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AI in SMEs - A holistic approach for successful implementations

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Abstract

Small and medium-sized enterprises (SMEs) are the backbone of global economic growth, and they still to a great extent does not comprehend the advantages brought about by the artificial intelligence (AI) technology as compared to large companies. Studies that have been previously conducted in this area recognize quite a number of hurdles such as the lack of finance, poor data quality, unavailability of skilled personnel, and unwillingness to change the way of doing things but still very little research has been done in this area and no comprehensive models have been proposed that integrate these factors. This article creates a comprehensive framework of seven pillars indicating that the SMEs would be ready for the implementation of the AI technology, synthesizing insights from empirical research, conceptual models, and high-impact industry reports. The study utilized a structured literature review whereby the researcher's pinpointed gaps, inconsistencies, and unresolved debates in the past works, and ultimately camouflaged all these manifestations into seven different readiness dimensions namely; strategic, organizational, data, technical, human, financial, and ethical readiness. The refined pillars do not overlap but clearly indicate what their role is in SME AI adoption thus ensuring good demarcation of the strategic areas that are suitable for supporting AI adoption in SMEs. This paper also provides visual illustrations to explain the interplay of the pillars as a unified system. The study later reveals new avenues for research and among them is the need for operational, sector-specific implementation guides for SMEs which are not found in the current literature thus urging the researchers to conduct further studies on this topic.

Keywords: Artificial Intelligence Adoption; SME Readiness; AI Readiness Framework; Digital Transformation; Technology Adoption Barriers; Structured Literature Review

1. Introduction

Small and medium-sized enterprises (SMEs) are essential to the global economic development process; they are most of the businesses and the major source of employment in most countries. However, the rapid digital transformation process has made it mandatory for SMEs to resort to the use of advanced technologies like Artificial Intelligence (AI) to increase their productivity, stay competitive in the market and keep up with the changing market conditions. Even though AI has the potential to bring numerous benefits to SMEs, its adoption is still far behind that of large enterprises due to different limitations related to the organization's structure and resources (Mohib et al., 2025). Recent research results indicate that SMEs usually face distinct challenges which prevent them from implementing AI. Such challenges are limited access to funds, lack of adequate digital infrastructure, shortage of talent, and shortage of knowledge regarding AI uses (Othman et al., 2025). These challenges lead to slow adoption and poorly planned AI projects. Besides, Mohib et al. (2025) point out that poor data quality, resistance from the organization, and lack of clear direction in the

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strategy are among the main problems SMEs encounter, thus these problems come together as a widespread concern that undermines the success of AI initiatives.

These challenges have led to the opinion of researchers and practitioners more that the adoption of AI should not just be seen as a technological upgrade but as a complete transformation of the organization. In this light, the small and medium enterprises need to assess not just the technical requirements but also the leadership acceptance, the skills of the employees, the data governance, the cultural acceptance, and the long-term strategic alignment (Schonberger, 2023). The holistic approach guarantees that the AI initiatives are utilized in such a way that the business processes consume them easily and eventually, this will lead to failure being less likely and SMEs getting to realize the worth of AI technologies in a significant way. The present article has the objective of introducing a structured, holistic framework that SMEs could utilize when planning and implementing AI solutions. The framework by uniting the organizational, technological, and human dimensions not only gives the SMEs a simple map for the successful AI adoption but also it opens a new world of possibilities characterized by the extinguished presence of AI in the enterprise. The target is to provide practical knowledge that not only takes care of the usual difficulties but also makes it possible for the SMEs to use AI as a support for their expansion, innovativeness, and staying competitive in the long run. A key contribution to this study is the development of a seven-pillar readiness model that is specifically tailored to the SME context. While previous frameworks such as general digital transformation models or large-enterprise AI readiness assessments offer useful insights, they rarely address the unique structural constraints of SMEs (limited capital, lean teams, informal processes, and variable digital maturity). The seven-pillar model presented here is distinct because it integrates strategic, organizational, technical, data, human, financial, and ethical factors into a single coherent structure. It fills a gap in the literature by offering a comprehensive, SME-specific approach rather than treating AI challenges in isolation. By clearly separating each pillar and identifying their inter-dependencies, this model provides a practical and theoretically grounded roadmap that SMEs can use to plan, evaluate, and scale AI initiatives effectively.

2. Understanding AI in the SME Context

Small and medium-sized enterprises (SMEs) come up with certain characteristics regarding their structure and resources which determine in a very fundamental way the extent to which they can adopt and benefit from artificial intelligence (AI). Structurally, they differ from large corporations in that they usually have smaller budgets, smaller teams, and shorter decision-making cycles, which can either fasten or limit AI implementation. These traits make AI adoption both attractive and difficult in terms of the company's willingness and strategic vision.

2.1. Characteristics of SMEs

Small and Medium Enterprises (SMEs) are characterized by their limited financial resources, fewer employees, and less complex management structures. The characteristics of SMEs support agility and flexibility which allow them to quickly experiment with new technologies and be able to cope with environmental changes (Mohib et al., 2025). On the downside, each of these traits can be a barrier to the adoption of high-end technologies like AI especially when there is a requirement for an investment that involves huge initial costs or a long waiting period for implementation. SMEs are usually quicker than bigger companies in decision making, but their informal strategies lead to fragmentation or uncoordinated AI acceptance (Othman et al., 2025).

2.2. AI Opportunities for SMEs

Small and medium enterprises (SMEs), regardless of their smallness, will eventually realize the benefits of AI-powered tools that help increase their efficiency and so make them rival competitors. AI can take over monotonous tasks and thus improve the quality of work done, support decision-making with predictive analytics (Okolie et al., 2025) and even make the marketing work easier by using customer segmentation and recommendation systems. Prior research points out that AI gives SMEs the opportunity to have better quality control in the manufacturing sector, to accurately forecast demand, to detect and prevent frauds, and to optimize the supply chain among others (Simon et al., 2025; Schönberger, 2023). Although these tools might not need sophisticated infrastructure, there are plenty of AI-as-a-Service (AIaaS) platforms that offer low-cost, flexible solutions that fit the SME environment.

2.3. AI Challenges Specific to SMEs

The advantages that AI tech brings to the table are indeed very huge. However, SMEs experience relatively more difficulties than larger companies in the AI adoption process. One such issue that is often raised is that there is a lack of in-house expertise or AI talent which forces SMEs to seek help from external vendors for training, support, and maintenance (Mohib et al., 2025). Furthermore, most SMEs are plagued with poor data infrastructure: the data is usually unstructured, isolated, or not available in digital form which results in the difficulty of AI model development (Othman

et al., 2025). Besides, there is uncertainty about the return on investment (ROI) which is another hindrance as SMEs might not want to invest in tech that has long-term payoffs or that has unclear financial benefits. Vendor dependence also brings other risks, especially when SMEs are using proprietary tools that are hard to integrate with existing systems, a problem that has been pointed out in several studies on AI focused on SMEs (Schonberger, 2023). Integration along with restricted internal IT capacity is often responsible for the delays or failures that happen in the adoption process of AI (Okolie et al., 2025). In summary, it can be said that AI has the capability to influence the SME sector significantly, however, the resource limitations coupled with the lack of skilled manpower, poor data infrastructure, and implementation risks call for a holistic and strategic approach in the adoption process.

2.4. Gaps and Inconsistencies

Despite growing academic interest, the literature on AI adoption in SMEs remains highly fragmented. Many studies describe challenges such as funding limitations, skills shortages, data immaturity, and cultural resistance, but few compare findings across industries or countries, resulting in inconsistent conclusions. Some research identifies data quality as the primary barrier, while others emphasize organizational culture, leadership commitment, or financial costs as the dominant constraint. Furthermore, most studies analyse AI adoption through a single dimension (e.g., data readiness or technical capability), leaving gaps in understanding how these factors interact. There is limited agreement on what constitutes “AI readiness” for SMEs, and no unified framework that captures the multifaceted nature of SME transformation. These inconsistencies highlight the need for an integrated model that synthesizes strategic, organizational, data, technological, human, financial, and ethical considerations an approach that this study addresses.

3. A Holistic Framework for AI Implementation in SMEs

A thorough and interconnected approach is needed for small and medium enterprises (SMEs) to successfully implement AI technology. Since SMEs usually have tighter budgets, fewer staff, and less technical resources than big enterprises, the adoption of AI through a fragmented or trial-and-error approach usually causes IP to be dormant, resistance to be high, and investments to be sunk. A holistic framework enables SMEs to make sure that AI projects are always in line with their main business drivers, are based on realistic resource availability, are integrated with the existing workflows, and are capable of being scaled up over time. This part presents seven connected pillars-strategic, organizational, data, technical, human, financial, and ethical readiness-that together indicate an SME's capability to adopt and maintain AI technologies successfully.

- Strategic Readiness

Strategic readiness forms the foundation of effective AI adoption by ensuring that AI initiatives are purpose-driven and aligned with the broader goals of the SME. Rather than pursuing AI because it appears innovative or fashionable, SMEs must clearly define the specific business problems AI is expected to address whether improving operational efficiency, reducing errors, enhancing customer service, or supporting long-term competitiveness. Establishing measurable objectives and linking them directly to AI efforts prevents misaligned investments and reduces the likelihood of early project failure. A key component of strategic readiness is the use of digital maturity and AI readiness assessment tools. These tools help SMEs determine their current level of digital capability, identify gaps in processes or infrastructure, and evaluate which areas of the business are most prepared for AI-driven improvement (OECD, 2023). Once strategic gaps are identified, SMEs should prioritize AI use cases that are high-impact yet low-complexity such as basic demand forecasting, customer inquiry automation, or invoice categorization because these early “quick wins” build confidence and demonstrate tangible value. Clear strategic prioritization also guides subsequent investments in data, technology, and workforce development by ensuring that all efforts support a coherent long-term vision.

- Organizational Readiness

Organizational readiness focuses on the internal environment required to support AI adoption, specifically leadership commitment, organizational culture, communication, and change management. Strong leadership is essential for SMEs because their decision-making structures are typically lean, and leadership support directly influences whether employees perceive AI as an opportunity for empowerment or a threat to job security (European Commission, 2023). A digitally oriented and experimentation-friendly culture is equally important, as organizations that encourage continuous learning and data-driven decision-making adapt more successfully to AI-enabled workflows. Organizational readiness also requires structured change management practices. SME employees must understand why AI is being introduced, how it will affect their roles, and what support will be provided throughout the transition. Clear communication plans reduce uncertainty, encourage buy-in, and mitigate resistance factors that research identifies as major determinants of successful AI implementation (Schonberger, 2023). Additionally, cross-functional coordination

is essential: bringing together operations, finance, IT (where present), and front-line staff helps ensure that AI solutions reflect real organizational needs rather than isolated technical preferences. Together, these practices create an internal environment that enables AI initiatives to be deployed sustainably and with minimal disruption.

- Data Readiness

Data readiness refers to an SME's ability to provide high-quality, accessible, and well-governed data to support AI systems. Because AI depends on accurate, consistent, and representative data, SMEs must first understand what data they have, where it is stored, how complete it is, and whether it reflects their core business processes. Data may be fragmented across spreadsheets, paper-based systems, or isolated software tools common barriers that impede AI model development and reliability (OECD, 2023).

Establishing foundational data governance is therefore essential. This includes clearly defining data ownership, setting rules for data entry and validation, implementing privacy and security procedures, and ensuring compliance with regulations such as GDPR or local data-protection laws (European Commission, 2023). SMEs should also focus on streamlining their data pipelines by digitizing manual processes, improving data collection practices, and integrating operational systems so that data flows consistently across the organization. When data governance and quality improve, AI tools become more accurate, scalable, and easier to maintain.

- Technical Readiness

Technical readiness concerns the infrastructure, tools, and technical capabilities required to deploy and maintain AI systems. SMEs must determine whether their existing systems can support AI workloads or whether upgrades are needed. Cloud adoption kept exclusively within this pillar provides SMEs with scalable, cost-effective options for storage, computing power, and access to AI-as-a-Service platforms, reducing the need for significant upfront investment (McKinsey Global Institute, 2022).

Another key component of technical readiness is systems integration. AI solutions must be able to communicate with existing enterprise tools such as ERP, POS, CRM, or workflow software. APIs and modular architectures reduce operational disruptions and prevent the creation of new data silos. Cybersecurity is also essential; SMEs must ensure secure authentication, encrypted data flows, and continuous monitoring to protect sensitive information. Technical readiness ultimately ensures that AI systems can be deployed reliably, securely, and in a way that aligns with the SME's operational environment.

- Human and Skills Readiness

Human readiness addresses the skills, competencies, and workforce capabilities required to adopt and work alongside AI systems. SMEs often lack in-house AI expertise, making general digital literacy and basic data skills essential across the workforce. Employees should understand how to interpret dashboards, use AI-assisted tools, and make decisions informed by AI insights. Some roles may require more specialized skills such as data analytics, technical troubleshooting, or vendor management necessitating targeted training or external support. Partnerships with universities, technology vendors, or government programs can help SMEs access affordable training opportunities (OECD, 2023). Human readiness also includes preparing employees for role evolution as AI automates repetitive tasks and increases demand for analytical and oversight skills. By building workforce capability proactively, SMEs reduce resistance, improve adoption success, and ensure AI is used effectively across daily operations.

Financial and Resource Planning

Financial readiness refers to an SME's ability to plan, budget, and sustain the financial commitments associated with AI adoption. Unlike some traditional technologies, AI requires not only initial investment, but also ongoing costs related to maintenance, updates, and staff training. SMEs must therefore conduct cost-benefit assessments, evaluate expected returns, and determine the financial viability of different AI use cases. ROI uncertainty placed exclusively within this pillar remains one of the biggest barriers for SMEs, as benefits may not appear immediately or may be difficult to quantify. To manage financial risk, SMEs can adopt lower-cost options such as subscription-based cloud services, AI-as-a-Service platforms, or phased pilots that test value before scaling. Grants, tax incentives, and government support programs can also reduce the financial burden (OECD, 2023). By planning for both short-term and long-term costs, SMEs ensure that AI initiatives are financially sustainable.

- Ethical and Responsible AI Considerations

Ethical readiness ensures that AI systems deployed by SMEs operate transparently, fairly, and in compliance with regulatory and societal expectations. This includes establishing processes for detecting and mitigating algorithmic bias, ensuring explainability where decisions affect customers or employees, and using personal data in ways that respect privacy rights. SMEs must also implement governance guidelines that define accountability for AI decisions, set boundaries for acceptable use, and specify how AI outputs should be monitored over time. Ethical readiness reduces legal and reputational risks and increases stakeholder trust especially important for SMEs that depend on customer relationships and community reputation. Adopting responsible AI practices aligns SMEs with emerging regulatory frameworks and supports sustainable long-term AI integration.

3.1. Justification for Pillar Completeness (Conceptual Triangulation)

The completeness of the seven readiness pillars is supported through conceptual triangulation across three major streams of literature. First, SME digital transformation studies and international policy reports consistently identify strategy, leadership, organizational culture, financial limitations, and technological capability as core determinants of successful technology adoption (OECD, 2023; European Commission, 2023). Second, research on AI implementation and governance highlights the foundational role of high-quality data, secure and scalable infrastructure, cybersecurity safeguards, and transparent decision-making mechanisms as prerequisites for responsible and effective AI deployment (Schonberger, 2023; Frank et al., 2019). Third, global industry analyses from McKinsey reveal that digital maturity, workforce skills, and resource constraints remain persistent barriers that disproportionately affect SMEs compared to larger enterprises (McKinsey Global Institute, 2022). Taken together, these converging evidence streams demonstrate that the seven refined pillars capture all essential readiness conditions emphasized across independent academic, policy, and industry sources. Because each pillar is grounded in concepts repeatedly validated across multiple disciplines, the framework is both comprehensive and non-overlapping, making it theoretically robust and practically useful for SMEs adopting AI.

Table 1 Components of a Holistic SME AI Implementation Framework

Component	Key Activities	SME Impact
Strategic Readiness	Align AI with business goals, prioritize high-value use cases, conduct readiness assessments	Ensures relevance, reduces misalignment, delivers early wins
Organizational Readiness	Build digital culture; strengthen leadership commitment, implement change management and communication plans	Reduces resistance and improves adoption
Data Readiness	Assess data quality, improve data collection, establish data governance and compliance	Improves AI accuracy, reliability, and scalability
Technical Readiness	Choose AI tools, integrate systems via APIs, adopt cloud infrastructure, strengthen cybersecurity	Enables reliable and secure AI deployment
Human Readiness	Upskill workforce, develop data literacy, train staff for evolving roles	Supports long-term sustainability and effective AI use
Financial Readiness	Budgeting; cost-benefit analysis, access grants or incentives, use subscription-based AI services	Reduces financial barriers and increases investment feasibility
Ethical AI Readiness	Ensure transparency, fairness, explainability, regulatory compliance	Builds trust and avoids legal or reputational risk

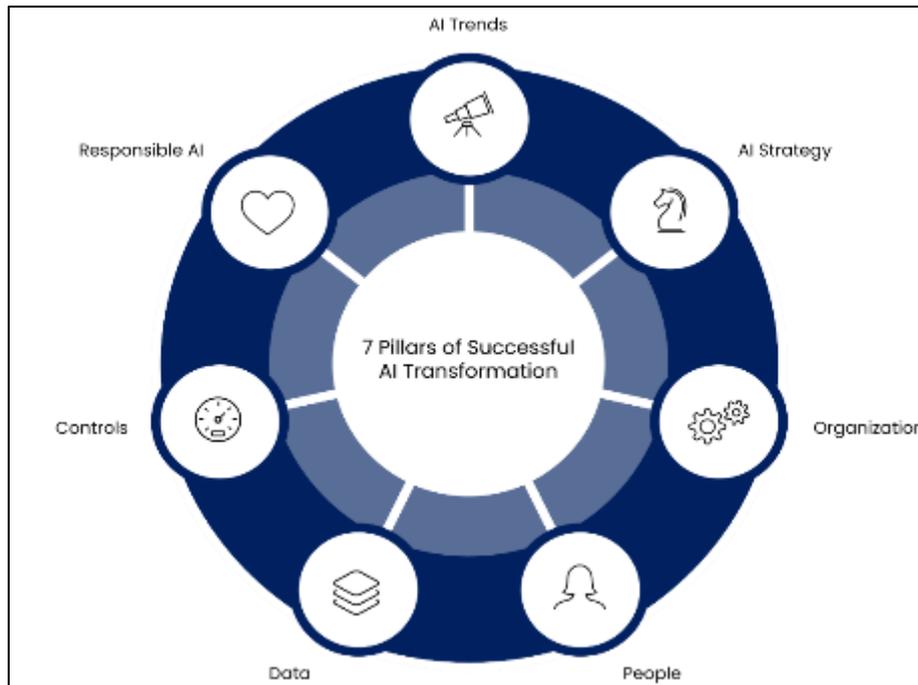


Figure 1 Seven Pillar Framework Diagram

4. Methodology

This article adopts a conceptual research design based on a structured literature review to build a holistic framework for AI implementation in SMEs. The purpose of this methodology is to synthesize and integrate existing empirical and conceptual research on AI adoption challenges, opportunities, and best practices in SMEs, and to categorize them into coherent “readiness pillars.”

4.1. Research Design

This research paper uses a conceptual research design backed by a systematic literature review, which is the right method when the intention is to create a perfection theory rather than to get new empirical data. A conceptual research design permits the researchers to bring together the existing knowledge, to find similarities in the studies, and to develop the frameworks that would explain the complex phenomena in this case, the successful introduction of AI in small and medium-sized enterprises (Snyder, 2019). The adoption of artificial intelligence by small and medium-sized enterprises is a quick-moving area of research with a lot of different and sometimes contradictory results in areas like business management, information systems, and digital transformation. Therefore, a conceptual/theoretical route allows the union of the various viewpoints into one comprehensive framework.

A conceptual design is also appropriate to the SMEs patd, that is, the companies with different sizes, industries, and market shares as well as their different levels of digital maturity and resource Allocation, Standardization of research methods becomes quite impossible. The existing literature has it that conceptual models are like a lighthouse to the practitioners in the emerging fields where struggles of practical solutions and slow but sure growth of empirical evidence are the things (Webster & Watson, 2002). The present research is, thus, aimed at creating a wide-ranging framework based on readiness that SMEs can utilize for the purpose of assessing and planning their AI adoption efforts. The approach to this conducting of the research is following the classic formation of a narrative integrative review which has the benefit of being able to meld together not only the empirical findings but also the conceptual arguments, case studies, and practitioner insights (Torraco, 2016). This process through which the study organizes existing research into a structured set of readiness pillars: strategic, organizational, data-related, technical, human, financial, and ethical considerations is one of its main goals. These pillars have been derived from the prominent themes that were detected in the literature on SME digital transformation and, consequently, the challenges of AI adoption (Mohib et al., 2025; Othman et al., 2025; Schonberger, 2023; Simon et al., 2025).

The justification for the choice of this research design is based on three pillars: To reflect the intricacy of the SME environments. The SMEs are facing a mixture of troubles: financial limitations, insufficient skills, and cultural resistance

which are interdependent and cannot be sufficiently elucidated through a single-variable empirical design (Mohib et al., 2025). To bring together disunited research outputs. AI adoption studies in SMEs tend to concentrate on specific dimensions like data readiness or leadership commitment, whereas very few researchers integrate all aspects into a single framework (Othman et al., 2025). To create a tool that is both practical and research based. The conceptual synthesis makes it possible to produce a readiness model that is not only easy to use by SME managers but also in tune with modern-day academic knowledge (Schonberger, 2023). In this manner, the conceptual research design provides the researcher with both analytical depth and practical importance, thus making it possible to come up with an all-inclusive AI implementation framework that is designed according to the specific characteristics and limitations of SMEs.

4.2. Source Selection and Review Strategy

A carefully structured and systematic procedure was adopted to create the literature corpus for this study. The review period was from 2020 to 2025, considering that AI adoption in SMEs is a fast-moving area where recent developments, technological changes, and organizational difficulties can only be properly understood through today's research. This period guarantees that the insights drawn are in line with the present situation regarding SME digital transformation and AI readiness. A detailed search strategy was compliant across the most important academic databases including Google Scholar, Scopus, and specific technology and business databases according to disciplines. The search involved mixing and matching certain keywords like "AI adoption in SMEs," "small and medium enterprises AND artificial intelligence," "SME digital transformation," "AI implementation challenges SMEs," and "AI readiness SMEs." These keywords led to the collection of a large but germane variety of studies that were dealing with the different aspects: technological, organizational, human, financial, and ethical ones of AI implementation in SMEs.

To select sources that would be of the highest quality and most relevant to the topic, unambiguous inclusion criteria have been applied. Only peer-reviewed journal articles, conference papers, and trustworthy reports from the industry or institutions that considered AI adoption in SMEs were considered. The studies accepted were to deliver empirically based findings, conceptual insights, or theoretical frameworks connected to organizational readiness, digital maturity, data infrastructure, technological capacity, workforce skills, financial limitations, or ethical considerations. Works that target only large companies and unrelated technology fields were not included in the research so that the precision of the concepts would be maintained. Inclusion of sources followed the prescribed best practices for conceptual literature reviews. The first step was to filter titles and abstracts for relevance. The studies that satisfied the initial criterion went through the full-text screening to identify their impact on the understanding of the AI adoption challenges and readiness in SMEs. Consequently, unnecessary, old, or irrelevant writings were expunged. This systematic method is in line with the accepted standards for carrying out thorough conceptual and integrative literature reviews.

4.3. Framework Development Process

Once the relevant literature was collected, the following steps were taken to build the holistic framework:

- **Extraction of Key Themes** — From each article/report, relevant aspects (e.g., financial barriers, data quality, leadership commitment) were extracted and listed.
- **Categorization into Pillars** — Extracted elements were grouped under broader "readiness" categories (strategic, organizational, data, technical, human, financial, ethical), based on conceptual similarity and their role in successful AI adoption.
- **Synthesis and Abstraction** — Through iterative comparison across studies, the framework was abstracted to a level that makes it generally applicable to SMEs, regardless of industry or region.
- **Validation through Cross-checking** — The framework was cross-checked against multiple sources to ensure that each pillar is supported by evidence or argumentation in at least two independent studies, reducing the risk of over-relying on idiosyncratic findings.

This approach ensures methodological transparency and provides readers with a means to follow, critique, or adapt the framework in their own contexts.

4.4. Limitations of the Methodology

Because this is a conceptual study rather than empirical research, it does not include new data collection or statistical analysis. As such:

- The framework depends entirely on published literature; unpublished "grey" data, proprietary case studies, or recent developments post-2025 may not be captured.

- The selection and interpretation of literature may be subject to researcher bias (e.g., selection bias, emphasis bias).
- The framework is general and may need contextual adaptation when applied to a specific SME (different industry, country, data regulation environment, etc.).

Recognizing these limitations, the framework is presented as a starting point, a guiding tool rather than a universal prescription.

5. Discussion

5.1. Importance of a Holistic Approach for SMEs

A comprehensive method to the AI adoption is fundamental for small and medium-sized enterprises (SMEs) because introducing AI is not only a technological but also a socio-technical transformation affecting all the areas of the organization such as strategy, processes, people, data, and governance. Such projects are likely to produce little sustainable value if SMEs consider AI just as a separate technology purchase: the technical components might be deployed but will not be integrated with the business processes, employees will not accept the change and the anticipated ROI will not occur (Oldemeyer, 2025). A readiness-based holistic model assists SMEs to identify and prioritize interdependent gaps like, for instance, improving data quality while at the same time planning workforce reskilling and aligning AI use cases to business objectives which increases the chance of providing measurable benefits and turning successful pilots into enduring capabilities. Recent systematic reviews have pointed out that SMEs who apply multi-dimensional readiness assessments have better planning and hence, their adoption of success rates are higher.

5.2. How the Seven Readiness Pillars Interact

The seven pillars (strategic, organizational, data, technical, human, financial, ethical) should not be viewed as isolated checkboxes but rather as a system of interconnected gears. Strategic readiness sets the direction for the use of cases with the most value and shapes the required technical and data investments accordingly. The organizational aspect (leadership commitment, cross-functional teams, change management) influences the degree of the smoothness in which the investments are put into practice. The human factor (skills and data literacy) can either boost or limit the technical solutions' effectiveness. If there are no people skilled in using and interpreting AI outputs, then the automated systems are likely to be under-utilized or misapplied. The financial aspect gives the necessary budget and impacts the decision of whether to go for cloud/AIaaS or in-house solutions. The ethical point of view and governance should be parallel embedding explainability, privacy, and bias mitigation nipping the legal and reputational risks that might cause the projects to fail. Empirical and review studies are the evidence of this dependency when the data governance pillar is weak in investments in sophisticated models, for example, won't deliver any or sometimes even negative returns.

5.3. Implications for SME Operations and Competitiveness

An AI capability that is properly implemented can yield efficiency (through automation of monotonous tasks), better quality of decision making (through predictive insights), improved customer experience (through personalization), and business agility (through quicker scenario testing) operationally. On the other hand, strategically speaking, small and medium enterprises (SMEs) that set up repeatable processes for the adoption of AI (pilot - evaluate - scale) will eventually gain a competitive edge through quicker time to insight and the capacity to access new revenue or cost-saving opportunities faster (for instance, demand forecasting, predictive maintenance, intelligent customer support). Nonetheless, the competitive advantages hinge on the SME's ability to assimilate AI results into daily operations and to perpetually keep data flows and model monitoring. Studies in different countries and industries imply that SMEs adopting a holistic approach investing in people's skills and governance as well as technology realize more persistent performance improvements compared to those who only concentrate on immediate automation.

5.4. Barriers Still Not Fully Addressed

Even with a holistic approach, several barriers persist. First, resource scarcity (limited budgets and time) constrains SMEs' abilities to build robust data pipelines or hire AI expertise. Second, fragmented vendor solutions and integration challenges create technical debt and lock-in risks when SMEs lack standardized architectures or API-driven integration plans. Third, regulatory complexity and ethical risk (privacy laws, emergent AI regulation) create compliance burdens that SMEs may not have the capacity to manage. Fourth, the measurement problem of difficulty in defining short-term KPIs for AI investments reduces managerial confidence, making it harder to justify continued investment. Recent

literature flags these as recurring issues even when SMEs adopt readiness frameworks, indicating that policy support, affordable tooling, and accessible training remain essential complements to internal readiness.

5.5. Comparison with Traditional Technology Adoption Models

Models for the adoption of new technology have, like the case of traditional TAM (Technology Acceptance Model), DOI (Diffusion of Innovations), and TOE (Technology–Organization–Environment), provided us with helpful pointers regarding the acceptance factors, organizational context, and environmental pressures. But still AI cannot be considered like any of the previous information technology innovations as it is data-driven, probabilistic, and a decision workflow is likely a place where it will be used more than just as a tool, thus the importance of data governance, ethics, and model monitoring will be ongoing. The TAM model mainly looks at the user perspective where the concepts of perceived usefulness and ease of use take center stage while the DOI model deals with attributes of innovation and categories of adopters; however, these models do not fully cover the complex readiness condition for AI in the case of (e.g., continuous model maintenance, data ethics). Therefore, a combination of a practical readiness framework (one that integrates the strengths of TOE/DOI/TAM with specific data, human skills, and ethical pillars) is going to work best for the SMEs that wish to adopt AI. The recent literature is supportive of such hybrid models as they will be able to cope with AI's peculiar operational and governance requirements.

6. Practical Case Examples / Illustrations

SMEs offer diverse environments where AI can succeed or fail depending on readiness, data maturity, leadership commitment, and resource availability. The following examples illustrate contrasting outcomes that demonstrate the value of a holistic readiness framework.

6.1. Successful AI Implementation Example in an SME

A mid-sized retail SME specializing in home goods successfully deployed an AI-powered demand forecasting system to optimize inventory planning. Prior to adoption, the business faced frequent stockouts and excess inventory due to seasonal fluctuations and unpredictable consumer behavior. The company began by assessing its data readiness, improving data collection processes through POS integration, and ensuring datasets were clean, consistent, and accessible. Leadership committed to the project early, and cross-functional collaboration between IT, operations, and sales allowed the SME to align AI use cases with strategic goals.

Following a three-month pilot using a cloud-based AI tool, forecasting accuracy improved by 28%, excess inventory dropped by 17%, and the SME reported faster decision cycles for purchasing. Success was largely attributed to strong organizational readiness, a clear strategic rationale, and the ability to align human and technical capabilities. Studies report similar outcomes in SMEs that invest proportionally in training, governance, and process alignment before implementing AI solutions (Peretz-Andersson, 2024; Sánchez, 2025).

6.2. Failed or Challenging AI Project Example

A manufacturing SME attempted to implement an AI-driven predictive maintenance system but encountered significant challenges that eventually led to project abandonment. Although the company invested in sensors and partnered with an external AI vendor, the project suffered poor data readiness sensor data was inconsistent, incomplete, and not properly time stamped. Organizational readiness was also low: employees viewed the system as a threat to their roles, and leadership failed to allocate dedicated personnel to oversee data management.

Financial limitations further constrained the SME's ability to refine or expand the project. The vendor's system required substantial customization, which exceeded the SME's budget and technical capacity. As a result, model performance was unreliable; employee resistance grew, and leadership ultimately halted the project. Research shows that SMEs without structured data governance or leadership alignment are significantly more likely to experience AI project failure, regardless of technical investments or vendor involvement (Oldemeyer, 2025; Ali, 2025).

6.3. Lessons Learned from Real-World Cases

The contrasting cases demonstrate that AI readiness is multi-dimensional and dependent on the proportional strengthening of all seven pillars. Successful implementations begin with strategic clarity, high-quality data pipelines, cross-functional organizational alignment, and human capability development. Conversely, failures often stem from pursuing AI as a purely technical project without preparing people, processes, or data infrastructure. The cases reinforce findings from recent literature: SMEs succeed with AI when they adopt phased pilots, align investments with business value, and provide training that supports cultural acceptance of digital change (Schonberger, 2023, Simon et al., 2025).

7. Recommendations

For better AI adoption outcomes, it is necessary for SMEs, governments, and technology providers to see AI readiness as a collective duty. The most important step for SMEs is to start with proper business objectives and self-assess their readiness first before taking any serious financial or technical action. They need to schedule pilot projects, train people, and appoint advocates in-house while gradually improving their data governance as the main area of focus. Firm management should provide the necessary resources for constant monitoring of the models, ethical oversight, and evaluation of the long-term value created. Policymakers need to add more funding programs, tax incentives, and initiatives for national AI readiness frameworks that are especially aimed at SMEs. Governments should also advocate producing inexpensive and standardized AI toolkits and make sure that regulatory guidance is always available to small firms. Technology suppliers should reduce the complexities involved, and make their pricing clear, and not only that but also provide the Service model and come up with training packages that are specifically designed for basic data literacy and ethical AI practice. Such approaches as micro-credentials offered online, collaborations with community colleges, and industry training are some of the ways that skill development is going to come into being, and that is the gap that most SMEs face when it comes to technology adoption. By reinforcing the different aspects of readiness in a unified manner, SMEs will be able to take the plunge into AI usage with a lot of advantages such as doing it the right way, achieving strategic impact that is measurable, and doing it economically.

8. Conclusion

The integration of artificial intelligence into small and medium-sized enterprises represents a significant opportunity to enhance productivity, innovation, and competitiveness. This study shows, however, that AI adoption in SMEs is multi-dimensional and extends far beyond acquiring new technologies. A holistic readiness model comprising strategic, organizational, data, technical, human, financial, and ethical pillars is essential for ensuring that AI initiatives are implemented sustainably and aligned with business objectives. The case illustrations highlight that SMEs are most successful when AI adoption is anchored in clear strategic intent, supported by strong leadership and structured change management, and reinforced by robust data governance and workforce development. Conversely, fragmented planning, weak data foundations, and unrealistic expectations frequently undermine AI projects. These findings underscore the value of readiness frameworks as diagnostic tools that help SMEs identify gaps and prioritize actions before committing significant resources.

As AI continues to advance, SMEs must treat adoption as an ongoing learning process and strengthen collaboration with policymakers, technology vendors, and training partners. Future research should focus on sector-specific readiness patterns, empirical validation of the seven-pillar model, and the development of practical, operational guides tailored to the unique constraints and contexts of SMEs. Strengthening readiness across these pillars will enable SMEs to adopt AI responsibly, effectively, and with long-term competitive benefit.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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