



TOE Factors, AI Marketing Adoption, Knowledge Sharing and Business Performance Among Malaysian SMEs: A Conceptual Review

*Nur Liyana Johari¹, Sharifah Zannierah Syed Marzuki², Norulhuda Tajuddin³, Nor Hidayatun Abdul Razak⁴

¹ Faculty of Business and Management, Universiti Teknologi MARA, Shah Alam Campus, Selangor, Malaysia (2024500949@student.uitm.edu.my)

² Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, Selangor, Malaysia (szannierah@uitm.edu.my)

³ Faculty of Business and Management, Universiti Teknologi MARA, Raub Campus, Pahang, Malaysia (alhudatajuddin583@uitm.edu.my)

⁴ Faculty of Business and Management, Universiti Teknologi MARA, Raub Campus, Pahang, Malaysia (norhidayatun@uitm.edu.my)

*Corresponding Author

Abstract:

This study adopts a conceptual review approach to examine the relationships between Technology–Organization–Environment (TOE) factors, AI marketing adoption, knowledge sharing, and business performance among Malaysian SMEs. Drawing on existing literature, the study identifies key research gaps and develops an integrated conceptual framework that combines the TOE framework with knowledge-sharing theory. While prior studies have primarily focused on the determinants of technology adoption, limited attention has been given to understanding how AI marketing adoption contributes to business performance and the organisational mechanisms through which value is created. By positioning knowledge sharing alongside AI marketing adoption, this study extends existing literature and provides a more comprehensive explanation of how Malaysian SMEs may transform technological adoption into meaningful business outcomes. The proposed framework offers a foundation for future empirical research and provides insights for SME managers and policymakers seeking to accelerate digital transformation initiatives.

ARTICLE INFORMATION

Received: 23 Apr 2026
Revised: 26 Jun 2026
Accepted: 05 Aug 2026
Published: 15 Aug 2026

Keywords: Artificial Intelligence, AI Marketing, TOE Framework, Knowledge Sharing, Business Performance, Malaysian SMEs

INTRODUCTION

Artificial intelligence (AI) has evolved significantly from its origins, moving from theoretical foundations to practical applications in contemporary society. McCarthy (2004), in his work “What Is Artificial Intelligence?”, described AI as the science and engineering of creating intelligent machines, further specifying that it involves computer-based tasks aimed at replicating human intelligence without being limited by biological constraints. Although he introduced the concept of AI in 1955, the first “boom” period was in the 1980s, driven by significant United States government funding and industry interest. This surge in activity, however, remained largely within research and industry circles, rather than reaching widespread public awareness. The landscape shifted dramatically in recent years as AI tools became increasingly accessible to businesses and consumers.

The adoption of AI in business functions, particularly marketing, has gained momentum as organizations recognize its potential. SMEs are particularly relevant to the present research because, while they play a critical role in driving growth, they also face persistent challenges such as resource constraints, smaller marketing teams, and lower levels of digital maturity compared to larger firms (Nurlan et al., 2024; Enshassi et al., 2025).

According to SME Corp. Malaysia (2023), SMEs represent 96.9 percent of all business establishments in Malaysia, with approximately 1.1 million enterprises nationwide.

Within the marketing domain, AI technologies are increasingly being used to automate customer interactions, generate content, optimise advertising campaigns, and improve targeting accuracy (Davenport & Guha, 2020; Huang & Rust, 2021). These capabilities are particularly valuable for SMEs because they may help overcome limitations in manpower and marketing resources. However, the extent to which SMEs are able to successfully adopt and utilise AI marketing technologies remains unclear, particularly in emerging economies such as Malaysia.

Despite the growing body of literature on artificial intelligence (AI) adoption, existing studies have predominantly focused on large organisations and technologically mature firms, where resources, expertise, and digital infrastructure are generally more established (Wang et al., 2010; Duan et al., 2019). While these studies have contributed significantly to understanding technology adoption, their findings may not be directly transferable to Small and Medium-sized Enterprises (SMEs), which operate under substantially different organisational conditions. Compared with large firms, SMEs often face financial constraints, limited technological capabilities, smaller workforces, and lower levels of digital maturity, all of which may influence their ability to adopt and effectively utilise AI technologies (Nurlan et al., 2024; Enshassi et al., 2025).

The emergence of AI-powered marketing tools presents both opportunities and challenges for SMEs. On one hand, AI technologies enable firms to automate marketing activities, enhance customer engagement, improve decision-making, and deliver personalised customer experiences at scale (Davenport & Guha, 2020; Huang & Rust, 2021). On the other hand, the successful implementation of AI marketing requires adequate technological readiness, managerial commitment, and organisational capabilities that many SMEs may struggle to develop. Consequently, understanding the factors that facilitate or hinder AI marketing adoption among SMEs remains an important area of inquiry.

Furthermore, although the Technology–Organization–Environment (TOE) framework has been widely applied to explain technology adoption decisions, much of the existing research treats technology adoption as an end outcome rather than examining how adoption contributes to organisational performance (Baker, 2012; Gangwar et al., 2015). As a result, limited attention has been given to understanding the mechanisms through which AI marketing adoption generates business value, particularly within SME settings. This limitation is especially relevant because technology adoption alone does not necessarily guarantee improved organisational performance.

Knowledge sharing may serve as an important organisational mechanism that enables firms to maximise the value derived from AI adoption. Prior studies have highlighted the role of knowledge sharing in facilitating organisational learning, innovation, and performance improvement (Nonaka & Takeuchi, 1995; Wang & Wang, 2012). However, research examining the interplay between TOE factors, AI marketing adoption, knowledge sharing, and business performance remains limited, particularly in the Malaysian SME context.

To address these gaps, this study proposes a conceptual framework that integrates the Technology–Organization–Environment (TOE) framework with knowledge-sharing theory to examine AI marketing adoption and its influence on business performance among Malaysian SMEs. Unlike prior studies that primarily focus on adoption determinants, the proposed framework extends existing literature by examining both the contextual factors driving AI marketing adoption and the organisational mechanisms through which adoption

may contribute to business performance. In doing so, the study provides a more comprehensive understanding of how Malaysian SMEs can transform technological adoption into meaningful business outcomes.

LITERATURE REVIEW

AI Marketing Adoption in SMEs

The rapid advancement of artificial intelligence (AI) has profoundly reshaped how organisations operate and compete, with marketing emerging as one of the most significantly transformed business functions (Davenport & Guha, 2020). AI marketing leverages machine learning, automation, and data analytics to enhance personalisation, improve decision-making, and increase marketing efficiency (Huang & Rust, 2021). Through capabilities such as predictive analytics, customer segmentation, content generation, and campaign optimisation, AI enables organisations to better understand customer behaviour and respond more effectively to market demands.

For Small and Medium-sized Enterprises (SMEs), AI marketing presents both opportunities and challenges. On one hand, AI technologies can help SMEs overcome resource limitations by automating routine marketing activities, improving customer engagement, and supporting data-driven decision-making (Nor et al., 2024). On the other hand, successful implementation often requires adequate technological infrastructure, financial resources, managerial support, and employee competencies that many SMEs may lack (Lai et al., 2025). These challenges are particularly relevant in developing economies, where variations in digital readiness may influence the extent to which firms are able to adopt and benefit from AI-enabled marketing technologies.

Technology–Organization–Environment (TOE) Framework

The Technology–Organization–Environment (TOE) framework developed by Tornatzky and Fleischer (1990) is one of the most widely adopted theoretical models for examining organisational technology adoption. The framework proposes that technology adoption decisions are influenced by three contextual dimensions: technological factors, organisational factors, and environmental factors (Baker, 2012).

The technological context refers to the characteristics of technologies available to an organisation, including their perceived benefits, compatibility, and complexity. The organisational context encompasses internal characteristics such as organisational readiness, management support, financial resources, and organisational structure. The environmental context includes external influences such as competitive pressure, industry characteristics, customer expectations, and government support (Tornatzky & Fleischer, 1990; Baker, 2012).

The broad applicability of the TOE framework has contributed to its widespread use across various technology adoption contexts, including e-commerce, cloud computing, big data analytics, and artificial intelligence (Wang et al., 2010; Gangwar et al., 2015). The framework is particularly suitable for SME research because it acknowledges that technology adoption is influenced not only by the technology itself but also by organisational capabilities and environmental conditions. Given that SMEs often operate under resource constraints and varying levels of digital maturity, TOE provides a comprehensive lens for understanding AI marketing adoption within this context.

Despite its widespread application, findings regarding the relative importance of technological, organisational, and environmental factors remain inconsistent across industries, technologies, and

organisational contexts. Factors found to be significant in one setting may have limited influence in another, suggesting that technology adoption decisions are often context dependent. This inconsistency highlights the need for further investigation of AI marketing adoption within SME environments, particularly in emerging economies such as Malaysia.

While the TOE framework offers a comprehensive perspective for understanding technology adoption decisions, it primarily focuses on explaining the determinants of adoption rather than the mechanisms through which adoption contributes to organisational outcomes. Although the framework explains why firms adopt technologies, it offers limited insight into how organisations convert technological adoption into improved business performance. This limitation suggests the need to incorporate complementary theoretical perspectives that explain how organisations create value from adopted technologies.

Knowledge Sharing Theory

Knowledge sharing refers to the process through which individuals exchange information, experiences, expertise, and insights to facilitate learning and problem-solving within an organisation (Nonaka & Takeuchi, 1995). It is widely recognised as a critical organisational capability that supports innovation, decision-making, and organisational performance.

As organisations increasingly adopt data-driven technologies, knowledge sharing becomes even more important. The successful utilisation of technological innovations often depends on an organisation's ability to disseminate knowledge, transfer expertise, and encourage collaboration among employees. Effective knowledge-sharing practices enable organisations to maximise the value derived from technological investments by ensuring that knowledge generated through technology is understood, shared, and applied across the organisation (Wang & Wang, 2012).

In the context of AI marketing, knowledge sharing is particularly relevant because AI technologies generate large volumes of insights that require interpretation and application. SMEs that encourage knowledge exchange among employees may be better positioned to utilise AI-generated information for strategic decision-making, customer engagement, and marketing optimisation. Consequently, knowledge sharing may represent an important organisational capability that complements AI marketing adoption and contributes to improved business performance.

Integrating TOE and Knowledge Sharing

While the TOE framework explains the contextual conditions that facilitate or hinder technology adoption, knowledge-sharing theory explains how organisations utilise and disseminate knowledge to create value from technological investments. These perspectives are complementary rather than competing. TOE identifies the technological, organisational, and environmental factors that influence the adoption of AI marketing technologies, whereas knowledge-sharing theory provides insight into the organisational mechanisms through which firms transform AI-enabled capabilities into improved performance outcomes.

The integration of TOE and knowledge-sharing theory is particularly relevant in the SME context. Due to resource limitations, SMEs must maximise the value obtained from every technological investment. Simply adopting AI marketing tools does not guarantee improved performance if employees are unable or unwilling to share, interpret, and apply the knowledge generated by those technologies. Therefore,

knowledge sharing may function as an important organisational process that enhances the effectiveness of AI marketing adoption.

Chatterjee, Rana, and Dwivedi (2023) argued that integrating TOE with knowledge-based perspectives provides stronger explanatory power in understanding AI adoption and its subsequent organisational impact. Building on this perspective, the present study integrates TOE and knowledge-sharing theory to provide a more comprehensive explanation of how Malaysian SMEs may transform AI marketing adoption into meaningful business outcomes.

Hypothesis Development

TOE Factors and AI Marketing Adoption

The TOE framework suggests that technological, organisational, and environmental conditions influence an organisation's likelihood of adopting technological innovations (Tornatzky & Fleischer, 1990; Baker, 2012). Firms with favourable technological readiness, strong managerial support, sufficient organisational resources, and supportive external environments are more likely to implement AI-based marketing technologies (Wang et al., 2010; Ramayah et al., 2013).

H1a: Technological factors have a significant influence on AI marketing adoption among Malaysian SMEs.

H1b: Organisational factors have a significant influence on AI marketing adoption among Malaysian SMEs.

H1c: Environmental factors have a significant influence on AI marketing adoption among Malaysian SMEs.

TOE Factors and Knowledge Sharing

The TOE framework also provides insight into how contextual conditions shape internal organisational processes such as knowledge sharing. Organisations with adequate technological infrastructure, strong leadership commitment, and supportive external environments are more likely to encourage collaboration and knowledge exchange among employees (Nonaka & Takeuchi, 1995; Wang & Wang, 2012).

H2a: Technological factors have a significant influence on knowledge sharing among Malaysian SMEs.

H2b: Organisational factors have a significant influence on knowledge sharing among Malaysian SMEs.

H2c: Environmental factors have a significant influence on knowledge sharing among Malaysian SMEs.

TOE Factors and Business Performance

Business performance represents the overall effectiveness of an organisation in achieving its objectives and is commonly used as an outcome variable in organisational and information systems research (Richard et al., 2009; Venkatraman & Ramanujam, 1986). Business performance extends

beyond financial outcomes to include dimensions such as customer satisfaction, operational efficiency, competitive advantage, and long-term sustainability (Kaplan & Norton, 1996; Neely et al., 2002).

TOE conditions may directly influence business performance by enhancing innovation capability, organisational efficiency, and market responsiveness (Gangwar et al., 2015). Organisations with strong technological capabilities, effective managerial support, and favourable environmental conditions are better positioned to achieve superior organisational outcomes (Chiew & Cheah, 2023).

H3a: Technological factors have a significant influence on business performance among Malaysian SMEs.

H3b: Organisational factors have a significant influence on business performance among Malaysian SMEs.

H3c: Environmental factors have a significant influence on business performance among Malaysian SMEs.

AI Marketing Adoption and Business Performance

The ultimate strategic rationale for adopting advanced technologies such as AI marketing is the enhancement of business performance (Davenport et al., 2020). For SMEs, this relationship is particularly important because limited resources require clear and measurable returns on investment. AI marketing can contribute to improved performance by enabling customer personalisation, increasing operational efficiency, supporting data-driven decision-making, and strengthening competitive positioning (Dwivedi et al., 2021; Huang & Rust, 2021).

Despite growing interest in AI adoption, existing studies have largely focused on adoption determinants rather than examining how adoption contributes to organisational value creation. Furthermore, much of the existing literature has concentrated on large organisations and developed economies, limiting its applicability to Malaysian SMEs. Although knowledge sharing has been extensively discussed in organisational learning literature, its role within AI marketing adoption frameworks remains underexplored. These gaps highlight the need for an integrated framework that explains not only why SMEs adopt AI marketing technologies but also how such adoption may contribute to improved business performance.

AI Marketing Adoption and Knowledge Sharing as Drivers of Business Performance

AI marketing adoption enables firms to enhance customer engagement, improve decision-making, and optimise marketing effectiveness through data-driven insights and automation (Huang & Rust, 2021; Dwivedi et al., 2021). Consequently, organisations that successfully adopt AI marketing technologies are more likely to achieve superior business performance.

H4: AI marketing adoption has a significant influence on business performance among Malaysian SMEs.

In addition to technological adoption, organisational capabilities such as knowledge sharing play an important role in ensuring that AI-generated insights are effectively disseminated and utilised throughout the organisation.

Knowledge sharing facilitates the dissemination and application of organisational knowledge, enabling firms to improve innovation, coordination, and decision-making (Wang & Wang, 2012). Effective knowledge-sharing practices therefore contribute positively to organisational performance.

H5: Knowledge sharing has a significant influence on business performance among Malaysian SMEs.

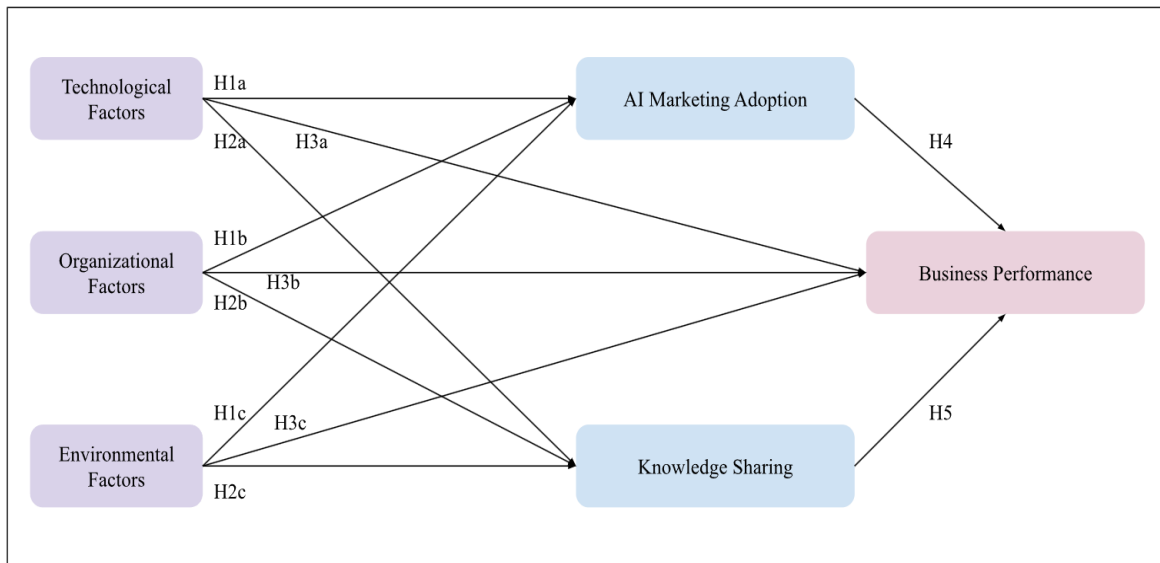


Figure 1. Proposed Conceptual Framework

RESEARCH METHODOLOGY

This study adopts a conceptual review approach to develop a theoretical framework explaining the relationships between Technology–Organization–Environment (TOE) factors, AI marketing adoption, knowledge sharing, and business performance among Malaysian SMEs. Unlike empirical studies that rely on primary data collection, conceptual papers aim to synthesise existing knowledge, identify research gaps, and propose theoretical relationships that can guide future empirical investigation.

The development of the proposed framework was informed by an extensive review of literature conducted as part of the authors’ doctoral research. Approximately 80 relevant publications were reviewed and synthesised. Relevant studies were identified through targeted searches of academic databases, including Scopus, Web of Science, Google Scholar, and other scholarly sources. The literature search focused on key themes related to artificial intelligence, AI marketing, technology adoption, the Technology–Organization–Environment (TOE) framework, knowledge sharing, business performance, and SMEs.

To ensure relevance to the study objectives, priority was given to peer-reviewed journal articles, academic books, and authoritative reports that examined technology adoption, AI implementation, organisational learning, and SME performance. Studies focusing on large organisations, technology adoption theories, and AI applications were also reviewed to establish theoretical foundations and identify gaps relevant to the SME

context. Particular attention was given to studies published within the last decade, while seminal works were included where necessary to provide theoretical grounding.

The selected literature was reviewed and synthesised through thematic analysis. The findings from prior studies were categorised into four major themes: AI marketing adoption, TOE factors, knowledge sharing, and business performance. Similarities, inconsistencies, and gaps within the existing literature were critically examined to identify areas requiring further investigation. This synthesis informed the development of the proposed conceptual framework and the formulation of hypotheses describing the relationships among the study constructs.

By integrating insights from technology adoption literature and knowledge-sharing theory, this conceptual review contributes to a more comprehensive understanding of how Malaysian SMEs may leverage AI marketing initiatives to improve organisational performance. The framework developed in this study provides a foundation for future empirical research aimed at validating the proposed relationships.

CONCLUSION

Artificial intelligence is increasingly transforming the marketing landscape by enabling organisations to enhance customer engagement, improve decision-making, and optimise marketing performance. Despite these potential benefits, AI marketing adoption among Malaysian SMEs remains relatively limited due to challenges associated with technological readiness, organisational capabilities, resource constraints, and environmental conditions (Lai et al., 2025; Enshassi et al., 2025). These challenges highlight the need for a more comprehensive understanding of the factors influencing AI marketing adoption and the mechanisms through which adoption contributes to organisational success.

This study contributes to the growing body of literature on AI adoption by proposing an integrated conceptual framework that combines the Technology–Organization–Environment (TOE) framework with knowledge-sharing theory. While previous studies have primarily focused on identifying the determinants of technology adoption, the proposed framework extends existing literature by examining both the contextual factors that influence AI marketing adoption and the organisational processes that may enable firms to derive business value from adopted technologies. In particular, the inclusion of knowledge sharing provides a theoretical explanation for how SMEs may transform AI-generated insights into improved organisational outcomes.

The study offers several practical implications for SME owners, managers, and policymakers. Understanding the technological, organisational, and environmental conditions that support AI marketing adoption may assist decision-makers in developing more effective digital transformation strategies. Furthermore, fostering a knowledge-sharing culture may enhance the ability of SMEs to utilise AI technologies more effectively and maximise the return on technological investments.

As a conceptual paper, the proposed framework provides a foundation for future empirical research. Subsequent studies may validate the proposed relationships and examine the extent to which AI marketing adoption and knowledge sharing contribute to business performance across different SME sectors and contexts. By advancing understanding of AI marketing adoption in Malaysian SMEs, this study contributes to ongoing efforts to support digital transformation and long-term business sustainability.

Author Contributions: First author: Writing the original draft. Second author: Checking and adding other write-ups, Third and Fourth author: Validating overall and adding more parts in the draft.

Funding: This research received no external funding.

Acknowledgements: The authors would like to thank Universiti Teknologi MARA and the selected SMEs for the support and encouragement in coming up with this paper.

Conflicts of Interest: The authors declared no conflicts of interest regarding this work.

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