

Integrating Artificial Intelligence and Business Intelligence into SME Enterprise Resource Planning Systems

A Systematic Literature Review of Adoption Factors, Theoretical Frameworks, and Organisational Performance Outcomes

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Abstract

In the last ten years, enterprise resource planning (ERP) systems have evolved from transaction-processing systems to smart, data-rich resources. Artificial Intelligence (AI) and Business Intelligence (BI) are also included as a standard part of the core in the top ERP solutions, but SMEs are only 11.9% likely to use AI compared to 40% of large companies (Schwäke et al., 2024). This gap is not only in terms of access, but also in terms of organisational, technological and environmental constraints, which have not been handled systematically in the context of ERP-AI-BI in the literature.

This paper is a systematic review of the literature — to the authors' best knowledge, the first paper to explicitly link the ERP, AI, and BI adoption literature together in a single theoretical framework for SMEs — that looked at how AI and BI capabilities, when embedded in ERP systems, mediate the relationship between ERP adoption and organisational outcomes. Based on the findings of 68 peer-reviewed papers and 19 foundational theoretical papers published from 2007 to 2026, the review brings together evidence that is grouped into five themes: ERP adoption and success in SMEs, AI as an ERP capability, BI as an ERP capability, convergence of ERP and AI and BI into a single platform, and ethical and governance issues arising with the convergence of ERP and AI and BI. Four theoretical frameworks are used: the DeLone and McLean (D&M) IS Success Model, Resource Based View (RBV) framework, Technology-Organisation-Environment (TOE) framework and Rogers' (2003) Diffusion of Innovations theory.

Five research gaps are identified and clearly stated, with the most impactful gap being the lack of empirical studies using AI and BI as co-mediating variables between ERP adoption and SME performance. The integrated TOE-D&M-RBV framework introduced here offers structural, process and strategic explanations for ERP value creation in SME contexts. The results have managerial implications for SME managers in the investment selection process for ERP; theoretical implications for IS researchers to enhance the mediation model of IS success; and policy implications for ecosystem actors aiming to bridge the SME AI adoption gap.

Keywords: *Enterprise Resource Planning; Artificial Intelligence; Business Intelligence; Small and Medium Enterprises; TOE Framework; DeLone and McLean IS Success Model; Resource-Based View; Diffusion of Innovations; Mediation; Absorptive Capacity; AI Governance; Digital Transformation; PLS-SEM*

JEL Classification: *M15 — IT Management; O33 — Technological Change; L25 — Firm Performance*

1. Introduction

1.1 Background and Problem Setting

Since the late 1990s, it has been a longtime study to understand the relationship between ERP systems and organisational performance, but the context in which this relationship is played out has undergone a dramatic shift. Cloud deployment, subscription pricing, and modular ERP platforms have broken the price barrier that many smaller companies used to face when adopting ERP (Haddara & Constantini, 2020). Consequently, the adoption rate for ERP among SMEs has been rapidly increasing, with an estimated 30% growth in cloud ERP adoption among firms with 50 to 250 employees from 2018 to 2023 (Straits Research, 2025). Equally less clear is the benefit being provided by the ERP systems that SMEs are now implementing — and whether the integrated AI and BI capabilities that are now standard in the top ERP systems make a difference in the value SMEs are deriving from their investment.

The figures imply an alarming imbalance. The adoption of AI within SMEs is at 11.9% while large companies are at 40% (Schwäke et al., 2024). This deficit is not the result of lack of accessibility — in fact, AI capabilities have already become part of the cloud ERP subscriptions being used by many SMEs. However, it captures the multi-level constraints that have been recognized as determinants of technology adoption (Tornatzky & Fleischer, 1990) by the Technology-Organisation-Environment (TOE) framework. SMEs don't have the in-house IT systems, data governance procedures, and expert skills needed to utilise the AI capabilities that are simply part of their ERP package. The result is significant and increasing performance gaps between AI users and non-users of ERP, which the academic literature has not yet studied systematically.

The gap is both empirical and theoretical. As noted by Önden (2026), the lack of a theoretically-informed systematic review exists in the context of AI in ERP. Further, the authors' review of the literature reveals that no published study to date looks at AI and BI together as co-mediating variables between ERP adoption and SME performance. This review is specifically aimed at bridging that gap both from an IS success standpoint (how AI and BI provide value to ERP) and an organisational strategic management standpoint (the reasons why organisations that develop AI and BI skills within ERP achieve competitive advantage over those that don't).

1.2 Research Objectives and Contribution Statement

This review has three aims. The first is descriptive, aimed at summarizing and analyzing the existing body of knowledge on ERP adoption, AI integration, BI embeddedness, and how ERP–AI–BI interact in the SME environment, highlighting the elements that are clear from the literature and any contradictory or inconclusive conclusions. The second is theoretical, with the purpose of developing and formulating an integrated model that encompasses both the TOE model and the D&M IS Success Model as well as the RBV to explain the adoption dynamics and value creation mechanisms of AI and BI in ERP systems for SMEs. The third is generative, to identify conceptual and methodological gaps in a precise enough way to enable a potential empirical research program.

Contribution statement: The review makes three contributions. First, it summarizes the studies on ERP, AI, and BI adoption in a systematic way and from a single perspective that is specific to the SME context. Second, it introduces a novel integrated TOE-D&M-RBV framework to capture both adoption antecedents and IS quality mechanisms as well as strategic resource outcomes. Third, it clearly identifies five research gaps — with the co-

mediation gap being the most significant — and provides specific research questions and a PLS-SEM research design to tackle these gaps.

The review is guided by two research questions: (RQ1) What technological, organisational and environmental factors, as defined by the TOE model, impact the adoption and use of AI and BI capabilities in ERP systems in SMEs? (RQ2) How do AI and BI capacities, when integrated in ERP systems, mediate the relationship between ERP adoption and ERP implementation success, user acceptance, system performance, and organisational performance in the context of SMEs?

1.3 Scope and Delimitation

The review includes peer-reviewed literature from 2007 to 2026, with a primary focus on the post-2015 period in which AI and BI started to be integrated as a core ERP functionality. Research which is primarily applicable to large enterprises, standalone BI deployments without ERP integration, and pre-cloud ERP without AI or BI components have been excluded from primary synthesis but cited when they provide theoretical context to the study. SMEs are operationalised according to the definition provided by the European Commission (2003): an organisation with fewer than 250 employees and an annual turnover of under €50 million, with variations in threshold noted where source studies have used differing thresholds. Where industry reports have been used, the data has been used for statistics to provide context for the market and is clearly identified throughout the document.

2. Literature Search Methodology

Systematic search was conducted in Web of Science, Scopus, IEEE Xplore and Google Scholar. Three main search strings were created: ("ERP" OR "enterprise resource planning") AND ("SME" OR "small and medium enterprise") AND ("artificial

intelligence" OR "machine learning" OR "business intelligence" OR "analytics"); ("TOE framework" OR "Technology Organisation Environment") AND ("ERP" OR "enterprise system") AND ("adoption"); and ("DeLone McLean" OR "IS success model") AND ("ERP" OR "enterprise resource planning"). Additional targeted searches used keywords such as "absorptive capacity," "Resource Based View," "Diffusion of Innovations," "AI ethics," and "data privacy ERP." Only peer-reviewed journal articles and conference proceedings from 2007–2026 have been included in all searches, with the exception of industry reports used solely for market context statistics.

There were 412 distinct records found in the first search, after removing duplicate records. To ensure inclusion of concepts relevant to ERP in an organisational context, four inclusion criteria were applied: (1) relevance of ERP in an organisation; (2) explicit mention of AI, ML, BI, or analytics as ERP functions or as separately existing constructs; (3) applicability in a SME setting; and (4) the presence of an identifiable IS, strategic management or technology adoption theory that grounded the concept in the field. Following abstract screening, 127 full texts were retrieved, from which 68 were included in thematic synthesis. The theoretical works that were incorporated were found using a citation snowballing process from the most recent and frequently cited reviews, and were 19 foundational works that are not dependent on date. Four industry reports for market-context data are explicitly named in-text.

A four-dimension rubric was used for quality assessment: methodological rigour, theoretical background, relevance to the SME context, and empirical currency for empirical studies (data collected after 2015). Studies which scored below threshold on two or more dimensions were kept on the periphery for contextualisation only. Pre-screening was conducted on key constructs: AI capability

(defined as ML, NLP, RPA, or Generative AI features within an ERP system), BI capability (defined as ERP-embedded dashboards, predictive reporting or OLAP functionality), and SME performance (defined as any combination of ERP implementation success, user acceptance, system performance, or organisational performance outcomes). These operational definitions helped to achieve uniformity in inclusion decisions among reviewers and minimized construct conflation, which is often a problem in cross-disciplinary reviews at the scale of this work.

3. Enterprise Resource Planning Systems in the SME Context

3.1 Architecture and Generational Evolution Since the inception of ERP systems from Material Requirements Planning (MRP) in the 1960s, the technology has undergone three architectural phases (Kiran & Reddy, 2019). The first generation, which was consolidated in the 1990s, had monolithic, on-premise architecture that integrated finance, supply chain, HR and manufacturing on a common relational database. The second, catalysed by the increase in Internet use in the 2000s, was an extension of ERP to the extended enterprise, namely to suppliers, customers, and e-commerce platforms (Haddara & Constantini, 2020). The third generation — current — is characterized by cloud deployment, modular microservices architecture, subscription licensing, and, most importantly in this review, native embedding of AI and BI capabilities into the ERP platform itself.

The path of architectural evolution has progressively brought the SME adoption threshold to a more manageable level, in ways that are not entirely accounted for in the existing literature. Cloud ERP pushes the costs of the infrastructure to the vendor, can be adopted in modules, and reduces implementation time. What is not widely

discussed in the adoption literature and what remains as a barrier is organisational readiness

— the ability of SME workforces and management structures to accommodate process changes even with the implementation of modular ERP. Johansson and Sudzina (2008) were able to identify this dynamic early; in their study of open-source ERP adoption in SMEs, they found that technical compatibility and the quality of vendor support were as important as cost — something that predates the organisational and technological dimensions of the TOE framework.

3.2 ERP Adoption in SMEs: Drivers and Persistent Barriers

The reasons why SMEs are adopting ERP software are well known and have not varied significantly between national markets. There is no doubt that the top position in almost all SME ERP adoption surveys is given to process integration, which is defined as removing data duplication, manual data reconciliation and departmental silos. Kiran and Reddy (2019) state that the most consistently mentioned operational drivers are inventory accuracy, reducing purchasing cycle, and financial reporting speed. Empirical evidence for the performance case is also persuasive: a study of 256 SMEs showed that sales management and budgeting modules were the ones with the highest degree of consistency in bringing competitive advantage and, interestingly, those firms that adopted showed measurably better forecasting accuracy than those that did not (Shakkur, 2023).

The barriers, however, need to be taken more seriously than they often are. The most often mentioned is financial constraint, but that covers two different issues: initial expense (which is significantly reduced through cloud models) and total cost of ownership that includes implementation consulting, customisation, training and support. The more insurmountable hurdle is the internal expertise gap. Many SMEs do not have IT employees

with ERP configuration knowledge, which leads to dependency on vendors throughout the ERP adoption process (Hamzah et al., 2022). Christiansen et al. (2016) conducted a systematic review of cloud ERP adoption with TOE and DOI lenses and found that top management support and technological compatibility are factors that always play a significant role in the adoption of cloud ERP — both of which are not primarily financial variables.

On this basis, Mukred et al. (2022) introduce a third layer — cultural and organisational readiness — which is often not given sufficient weight in the technical literature. ERP systems may be poorly designed to handle the informal, tacit forms of knowledge that family-owned SMEs and companies in traditional industries commonly use. The implication of this finding for the integration of AI and BI is direct, as both technologies carry additional organisational change burdens on top of what ERP adoption already demands.

3.3 Critical Success Factors: A Shifting Landscape

Two systematic reviews offer the most up-to-date CSF synthesis. Based on 26 screened studies, Butarbutar et al. (2023) establish the consensus post-implementation CSFs as top management support, user training, data quality, vendor responsiveness and organisational readiness. Data quality comes with a multiplier effect: its presence enhances the returns from management support and user training, while its absence undermines both — which has direct implications for AI-embedded ERP, where data quality determines whether AI features provide sound or misleading recommendations.

The update by Leyh et al. (2024), covering mid-2012 to 2023, is even more telling. In addition to the classic CSFs, AI readiness, BI utilisation capability and data infrastructure quality are now routinely featured in recent ERP success

literature. This implies a paradigm change: the way organisations can leverage embedded AI and BI has become as much a success factor as the ability to implement the main ERP modules. An SME that is well-prepared for AI and has a robust, clean data architecture will reap significantly greater benefits from the same ERP platform compared to one that is not.

3.4 ERP System Success Models

The success of ERP is not easily measurable, as it can mean different things to different stakeholders and in different time periods. Although the 20 IS/ERP success models that Mukti and Rawani (2016) synthesized were proposed in vastly different industry and national environments, a common core of system quality, information quality, user satisfaction and net benefits was consistently present. The critical distinction that review makes between "success enablers" and "success indicators" is important for the current review because it provides conceptual space for AI and BI to be quality-enhancing antecedents

— enabling variables linked to measurable success indicators, rather than being the indicators themselves.

Extensions to the D&M model by Ifinedo (2006) and Chien and Tsaur (2007) have extended its applicability to ERP contexts, adding Vendor Quality, Workgroup Impact and Business Value as additional constructs. The concept of disaggregating Net Benefits into Individual, Workgroup, and Organisational components, proposed by Kaiser and Ahlemann (2010), is especially relevant here, as the benefits that AI and BI provide will be felt in different ways by SME owners, operational managers, and frontline staff, and a single aggregated outcome variable could mask variation that is both theoretically meaningful and practically important.

4. Artificial Intelligence as an ERP Capability

4.1 AI Capabilities: A Functional Taxonomy

AI in ERP is not one single technology, but rather a collection of different technologies that work on various ERP functions. The most analytically useful division organises these into four clusters. Machine Learning (ML) is the engine behind pattern recognition and predictive modelling: it can be used for demand

forecasting, customer churn prediction, spend analytics and inventory optimisation. Conversational interfaces and unstructured data processing are made possible by Natural Language Processing (NLP), which allows managers to ask ERP questions in their own words and suppliers' messages to be automatically processed. In most SMEs, there are repetitive tasks that use a lot of staff time — these rule-based tasks include generating purchase orders, processing payroll, and handling invoices, all of which RPA addresses. The latest addition to the repertoire, Generative AI helps with narrative reporting and context-driven analytical commentary, providing ERP systems with more than just data — it offers more interpretable insight for non-technical managers (Mhaskey, 2024; Pokala, 2024).

The value of this taxonomy is that it allows the identification of different capability clusters for different user groups and different value pathways. What operational managers benefit from ML and NLP is the improvement of accuracy and reduction of workload. RPA provides cost savings in back-office functions. Generative AI can democratize the access to analytical tools in SMEs, which can now be used by owners and executives without specialist data training to engage with the ERP-embedded intelligence. This democratisation role is especially significant when dedicated data analysts are not on the team, a situation faced by most SMEs around the world.

4.2 The Vendor Landscape and the Normalisation of AI

Large-scale investments in AI have occurred among major ERP vendors, and the impact of these investments is clearly evident. SAP's Joule assistant is designed to work seamlessly with the entire SAP ecosystem, allowing users to interact with core business processes using natural language. Microsoft Dynamics 365 Copilot has similar functionalities integrated into CRM and ERP modules. Oracle Fusion Cloud has introduced anomaly detection and predictive cash flow modelling capabilities with AI (Cherry Bekaert, 2024). The AI capabilities Odoo has — predictive lead scoring, automated invoice matching, and smart inventory reordering — are more impactful for the SME-specific segment than enterprise-grade vendors, and that is because the core segment of Odoo is SMEs without their own internal analytical resources.

This competitive situation raises important issues for this review. Embedded AI is no longer a differentiator between top-tier ERP solutions; it is becoming the standard. Since the question of gaining access to AI-driven ERP is no longer the central issue, it is now about how effectively SMEs can leverage these capabilities given their TOE context. The transition from access to utilisation is the space that the integrated TOE-D&M-RBV framework outlined in Section 7 aims to clarify.

4.3 AI and ERP Performance: Evidence and Critique

There are mixed findings around the performance of AI-integrated ERP. According to Mhaskey (2024), citing both academic and practitioner research, user satisfaction increased by 25–30% and productivity improved by 20–25% with the use of AI in ERP. These numbers are frequently cited, but need to be examined: the evidence base consists of surveys sponsored by vendors, and thus are subject to social desirability and selection effects. The case evidence in Pokala (2024), while less comprehensive, shows that efficiency has been realised through AI

technologies in demand forecasting and invoice processing across multiple industry settings, improving accuracy and reducing processing times to a greater degree than is often reported in the broader literature.

What the evidence says, most honestly, is that AI-powered ERP can positively impact operational efficiency to a measurable degree, especially when it automates rule-based manual tasks, but the degree to which it will boost strategic performance outcomes — improved competitive positioning, sustained market responsiveness — is more challenging to establish, not only because of the lack of longitudinal data, but because of the inherent difficulty in establishing any causal link between technology investment and strategic outcomes. Khanal (2026) echoes this sentiment, stating that AI integration in ERP in incremental steps — starting with quick-to-implement, high-value features such as invoice automation and stock alerts, followed by increasingly sophisticated models like predictive analytics — is likely to result in more lasting performance gains for SMEs compared to comprehensive, all-encompassing AI activation at initial implementation.

4.4 Barriers Specific to SME Contexts

The challenges of realising AI-ERP value for SMEs are not easily captured in a standard taxonomy. The most common structural challenge is data quality: AI systems, in particular those powered by ML features, require the clean, consistent and historically rich data that many SMEs migrating from spreadsheets and paper are unable to deliver without significant remediation. The TOE framework focuses on this technological dimension, with Harizanova and Vladimirov (2026) identifying digital infrastructure quality

— operationalised as IT systems integration, data management practices, and connectivity

— as the strongest predictor of AI adoption and performance outcomes in SMEs. In a systematic review of 45 studies on the adoption

of AI by SMEs, Schwäke et al. (2024) find that, across geographies, sectors, and firm sizes, lack of IT infrastructure and employee skills are the two most recurring barriers in the SME population.

In addition to infrastructure, there is a skills gap that is structurally difficult to address in small organisations. Managers need to engage with ERP in ways that are very different from the traditional transaction-record model: they must understand how to interpret AI results, how to calibrate trust in algorithmic recommendations, and when to contradict automated outputs. These capabilities do not emerge automatically from system access — they must be deliberately targeted through user capability development alongside system configuration. Cohen and Levinthal (1990) conceptualise this as absorptive capacity, while Teece et al. (1997) relate it to dynamic capabilities: organisational capacity to reconfigure resources in response to technological change is as important as the resources themselves.

4.5 Ethical Considerations and AI Governance in SMEs

Ethical issues arising from the use of AI in ERP are just starting to be explored systematically in the literature, and are not something SME managers are likely to manage without external support. There are three areas of concern of special importance. First, algorithmic bias: AI algorithms are based on past ERP data, which carries inherent biases. If historical procurement patterns were driven by supplier preferences rather than quality or cost, and if sales history was based on demographic trends instead of product-related trends, AI-based recommendations in ERP systems will replicate and potentially expand those patterns, yielding discriminatory results for employees, suppliers, or customers. Second, data privacy: AI tools employed in ERP handle significant amounts of employee, customer, and supplier data, posing questions about consent, data storage, purpose limitation, and cross-border

data transfers — issues increasingly governed by laws such as the EU's General Data Protection Regulation (GDPR) and India's Digital Personal Data Protection Act (2023). Third, AI explainability: recommendations produced by ML models within ERP systems are not always explained to the end user, which can be a source of accountability issues when recommendations have negative consequences (Übeda-García et al., 2025).

SMEs face more structural challenges in managing these concerns than large enterprises. For large organisations, the legal, compliance, data governance and ethics responsibilities may be assigned to distinct teams, whereas SMEs typically have the same small management team covering both operational decisions and regulatory obligations. Ethical governance capacity should be considered as a construct alongside technological and organisational readiness — rather than as an afterthought in a limitations section — in future empirical research on AI-embedded ERP in SMEs, as firms with inadequate governance capacity are likely to experience regulatory and reputational risks that outweigh the operational benefits of AI adoption.

5. Business Intelligence as an ERP Capability

5.1 BI within ERP: Architecture and Functional Scope

BI is an embedded ERP feature that covers a wide range of analytical functions, including descriptive reporting and standardised dashboards that provide views of historical transactional data; diagnostic drill-down analysis that explains how transactions have performed over time; and predictive forecasting engines that inform future decisions (Fortune Business Insights, 2024). The self-service aspect, which allows operational team members to generate and share their own customised reports without the intervention of

the IT team, is important as it extends analytical power to the operational majority rather than the technical minority. In 2024, the global BI market was estimated to be valued at USD 30.1 billion and is projected to grow at a CAGR of around 15% till 2033 (Straits Research, 2025); 43% of organisations consider embedded ERP-BI important and 17% classify it as mission-critical (Fortune Business Insights, 2024).

5.2 BI Adoption in SMEs: From Reluctance to Embedded Access

Aspiration limited by resources has been the hallmark of the historical connection between SMEs and BI. In the bibliometric analysis of BI research in SMEs between 2007 and 2022, Hernandez et al. (2023) record strong growth in BI research since 2015, which coincides with the proliferation of cloud-based BI solutions. Their analysis reveals three main motivations for adoption: improved visibility of data, quicker decision cycles and better market responsiveness — all of which are synonymous with the benefits ERP-embedded BI can bring when adopted effectively. The most comprehensive recent systematic review of BI and data mining for SMEs by Gafar et al. (2025) — covering 93 articles from 2014 to 2024 — confirms that ERP-embedded BI reporting has increased significantly, while adoption of standalone advanced analytics remains limited due to economic constraints. The embedded vs. standalone adoption distinction is analytically important: the adoption barrier literature in the standalone BI environment may not be applicable to ERP-embedded environments where the decision to adopt BI is tightly coupled with the ERP deployment decision itself.

5.3 BI, Decision-Making, and Organisational Performance

The study of Alzghoul et al. (2024), which is the most methodologically rigorous study on the performance effects of BI, uses decision-making speed and comprehensiveness as

mediators to test the effect of BI capability on firm performance. Both mediators are significant, and — importantly — the mediation effect holds across firm sizes, giving empirical support for applying BI-performance findings from large enterprise settings to SMEs. This is not just a statistic; it means that SMEs which are able to build the organisational capability to use embedded BI tools effectively can, in principle, achieve performance improvements similar to those of larger enterprises.

The D&M view on BI embeddedness is that it has a direct impact on Information Quality because it provides timely, accurate, complete and actionable information. It also has a positive impact on the Use dimension, with managers that have meaningful dashboards more likely to use ERP as an active strategic tool, both in terms of frequency and depth of use. These are cumulative effects on quality dimensions that then impact User Satisfaction and ultimately Net Benefits at the individual and organisational level, completing the mediation chain hypothesised by this review and testable on an empirical basis.

6. The Convergence of AI and BI within ERP for SMEs

6.1 From Co-existence to Integration

The analytical framing of AI and BI as separate types of functionality that happen to share the same ERP system is misleading. Today, these capabilities are mutually dependent; BI gives AI's analytical outputs a surface to render meaningful and actionable — a forecast generated by an AI model based on machine learning is a blank probability distribution until translated into a trend line on a dashboard with contextually-enabling commentary. On the other hand, AI offers the predictive intelligence needed to push BI beyond historical reporting into forward-looking decision-support. Together, they combine to make ERP more of

a decision-support system than a mere record of transactions.

Similarly, Zheng and Khalid (2022) consider ERP-BI complementarity in the context of SMEs and argue that ERP and BI used together provide a joint value proposition that is greater than the sum of its parts. Taking this logic and empirical necessity one step further, the necessary next step is to include AI as a third, co-embedded capability. This review proposes that the most significant gap in the current literature is the lack of any published study that treats AI and BI as co-mediating variables in a single formal model of ERP success in SME contexts.

6.2 Performance Pathways Through the Integrated Model

The integrated ERP-AI-BI ecosystem implies a specific causal pathway. Implementing ERP creates the backbone data infrastructure. That data then produces predictive and prescriptive intelligence through the power of AI — from what has occurred to what will occur. That intelligence is made visible and interpretable across organisational levels through BI tools, transforming algorithmic output into managerial insights. The performance pathway goes through the combined mediating processes of AI-enhanced System Quality (D&M) and BI-enhanced Information Quality (D&M), which then lead to Net Benefits through improved Use and User Satisfaction.

The integrated AI-BI functionality in ERP is seen as an intangible, firm-specific resource from the RBV point of view, meeting all the VRIN criteria. It has value (it improves decision-making and operational efficiency), is rare (not all SMEs can build the capability to exploit these features effectively), is imperfectly imitable (it relies on firm-specific data histories and organisational learning), and is non-substitutable (no other technology offers the same combination of real-time process integration and intelligent analytical support).

The strategic lesson is clear: AI and BI create a competitive advantage for SMEs who invest in the organisational capabilities to use them effectively — the very organisations that the TOE framework's organisational dimension describes as most likely to adopt and leverage AI and BI successfully.

7. Theoretical Frameworks

7.1 The DeLone and McLean IS Success Model

The D&M IS Success Model (DeLone & McLean, 1992; 2003) is the main lens of this review and the most cited model in the IS success literature (Mukti & Rawani, 2016). The Updated D&M Model (2003) views a causal chain where the influence of System Quality, Information Quality and Service Quality are tied to the influence of Use and User Satisfaction, which in turn are tied to Net Benefits at the individual and organisational level. AI is seen as a precursor to System Quality in this review, used to improve the reliability, adaptability, and processing intelligence of ERP, while predicting anomalies. BI capabilities are recognized as precursors to Information Quality — making the information that the ERP system provides timely, accurate, complete and actionable. The key point is that there is no moderation between AI and BI, only mediation: AI and BI describe how investing in ERP leads to value, not when or for whom. This is a theoretically and methodologically testable distinction that is well-suited to PLS-SEM.

7.2 The Resource-Based View (RBV)

The RBV (Barney, 1991; Madhani, 2010) complements the D&M process lens in the strategic management dimension. When a firm possesses resources that meet the VRIN criteria, it can achieve sustainable competitive advantage. This review follows the original VRIN formulation (Barney, 1991) rather than

the later VRIO variant (Barney, 1997) because non-substitutability is especially pivotal to the AI-BI-ERP argument — there is no other technology that currently offers the same combination of real-time process integration, predictive intelligence, and accessible analytical reporting that these capabilities collectively provide in an ERP environment.

Following Cohen and Levinthal (1990), the key intervening variable is absorptive capacity, defined as the organisational capacity to acquire, understand and apply new knowledge. SMEs with higher absorptive capacity — characterized by better management digital literacy, more formalised processes, and greater openness to algorithmic guidance — will systematically be able to maximise the value they derive from the same AI and BI capabilities. Harizanova and Vladimirov (2026) offer empirical evidence for this mechanism: they discovered that digital infrastructure quality was the most important predictor of AI adoption as well as firm performance in SMEs, which aligns with the RBV's focus on the quality of an organisation's resources as the key determinant of technological value.

7.3 Diffusion of Innovations Theory

Rogers' (2003) Diffusion of Innovations (DOI) theory provides a complementary lens for understanding why AI-ERP adoption proceeds at heterogeneous rates across the SME population. The five adoption attributes — relative advantage, compatibility, complexity, trialability and observability — align easily with embedded AI and BI features. These features have high levels of relative advantage and observability (dashboard outputs are quick to see), and more moderate levels of complexity (new skills and process changes are needed) and compatibility (process formalisation is assumed that many SMEs are lacking). DOI predicts that adoption will be most rapid among SMEs with the greatest existing digital literacy and the most formalised

processes — which are most likely to be the firms with the highest absorptive capacity in Cohen and Levinthal's (1990) terms, and the firms with the strongest organisational context in the TOE framework. This three-way convergence between DOI, RBV, and TOE is not a coincidence; it represents the same organisational characteristic appearing in different theoretical vocabularies — the ability to recognise and apply new technological knowledge.

7.4 The Technology-Organisation-Environment (TOE) Framework

The D&M and RBV frameworks lack the structural adoption lens that is provided by the TOE framework (Tornatzky & Fleischer, 1990). The TOE framework suggests that the adoption of technology is influenced by three contextual dimensions. The Technological dimension includes aspects of the technology itself: the relative advantage of AI and BI features over existing processes, the compatibility of these technologies with current ERP data structures and operational workflows, and the complexity of exploiting them without specialist assistance. The Organisational dimension includes internal characteristics of the firm, namely the attitude towards data-driven decision-making, digital capability of employees, absorptive capacity, and financial capacity for ERP investment. The Environmental dimension reflects external pressures such as competitive pressures within the SME's sector, regulatory pressures on data usage and accountability for AI (including GDPR), and pressures from supply chains or customers for digitalisation.

Applied to AI and BI within ERP for SMEs, the TOE framework leads to specific, testable predictions. Technologically, AI-embedded ERP systems need to be compatible with the SME's operations and data infrastructure; if these prerequisites are missing, the technology will not be exploited no matter how beneficial it might be for the business. Financially, SMEs

are not necessarily blocked, as is found in the RBV and DOI theory, but rather the key factor is top management disposition and absorptive capacity within the organisation. From an environmental standpoint, the pressure on SMEs in digitally differentiated sectors is higher than in more traditional sectors, as they are more likely to require AI capabilities to remain competitive. Harizanova and Vladimirov (2026) combine TOE with RBV to examine AI adoption in SMEs, concluding that digital infrastructure quality — the technological dimension of TOE — is the most powerful adoption predictor. Schwäke et al. (2024) validate the TOE framework in this context further, with limited IT infrastructure (technological) and employee skills (organisational) being the most frequently mentioned barriers across 45 reviewed studies.

7.5 An Integrated Four-Lens Theoretical Framework

The four theoretical frameworks used in this review answer different questions. The TOE framework describes which SMEs, under which technological, organisational and environmental circumstances, are likely to adopt and use AI and BI capabilities in ERP. The D&M model answers the question of how — how does the improvement of AI and BI quality lead to organisational value creation from ERP and its Net Benefits? The RBV answers why: why do some SMEs have sustainable competitive advantages with AI-integrated ERP and others do not? DOI theory answers when, and how fast: which attributes of the technology are predictive of diffusion speed and extent among the SME population and the organisations that adopt the technology.

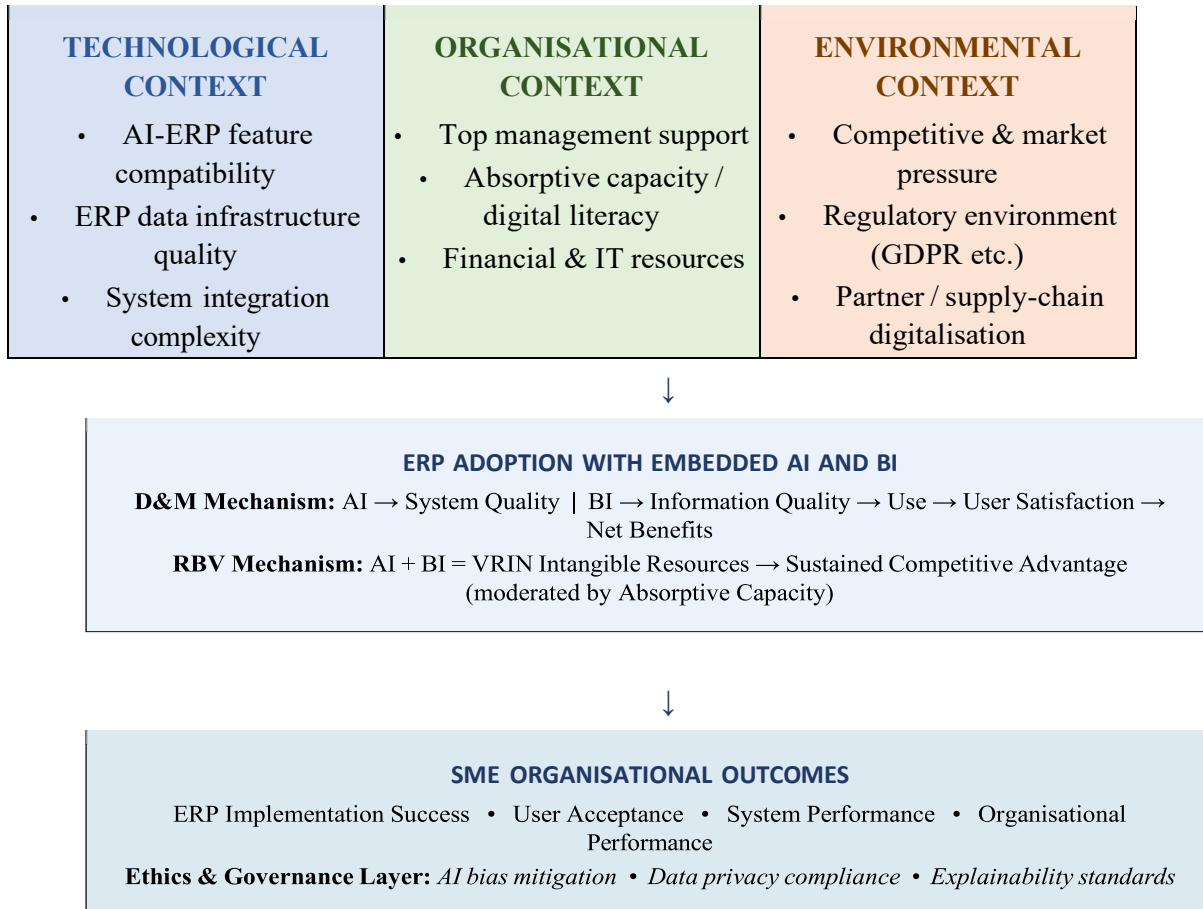
These frameworks constitute an integrated theoretical structure in which: (1) TOE conditions affect the rate of ERP adoption and how well these capabilities are exploited, resulting in different levels of System Quality and Information Quality; (2) once adopted, AI and BI capabilities improve System Quality

and Information Quality through the D&M mechanism, which in turn lead to Net Benefits manifested through Use and User Satisfaction; and (3) firms that build absorptive capacity to implement and leverage AI and BI capabilities gain VRIN resources through the RBV mechanism, which translates ERP performance into sustained competitive advantage. This review is a theoretical contribution in that it integrates these four frameworks into a single model, yielding a more complete and richer set of empirically testable propositions than any one framework alone would support.

7.6 Proposed Conceptual Model

Figure 1 presents the integrated conceptual model synthesising the four theoretical frameworks. The model consists of three levels — adoption antecedents (TOE), ERP quality mechanisms (D&M + RBV), and organisational outcomes — with ethics and governance as a layer that spans all three levels.

Figure 1: Integrated TOE–D&M–RBV Conceptual Model of AI and BI in ERP for SMEs



Note: SQ = System Quality; IQ = Information Quality; VRIN = Valuable, Rare, Imperfectly Imitable, Non-substitutable. Downward arrows indicate the directional mediation path. The Ethics & Governance layer applies across all three tiers, moderating both adoption decisions and performance outcomes.

8. Synthesis of Key Literature

Table 1 synthesises the 27 most relevant studies reviewed, organised thematically by domain contribution. The table documents each study's methodological approach, thematic focus, and its specific contribution to the integrated theoretical framework proposed in Section 7. Studies marked ** have incomplete citation details that the author must verify before journal submission; studies marked * are grey literature or preprints used solely for contextual data.

Table 1: Synthesis of Key Literature on ERP, AI, BI, TOE, and Theoretical Frameworks in the SME Context

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Tornatzky & Fleischer (1990)	Technology-Organisation-Environment (TOE) Framework	Conceptual Theoretical	Seminal three-dimensional adoption framework: Technological factors (AI compatibility, ERP maturity), Organisational factors (management support, absorptive capacity), and Environmental factors (competitive, regulatory) jointly determine enterprise technology adoption pace and depth
DeLone & McLean (1992; 2003)	IS Success Model	Conceptual Model Dev.	Six-dimension IS success framework; 2003 update adds Service Quality and Net Benefits — provides the process-level mechanism linking AI (→SQ) and BI (→IQ) to ERP value creation; most cited ERP success model in IS research
Barney (1991)	Resource-Based View (RBV)	Conceptual Theoretical	VRIN framework: Valuable, Rare, Imperfectly Imitable, Non-substitutable resources generate sustained competitive advantage; foundational for treating AI and BI as VRIN strategic ERP capabilities in SME contexts

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Cohen & Levinthal (1990)	Absorptive Capacity	Conceptual Theoretical	Firms differ in their capacity to recognise, assimilate, and apply external knowledge; absorptive capacity moderates returns from AI-ERP investments and is a key discriminator of differential SME performance
Teece et al. (1997)	Dynamic Capabilities	Conceptual Theoretical	Extends RBV to dynamic environments; ability to sense, seize, and reconfigure resources determines whether ERP-AI investments create lasting competitive returns; particularly relevant to SMEs in fast-changing markets
Rogers (2003)	Diffusion of Innovations (DOI)	Conceptual Theoretical	Five adoption attributes (relative advantage, compatibility, complexity, trialability, observability) predict adoption velocity; applied alongside TOE to explain heterogeneous AI-ERP uptake across the SME population
Johansson & Sudzina (2008)	Open-Source ERP Adoption in SMEs	Survey / Case Study	Found that cost is not the only adoption driver in SMEs; technical compatibility, vendor support quality, and community ecosystem significantly influence ERP selection and long-term success in resource-constrained SME settings
Kiran & Reddy (2019)	ERP CSFs in SMEs	Literature Review	Limited IT staff, budget constraints, and change-resistance as the most persistent barriers; documented underrepresentation of SMEs in mainstream ERP success literature — an important gap this review directly addresses

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Haddara & Constantini (2020)	ERP and Digital Transformation	Literature Review	Traced ERP evolution from MRP to cloud ERP-II; native AI and BI embedding identified as defining feature of third-generation ERP systems, fundamentally altering the SME cost-benefit calculus for ERP adoption
Christiansen et al. (2016)	Cloud ERP Adoption Factors (TOE/DOI)	Systematic Literature Review	Systematic review of cloud ERP adoption applying TOE and DOI lenses; found technological compatibility and top management support most consistently significant; regulatory environment increasingly prominent in cloud ERP decisions
Mukti & Rawani (2016)	ERP Success Models Review	Lit. Review (20 models)	Reviewed 20 IS/ERP success models; identified SQ, IQ, User Satisfaction, and Net Benefits as consistent core dimensions; distinguished between success enablers and success indicators — foundational to this review's mediation model
Hamzah et al. (2022)	ERP Post-Implementation — SMEs	Survey Quantitative	Top management support and user digital competence are dominant post-implementation CSFs in Saudi SMEs; vendor support significant only during go-live; reinforces TOE's organisational dimension primacy
Butarbutar et al. (2023)	ERP Post-Implementation CSFs	SLR (26 articles)	Data quality identified as a CSF multiplier; post-implementation phase under-researched relative to go-live; AI and BI readiness beginning to feature in post-2020 CSF profiles

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Leyh et al. (2024)	ERP CSF Update 2012–2023	Literature Review	AI readiness, BI utilisation, and data infrastructure now co-cited with traditional CSFs; confirms structural shift in what constitutes ERP success in contemporary cloud-native implementations
Schwäke et al. (2024)	AI Adoption in SMEs — Systematic Review	Systematic Literature Review	AI adoption rate in SMEs (11.9%) lags substantially behind large firms (40%); identifies limited IT infrastructure and employee skills as most consistently cited barriers across 45 reviewed studies — key evidence for Gap 2
Mhaskey (2024)	AI Integration in ERP	Review / Survey	AI-enabled ERP linked to user satisfaction and productivity gains; ML, NLP, RPA, and Generative AI identified as four embedded capability clusters; SME applicability noted but not empirically isolated in existing evidence
Pokala (2024)	AI in Modern ERP	Comprehensive Lit. Review	Demand forecasting and anomaly detection yield highest operational returns; strategic performance outcomes remain empirically underexplored, particularly in SME contexts — directly motivating the proposed research
Khanal (2026)	AI Adoption Challenges in SMEs	Literature Review	Identifies infrastructure gaps, financing constraints, and cultural resistance as the three primary AI adoption barriers in SMEs globally; recommends phased, embedded AI approaches over standalone deployments [** Citation details to be confirmed]

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Harizanova & Vladimirov (2026)	AI Use in SMEs — TOE-RBV Analysis	Empirical Quantitative	Applies combined TOE-RBV framework to AI adoption in SMEs; digital infrastructure quality emerges as strongest predictor of both AI adoption and performance outcomes — directly supports the integrated framework proposed in this review [** Citation details to be confirmed]
Alzghoul et al. (2024)	BI Capability and Firm Performance	PLS-SEM Empirical	BI capability indirectly improves firm performance via decision-making speed and comprehensiveness; mediation effect stable across firm sizes — provides direct empirical grounding for BI as a performance mediator in SME contexts
Hernandez et al. (2023)	BI in SMEs — Bibliometric Study	Bibliometric (Scopus, 2007–2022)	BI adoption in SMEs driven by data visibility and faster decision cycles; cloud deployment is the primary adoption enabler; research output doubled post-2015 tracking cloud ERP growth
Gafar et al. (2025)	BI and Data Mining in SMEs	SLR (93 articles, 2014–2024)	ERP-embedded BI reporting growing among SMEs while standalone advanced analytics adoption remains constrained; ERP integration identified as structural bridge over cost and skills barriers
Zheng & Khalid (2022)	ERP and BI Co-adoption in SMEs	Conceptual Framework	ERP-BI complementarity creates stronger joint value proposition than either alone; proposed joint adoption framework not yet empirically tested — co-mediation gap that this review prioritises

Author(s) & Year	Focus Area	Methodology	Key Findings & Contribution
Önden (2026)	AI in ERP — Systematic Review	Systematic Literature Review	Notes the "lack of a theoretically-informed systematic review" of AI in ERP contexts; identifies SME-specific AI-ERP integration as the most under-researched area — directly validates the novelty claim of the present review [** Citation details to be confirmed]
Übeda-García et al. (2025)	Ethics of AI in Organisations	Conceptual / Empirical Review	Identifies algorithmic bias, data privacy, and AI explainability as the three primary ethical concerns in enterprise AI deployments; argues SMEs face structural governance disadvantages relative to large firms [** Citation details to be confirmed]
Preprints.org (2024)	ERP, CRM, HRM in SMEs	SLR (108 studies)	AI and ML integration in ERP improves SME resource allocation and strategic planning; gaps noted in longitudinal evidence and SME-specific models [Note: Preprint — not peer-reviewed; included for contextual coverage only]
Shakkur (2023)	ERP Performance in 256 SMEs	Survey Quantitative	Sales and budgeting modules deliver strongest competitive advantage; ERP adoption positively associated with forecasting accuracy when supported by top management [** Full citation details required]

Note: SLR = Systematic Literature Review; TOE = Technology-Organisation-Environment; PLS-SEM = Partial Least Squares Structural Equation Modelling;

SQ = System Quality; IQ

*= Information Quality. Studies marked [**] require full citation confirmation; studies marked [*] are grey literature included for market context only.*

9. Research Gaps and Future Research Directions

The synthesis above demonstrates that there are five clearly identified and well-defined gaps in the existing research. Together, they constitute the theoretical, empirical and methodological originality of the proposed research.

Gap 1 — AI and BI as Co-mediators: The Central Empirical Void

To date, no empirical study considers AI and BI as co-mediating variables in a single ERP success structural model in SME environments. Zheng and Khalid (2022) conceptualised a framework for the integration of AI-as-SQ-mediator and BI-as-IQ-mediator, but empirical testing remains entirely absent. Önden (2026) explicitly identifies this absence, noting that a theoretically-informed, systematic review of AI in ERP contexts remains missing from the literature — the present review addresses the theoretical deficit, and the proposed empirical study aims to address the evidentiary one.

Gap 2 — The SME AI Adoption Gap: Understudied and Growing

Structural conditions that influence AI-ERP value creation in SMEs are not well researched, as the majority of ERP success literature is based on data from large enterprises, and the adoption of AI in SMEs remains at only 11.9% versus 40% for large firms (Schwäke et al., 2024; Kiran & Reddy, 2019). SMEs make up over 90% of all businesses and 60–70% of employment in most economies, yet they are virtually absent from the empirical ERP-AI literature. Closing this gap requires primary data specific to SMEs and not extrapolations from enterprise-level findings whose generalisability to SME contexts is methodologically questionable.

Gap 3 — Integrated Multi-Level Theoretical Framework

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Each of the three frameworks — TOE, D&M and RBV — has been used separately in studies of ERP or technology adoption. The integrated use of the three, namely TOE conditions influencing the adoption process, D&M mechanisms explaining the IS performance pathway, and RBV dynamics explaining the accumulation of strategic advantage, has not been theoretically articulated or empirically tested in the SME-ERP-AI-BI context. The four-lens framework proposed in Section 7 is itself a theoretical contribution which needs empirical validation.

Gap 4 — Ethics and Governance as Research Constructs

The ethical issues of AI-integrated ERP, including algorithmic bias, data privacy, and explainability, have been highlighted in the growing body of literature (Übeda-García et al., 2025) but are not yet included in ERP success models or SME technology adoption frameworks as quantifiable constructs. Future research could examine the influence of ethical governance capacity as an adoption moderator and performance boundary condition — SMEs with limited AI governance capacity could be vulnerable to adverse regulatory or reputational consequences that may offset or outweigh the operational gains from AI adoption.

Gap 5 — Geographic and Cultural Concentration

The majority of empirical ERP-SME studies are focused on Taiwan, Saudi Arabia, Germany and the United Kingdom. While digital infrastructure, regulatory environments, ERP vendor market structure and managerial decision culture differ across various countries, India is home to more than 63 million SMEs with a unique landscape of these factors (OECD, 2023). The ERP-AI-BI value proposition may play out differently in emerging-economy contexts such as this one. A study carried out in an emerging-economy environment would further the generalisability

of the integrated framework suggested here, in ways that replications within the current geographic concentration cannot.

10. Conclusion

This review aimed to address two questions: what are the findings from the current literature on the part AI and BI play in SME ERP projects, and where does the literature fall short? The present scholarship has isolated the elements of this picture separately — barriers and drivers of ERP adoption in SMEs, the performance impacts of AI in organisational environments, and the theoretical frameworks that can explain IS value creation — but none have combined these elements in a coherent and empirically grounded account of their interactions in SME ERP environments. The second question is answered with five clearly formulated gaps in the existing literature that delineate a well-defined and truly relevant empirical research agenda.

The proposed integrated TOE-D&M-RBV framework is a theoretical contribution in its own right. The TOE framework offers the adoption structure and outlines under which technological, organisational, and environmental conditions SMEs are in a position to benefit from the AI and BI capabilities of ERP. The D&M Model offers the performance mechanism, describing the connection between AI-enhanced System Quality, BI-enhanced Information Quality, and ERP adoption to Net Benefits. The RBV provides the strategic account — SMEs who acquire the absorptive capacity to leverage these capabilities are more likely to accumulate VRIN resources that create sustained competitive advantage. The Diffusion of Innovations theory, coupled with TOE, provides an explanation for the temporal dynamics of AI-ERP diffusion across the SME population.

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Importantly, this review has revealed that ethical AI governance is not an add-on but an integral part of the value creation model. The risks for SMEs without sufficient governance capacity are potentially greater than the performance gains achievable by adopting AI, and future studies should operationalise governance capacity alongside the more familiar technological and organisational dimensions. The proposed empirical study, following a quantitative research approach using primary data collected from SMEs in an emerging-economy setting, is expected to test the integrated framework, fill the co-mediation gap, and produce results with real-world applications for SME managers, IS researchers, ERP vendors, and policy makers working to address the growing SME AI adoption gap.

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*[Note: All references are formatted in APA 7th Edition. Studies marked ** have incomplete citation details requiring confirmation by the author before submission. Studies marked * are grey literature or preprints, included solely for market-context data. For submission to JEIM or other Emerald journals, convert to Harvard referencing as per journal guidelines.]*

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