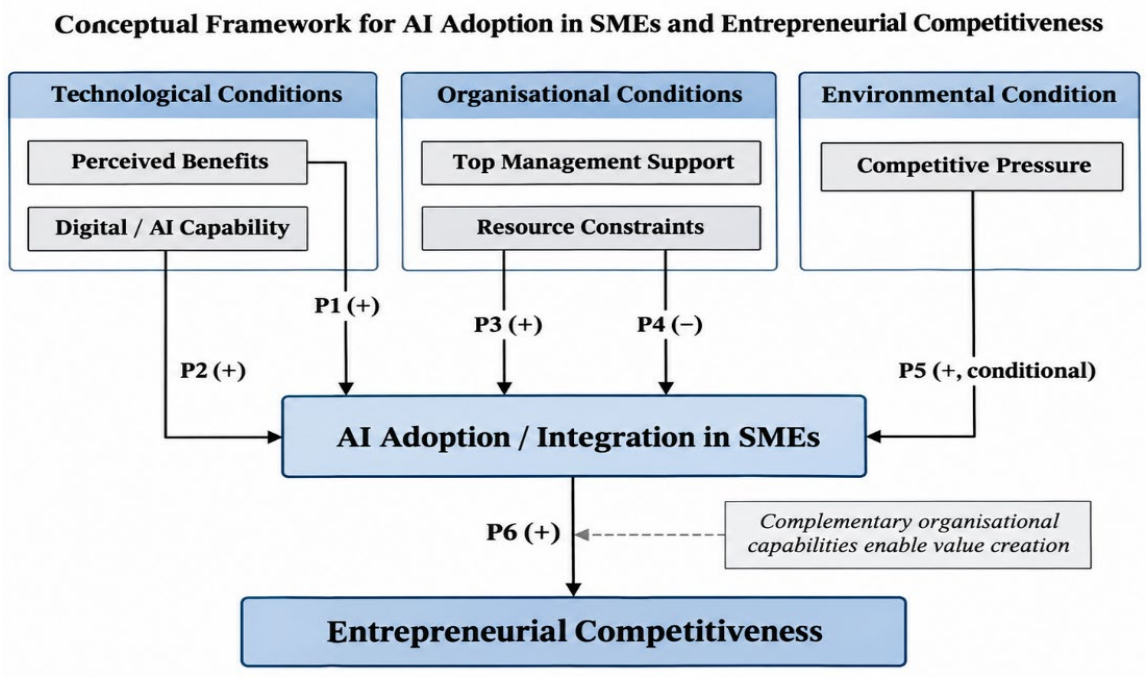


Figure 1: Proposed two-stage conceptual framework linking AI adoption conditions to entrepreneurial competitiveness in SMEs

4. Methodological Approach

This study adopts a focused theoretical and narrative literature-synthesis approach to explain both the conditions shaping AI adoption in SMEs and how adoption may contribute to entrepreneurial competitiveness. The aim is not to conduct an exhaustive systematic review or test empirical relationships, but to synthesise relevant theoretical and empirical evidence and identify recurring mechanisms linking adoption conditions with competitive value creation.

The review focused primarily on peer-reviewed studies published between 2023 and 2026, with earlier work included selectively where it provided relevant theoretical foundations or evidence on SME digital transformation. Scite was used to identify and verify literature using combinations of terms including "AI adoption," "SMEs," "digital transformation," "TOE framework," "digital capability," "top management support," "resource constraints," "competitive pressure," "AI capability," and "entrepreneurial competitiveness."

Sources were selected purposively according to two analytical stages. The first concerned the antecedents of AI adoption, including perceived benefits, digital/AI capability, top management support, resource constraints, and competitive pressure. The second concerned strategic outcomes, including innovation, responsiveness, decision quality, efficiency, opportunity identification, and competitiveness. Studies focused primarily on technical AI development or contexts unrelated to organisational adoption were excluded.

The literature was analysed through a theory-driven thematic process. Findings were first organised according to the technological, organisational, and environmental dimensions of TOE. The analysis then examined how AI

adoption was linked to competitive outcomes and how complementary organisational capabilities influenced this conversion process through a resource-based perspective.

The synthesis produced three outputs: identification of the main conditions associated with SME AI adoption, clarification of the distinction between adoption and competitive value creation, and development of the six conceptual propositions in Figure 1. These propositions represent theoretical relationships derived from the literature rather than empirically established findings.

5. Conceptual Synthesis and Theoretical Findings

The literature synthesis produces three main theoretical findings concerning AI adoption and competitiveness in SMEs. These are not empirical results from primary data, but recurring patterns identified across the reviewed literature that support the propositions in Figure 1.

5.1 AI Adoption Reflects Interacting Technological, Organisational and Environmental Conditions

The first finding is that AI adoption cannot be explained by a single factor. Perceived benefits influence whether managers consider AI worth investing in, while digital and AI capabilities determine whether firms possess the infrastructure, skills, data resources, and routines required for implementation (Omrani et al., 2024; Jaciow et al., 2026).

Organisational conditions are equally important. Top management support can facilitate investment, experimentation, and staff development, while resource constraints may restrict implementation even when AI benefits are recognised (Zhang et al., 2024; Yesuf & Fields, 2025). AI adoption should therefore be understood as an organisational capability-building process rather than simply a technology-acquisition decision.

The synthesis thus supports P1–P4 by showing that perceived benefits, digital/AI capability, managerial support, and resource availability jointly shape meaningful AI integration.

5.2 Internal Readiness Conditions the Influence of Competitive Pressure

The second finding concerns competitive pressure. External competition may encourage SMEs to recognise the strategic importance of AI, but its influence is not automatic. Jaciow et al. (2026) indicate that competitive pressure may have limited effect when firms lack sufficient capabilities, resources, or managerial engagement.

Environmental pressure is therefore better understood as a source of urgency than a sufficient cause of adoption. P5 reflects this conditional relationship: competitive pressure can encourage AI adoption, but its effect depends on technological and organisational readiness.

5.3 AI Adoption Does Not Automatically Produce Entrepreneurial Competitiveness

The third finding is that AI adoption should not be equated with competitive advantage. AI may improve innovation, decision making, efficiency, responsiveness, and opportunity recognition (Saleem et al., 2023; Yesuf & Fields, 2025), but these outcomes depend on how effectively firms integrate AI into organisational activities.

Sánchez-Rodríguez et al. (2025) emphasise the role of complementary dynamic and organisational capabilities in converting AI adoption into strategic innovation and competitiveness. Nguyen et al. (2026) similarly conceptualise AI capability as a combination of infrastructure, analytical skills, routines, and decision-making processes rather than mere possession of AI tools.

The synthesis therefore identifies the adoption–competitiveness relationship as a value-conversion process. AI becomes strategically valuable when combined with organisational knowledge, managerial capabilities, routines, and complementary resources.

This finding supports P6 and captures the framework's central contribution: the first stage explains whether and why SMEs adopt AI, while the second explains how adoption may be translated into entrepreneurial competitiveness.

6. Discussion and Implications

The conceptual synthesis distinguishes between two related questions: what enables SMEs to adopt AI, and what enables them to create competitive value from that adoption. This distinction matters because adoption conditions do not automatically guarantee stronger performance or competitiveness.

First, the synthesis reinforces the continued relevance of the TOE framework despite the rapid evolution of AI. TOE remains useful because SMEs still face technological, organisational, and environmental conditions that shape implementation. Perceived benefits and digital capability influence whether firms recognise and can exploit AI opportunities, while leadership support and resource availability determine whether adoption can progress beyond experimentation (Omrani et al., 2024; Jaciow et al., 2026). Its relevance therefore lies in explaining the organisational conditions surrounding AI adoption rather than the technology itself.

Second, internal readiness may be more important than competitive pressure alone. External pressure can create urgency, but firms with weak infrastructure, limited skills, or inadequate resources may still be unable to respond (Jaciow et al., 2026). Managers should therefore assess their capabilities before adopting AI simply because competitors are doing so.

Third, adoption should not be treated as the endpoint of digital transformation. AI creates competitive value when embedded in organisational routines and combined with complementary knowledge, managerial capabilities, and strategic processes (Sánchez-Rodríguez et al., 2025; Nguyen et al., 2026).

For SME managers, investment should therefore extend beyond acquiring AI tools to developing employee skills, data capabilities, managerial understanding, and organisational routines. Incremental adoption may be especially appropriate for resource-constrained firms, allowing them to test applications and build capabilities gradually.

For policymakers and SME-support institutions, support should move beyond AI awareness towards training, digital infrastructure, access to expertise, financing, and capability development. Because SMEs differ in technological maturity, support mechanisms should also be differentiated.

Theoretically, the framework links two research streams that are often treated separately: TOE explains the conditions surrounding adoption, while the resource-based perspective explains the conversion of adoption into competitive value. This shifts attention from whether SMEs adopt AI towards how they develop the capabilities required to benefit from it.

7. Conclusions

Artificial intelligence offers SMEs substantial opportunities to improve efficiency, decision making, innovation, market responsiveness, and opportunity identification. However, adoption remains uneven because firms differ in technological capability, managerial commitment, resource availability, and ability to respond to competitive pressures.

This paper develops a two-stage conceptual framework linking the conditions for AI adoption with the conversion of adoption into entrepreneurial competitiveness. TOE explains how perceived benefits, digital/AI capability, top management support, resource constraints, and competitive pressure shape adoption, while a resource-based perspective explains why adoption alone is insufficient to generate competitive value. SMEs must combine AI with complementary organisational knowledge, skills, routines, and managerial capabilities.

The paper therefore shifts attention from whether SMEs adopt AI towards how they create value from adoption. It also suggests that competitive pressure is unlikely to produce meaningful adoption without sufficient internal readiness.

As a theoretical synthesis, the propositions require future empirical examination across industries, firm sizes, and national contexts. Overall, sustainable AI-enabled competitiveness depends not simply on acquiring technology, but on developing the organisational capacity to integrate and exploit it strategically.

Acknowledgement

This study is supported and funded by Arab Open University (AOU) – Kuwait Branch.

Ethics Declaration: Ethical approval was not required because the study is based exclusively on published literature and involved no human participants or primary data collection.

AI Declaration: Generative artificial intelligence tools, including ChatGPT, were used to support aspects of the research and manuscript preparation process, including literature exploration, organisation of the manuscript, language editing, and stylistic refinement. Scite was used to support literature searching and verification of academic sources. All AI-assisted outputs were critically reviewed, verified, and revised by the authors, who take full responsibility for the accuracy, interpretation, originality, and final content of the manuscript.

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