

**Conceptualising the AI-Ready SME: A Digital Transformation Framework to Achieve AU Agenda
2063's Inclusive Growth and Industrialisation Goals**

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Abstract

The African Union's Agenda 2063 aims for inclusive growth and an accelerated pace of industrialisation. However, small and medium-sized businesses (SMEs), which are at the heart of Africa's economy, are hindered by multiple factors in developing, deploying, and using artificial intelligence (AI) to dramatically improve performance. This conceptual analysis paper examines a key missing piece of the puzzle at the intersection of digital transformation, AI, and Africa's development. The paper contributes new knowledge and closes the knowledge gap through the 'AI-Ready SME' proposition. This proposition takes a holistic approach to transforming organisations, covering how well they use data, their digital setup, leaders who can adapt, understanding of AI, and a sound ethical approach that aligns with local social and economic realities. Using the idea of 'dynamic capabilities' and ways of innovating that include everyone, the paper proposes a step-by-step process for digital transformation, from getting the basic digital elements in place to using AI to improve how things are done. This specifically focuses on being something SMEs with limited funds can afford, grow, and withstand difficulties. The paper asserts that, if Agenda 2063 is to be achieved, there is an imperative to move beyond numerous small, isolated AI trials and instead build a broader preparation system. This system would include groups of SMEs and financial technology companies, government support through incentives, and collaborations to improve skills. The paper contributes a multi-faceted 'readiness index' to measure the potential for AI across different sectors of African SMEs, a practical plan to put things in place that balances using AI to automate tasks and creating jobs as the industry grows, and ideas for future research. The framework offers practical advice for policymakers, organisations providing development funding, and those who support SMEs; it aims to spread the benefits of AI and reduce the risk of exclusion. This paper views AI as a means to support Africa's fundamental transformation and more equitable wealth distribution, and places SME preparation at its centre so it's not a source of disruption.

Key Words: Digital Transformation; AI-Ready SMEs; African Union; Agenda 2063; Emerging Markets

Introduction

Small and Medium-sized Enterprises (SMEs) are central to Africa's economic development, job creation, and poverty reduction, accounting for a significant share of employment and GDP across the continent (Nwagbala et al., 2025). The African Union's Agenda 2063 emphasises industrialisation and broad-based growth, both of which depend on a strong, technology-driven SME sector. However, African SMEs face considerable barriers to digital transformation, particularly in the adoption of Artificial Intelligence (AI). Principal

challenges include limited digital skills, high implementation costs, inadequate infrastructure, and the absence of context-specific AI frameworks (Par, 2025; Weilbach, 2025).

This study presents a digital transformation framework tailored to support the effective adoption of AI by African SMEs. The framework directly addresses prevailing challenges and aligns with the objectives of the AU Agenda 2063 for sustainable economic growth (Ewim et al., 2024; Hussain & Rizwan, 2024). It outlines the core components and strategies SMEs need to achieve AI readiness, with the aim of strengthening process efficiency, competitiveness, and economic participation (Achieng & Malatji, 2022; Holland, 2026). By integrating theoretical foundations with practical solutions, the framework addresses critical barriers, including financial constraints, skill shortages, and employee acceptance (Hussain & Rizwan, 2024).

Background to AI and Digital Transformation in SMEs

The digital era has fundamentally transformed business operations, with Artificial Intelligence advancing efficiency, innovation, and productivity throughout diverse industries (Mustafa et al., 2025). For SMEs, AI provides opportunities to optimise operations, extract implementable insights from data, and personalise customer experiences, consequently boosting global competitiveness (Holland, 2026). Nevertheless, many SMEs encounter notable obstacles to AI adoption, including insufficient technical expertise, high implementation costs, and a lack of infrastructure (Delgado-Sánchez et al., 2025; Proietti & Magnani, 2025; Vilma & Booshnam, 2025). These problems are commonly exacerbated in Africa due to underdeveloped digital systems and a pronounced shortage of skilled professionals, underscoring the need for a context-specific approach to AI adoption (Enshassi et al., 2023; Yusuf et al., 2024).

This paper proposes a framework that addresses the exceptional challenges confronting African SMEs, emphasising scalable AI solutions adapted to local contexts and support for inclusive growth, as articulated in the AU Agenda 2063 (Par, 2025; Weilbach, 2025). The framework provides practical guidance to help managers facilitate AI adoption by overcoming barriers, including funding limitations, skill shortages, and employee resistance (Hussain & Rizwan, 2024). It highlights the importance of sound data management, customised technological tools, and comprehensive employee training, particularly in resource-scarce settings (Eyeregba et al., 2024). By lowering entry barriers, the framework empowers SMEs to access advanced AI capabilities previously reserved for larger enterprises, thereby improving business efficiency and decision-making (Eyeregba et al., 2024; Okoye et al., 2024). This shift toward accessible AI solutions underscores the need for strategic frameworks that support SMEs in identifying, integrating, and optimising these technologies for sustained growth and alignment with broader development objectives (Par, 2025). The study addresses critical research gaps by proposing a digital transformation framework uniquely designed for African SMEs, advancing the AU Agenda 2063's industrialisation and inclusive development goals. Furthermore, the framework addresses deficiencies in existing research on AI integration within SMEs, particularly in developing economies, by prioritising feasible strategies that go beyond adoption intent (Hermansyah, 2023; Paul, 2023).

The Significance of AU Agenda 2063

The framework prioritises the development of digital solutions that satisfy the needs of diverse users, including individuals with disabilities or limited digital skills, thereby reinforcing digital inclusion (Raji et al., 2024). It corresponds with national digital policies and regional agreements, such as the African Continental Free Trade Area, to promote a

unified ecosystem for digital transformation among Sub-Saharan African SMEs (Achieng & Malatji, 2022). This approach secures that AI adoption is technologically feasible, economically viable, and socially inclusive, directly supporting the AU Agenda 2063's objectives for sustainable economic development and industrialisation. Attaining these outcomes requires a strategy that integrates policy support, ecosystem collaboration, targeted investment in human capital, and infrastructure advances to facilitate scalable AI integration and support enduring viability (Holland, 2026). This all-encompassing approach is indispensable for handling the specific problems encountered by SMEs in developing economies, namely funding shortages, skill shortages, and deficient infrastructure, which frequently hinder AI adoption (Weilbach, 2025).

Problem Statement and Research Gap

While AI holds considerable potential to advance economic growth and industrialisation within SMEs, particularly in Africa, a substantial gap persists in the literature on comprehensive, context-specific frameworks for operationalising AI readiness (Nwagbala et al., 2025). Existing research frequently emphasises AI adoption intent (Bindah et al., 2025) or isolated technological factors, frequently overlooking holistic, ethical, and trustworthy approaches to AI lifecycle management within resource-scarce environments (Sarker et al., 2025). This gap is especially evident in Sub-Saharan Africa, where unique socio-economic conditions and disparities in digital infrastructure demand a tailored model for the ethical adoption of generative AI (Mweha, 2026). An effective framework must embed ethical norms and responsible AI principles to mitigate unintended biases, ensure data privacy, and support transparency in AI applications within SMEs (Soudi&Bauters, 2024). Additionally, the absence of competent governance mechanisms for generative AI in these enterprises increases the risks connected with its deployment (Mweha, 2026). Such deficiencies can diminish trust, compromise data quality, and lead to regulatory non-compliance, thereby impeding the development objectives AI is intended to support. Therefore, a framework for AI readiness in SMEs must incorporate strong ethical AI principles and trust mechanisms from the outset, delivering secure and responsible AI lifecycle management (Sarker et al., 2025). This paper addresses this gap by proposing a leading framework that not only assesses AI readiness but also embeds ethical AI governance principles to promote responsible generative AI adoption in Sub-Saharan African SMEs (Mweha, 2026).

Conceptual Foundations

This section establishes the theoretical bases of the proposed digital transformation framework, drawing on established concepts in technology adoption, organisational change, and ethical AI governance. It synthesises insights from Stakeholder Theory, Diffusion of Innovation, and the Technology-Organisation-Environment framework to construct a new model for responsible AI adoption in emerging markets (Boikanyo, 2025). This consolidated approach recognises the multidimensional interconnections among technological, organisational, and social aspects that shape AI integration within SMEs (Boikanyo, 2025). Such a layered perspective is indispensable for developing a framework which does not only facilitates AI readiness but also promotes ethical and sustainable AI practices within these enterprises (Kittipanya-ngam et al., 2025; Rahman et al., 2025; Soudi&Bauters, 2024). Furthermore, it objectively appraises existing ethical AI guidelines and frameworks, assessing their usefulness, relevance, and limitations within the defined functional contexts of African SMEs (Soudi&Bauters, 2024). This evaluation highlights the need to develop contextually relevant ethical AI principles that align with the socio-economic realities and cultural particularities of the region (Abhulimen& Ejike, 2024; Ofem, 2024). It also integrates socio-technical theory to advocate a mutually beneficial relationship between

human reasoning and AI's computational autonomy, emphasising culturally compatible and ethically aligned AI systems (Tjondronegoro, 2025). This approach connects the divide across abstract ethical principles and their operationalisation, translating values such as fairness and responsibility into implementable layers of AI adoption (Sarker et al., 2026). This assures that the proposed framework not only addresses technological and organisational readiness but also embeds ethical aspects across all phases of AI integration (Julis, 2024).

Defining Small and Medium-sized Enterprises (SMEs) in the African Context

While global definitions of SMEs often vary by revenue, assets, and employee count, the African context requires a subtle understanding that accounts for unique socio-economic structures, the prevalence of the informal sector, and developmental stages. This paper adopts a broad definition that encompasses these regional characteristics, recognising the heterogeneity among SMEs across African nations and their varying levels of technological sophistication (Dandadzi&Seeletse, 2025). This includes factors such as access to formal financial institutions, inclusion in global supply chains, and the prevalence of digital infrastructure (Tewari et al., 2026). Specifically, given the resource restrictions and unique working environments of African SMEs, their capacity for AI adoption must be assessed differently from that of larger enterprises (Proietti & Magnani, 2025). Therefore, a customised approach to evaluating AI readiness is imperative, one that considers not only internal organisational factors but also the external ecosystem, including governmental support and accessible technical infrastructure (Okoye et al., 2024). Such an assessment should also include an analysis of overarching ethical AI frameworks relevant to the Sub-Saharan African context, which typically call for culturally sensitive and contextually appropriate mechanisms for deployment (Mweha, 2026).

Artificial Intelligence (AI): Concepts, Capabilities, and Applications for SMEs

Artificial intelligence broadly encompasses computational systems designed to perform tasks that typically require human intelligence, including learning, problem-solving, perception, and decision-making processes (Delgado-Sánchez et al., 2025). For SMEs, AI's transformational potential lies in its capacity to automate repetitive tasks, optimise business processes, and generate actionable insights from large datasets, thereby improving productivity and competitiveness even with limited resources (Hussain & Rizwan, 2024). Specifically, AI applications like predictive analytics, natural language processing, and machine learning algorithms can be leveraged by SMEs to improve customer engagement, streamline supply chain management, and facilitate data-driven strategic planning (Sarker et al., 2025). These AI implementations can extract patterns from data, helping businesses to optimise decision-making procedures and secure long-term growth (Ebuka et al., 2023). This includes utilising advanced techniques such as deep learning and neural networks to simulate human intelligence and perform tasks that would otherwise require significant human effort (Schönberger, 2023). The application of AI within SMEs remains nascent, with varying levels of understanding and implementation across sectors and regions (Eyeregba et al., 2024). Despite the demonstrable benefits, many SMEs encounter major obstacles, such as cost, complexity, and a scarcity of specialised skills, that impede the widespread integration of AI (Eyeregba et al., 2024; Nwagbala et al., 2025). These problems require a coherent approach to AI readiness that addresses resource limitations and cultivates a climate supportive of technological assimilation (Dinh et al., 2025; Eyeregba et al., 2024).

Digital Transformation: A Multi-Dimensional Perspective

Digital transformation, in the context of SMEs, exceeds mere technology adoption to encompass a holistic organisational change involving strategy, culture, operations, and customer engagement (Yusuf et al., 2024). It involves reimagining business models, processes, and customer experiences through the strategic fusion of digital technologies, thereby leading to greater efficiency, innovation, and competitive advantage. This transformation, driven by emerging technologies including machine learning, deep learning, and large language models, is remodelling different sectors by enabling innovative business models, improving productivity, and improving customer engagement (Sarker et al., 2025, 2026). For SMEs, digital transformation offers an opportunity to overcome established limitations by leveraging AI to optimise resource allocation, automate complex processes, and derive insights from large datasets, thereby enhancing capacity and market responsiveness (Bhuiyan et al., 2024; Bran et al., 2025; Hu et al., 2024). This key imperative requires a comprehensive appraisal of existing digital frameworks, human capital capabilities, and organisational agility to identify critical areas for technological incorporation and upskilling (Hu et al., 2024). This evolution requires a departure from linear decision-making in favour of data-informed strategies that leverage intelligent systems to increase operational efficiency and market advantage (Bhuiyan et al., 2024; Damnjanović et al., 2025). However, multiple challenges impede successful AI adoption and digital transformation within SMEs, including limited financial resources, lack of skilled personnel, data security concerns, and organisational resistance to change (Proietti & Magnani, 2025; Yusuf et al., 2024). These impediments commonly appear as an inability to modernise legacy IT infrastructures, which are frequently fragmented and technically challenging to overhaul, consequently hindering the adoption of novel digital innovations and heightening operational risks (Mou et al., 2022).

Inclusive Growth and Industrialisation: Operationalising AU Agenda 2063 Goals

The AU Agenda 2063 sets out a comprehensive strategic framework for Africa's socio-economic transformation, emphasising inclusive growth and industrialisation as core pillars. For SMEs, particularly in Sub-Saharan Africa, achieving these goals entails integrating digital technologies, specifically AI, to improve productivity, stimulate innovation, and participate effectively in global value chains (Achieng & Malatji, 2022). This integration promotes the creation of new industries, improves manufacturing processes, and enables competitive participation in the global marketplace, finally contributing to sustainable economic development and job creation across the continent (Nwagbala et al., 2025). Recognising the essential role of effective cybersecurity strategies insafeguardingdata and infrastructure robustness, particularly for SMEs, is critical to protecting these disruptive initiatives (Okoye et al., 2024). The deliberate integration of AI and FinTech solutions can significantly enhance economic development, but adoption is often hampered by regulatory challenges and critical skill gaps within the SME sector (Okoye et al., 2024). Furthermore, the substantial costs of AI implementation, coupled with a scarcity of resources and skills, pose considerable barriers to African SMEs seeking to adopt these advanced technologies (Yusuf et al., 2024). This illustrates the need to develop tailored frameworks that ease these barriers and promote accessible AI integration for sustainable and just industrial growth (Okoye et al., 2024).

Theoretical Frameworks for Digital Transformation and AI Adoption

Several theoretical frameworks can elucidate the multifaceted interactionsamong digital transformation, AI adoption, and the strategic intentions of inclusive growth and industrialisation in the SME context. These frameworks typically encompass dimensions,

particularly technological readiness, organisational capacity, regulatory contexts, and socio-economic impact, affording a perspective for examining the facilitating and obstructing factors for AI integration (Ewuga et al., 2023). This entails a multifaceted theoretical lens that incorporates technology acceptance models, resource-based views, and institutional theory to fully capture the dynamics of AI adoption across diverse SME environments. Specifically, the Technology Acceptance Model can elucidate user acceptance of AI tools, while the Resource-Based View can explain how distinct organisational resources, such as digital infrastructure and human capital, influence the success of AI integration. Furthermore, Institutional Theory can shed light on the extrinsic pressures and regulatory regimes that shape SMEs' decisions about AI adoption and digital transformation. These theoretical perspectives collectively provide a sound analytical framework for understanding the multiple challenges and opportunities linked with advancing AI-driven digital transformation within African SMEs, particularly in accordance with the ambitious objectives of the AU Agenda 2063. Such a framework must account for major constraints, including skill shortages, infrastructure shortcomings, financial barriers, and fragmented data governance, which are prevalent in developing economies (Holland, 2026). A subtle understanding of these barriers is essential to developing customised interventions and policy recommendations that promote an enabling environment for AI adoption and digital transformation among SMEs in the Global South (Mou et al., 2022; Yusuf et al., 2024). This comprehensive understanding is crucial for designing effective strategies that bridge the gap between aspirational goals and practical implementation, thereby enabling SMEs to harness AI for sustainable economic growth and industrialisation (Farayola et al., 2023). Considering these theoretical underpinnings, a deeper examination of real-world AI adoption trends among SMEs, particularly in developing economies, becomes imperative to validate and refine these conceptual models (Bindah et al., 2025; Holland, 2026). This critical analysis can draw on frameworks such as the Technology-Organisation-Environment framework, which offers a robust lens for understanding the drivers and inhibitors of AI adoption in the specific context of SMEs (Schwaeke et al., 2024).

The TOE framework, widely supported in diverse studies, comprehensively captures innovation adoption by considering technological, organisational, and environmental factors, while the Resource-Based View emphasises the strategic utilisation of scarce and unique organisational resources for competitive advantage and sustainability (Prakasa & Fauzan, 2024). Integrating these frameworks with dynamic capabilities theory further illuminates how SMEs can proactively adapt to evolving digital landscapes by sensing opportunities, seizing market advantages, and reconfiguring internal capabilities to embed AI to drive innovation and competitiveness (Alshammakhi & Sheikh, 2025; Yesuf & Fields, 2025). Furthermore, an organisational culture that promotes digital literacy and continuous learning is essential for fostering an environment conducive to successful technology adoption and employee training within SMEs (Prakasa & Fauzan, 2024). Moreover, entrepreneurial acumen and management's grasp of fundamental AI concepts are critical to identify appropriate AI applications and strategies, which in turn necessitate national policies that incentivise entrepreneurship and facilitate the expansion of SME operations (Amoako et al., 2021).

Technology Acceptance Models (TAM)

Models such as the Technology Acceptance Model hold that perceived usefulness and perceived ease of use are primary determinants of an individual's intention to adopt a new technology (Ebuka et al., 2023). In the SME context, this suggests that the perceived benefits of AI in enhancing efficiency or profitability, together with the ease of integrating AI solutions into existing operational workflows, are crucial for widespread adoption

(Schönberger, 2023). However, the TOE framework extends this perspective by also considering the organisational context, including top management support and technological proficiency, and the external environment, such as competitive pressure and regulatory frameworks, as critical influences on AI adoption in SMEs (Lai et al., 2025). Specifically, the Technology-Organisation-Environment framework holds that the adoption of technological innovations by organisations is influenced by three main contexts: technological, organisational, and environmental (Alsheibani et al., 2020; Rawashdeh et al., 2022). The technological context encompasses both the internal AI infrastructure and the external availability and maturity of AI solutions, while the organisational context pertains to the firm's readiness, absorptive capacity, and leadership commitment to AI adoption (Ashkani et al., 2026).

Resource-Based View (RBV)

Finally, the environmental context, as delineated by the TOE framework, encapsulates external pressures and opportunities, including market competition, regulatory frameworks, and the availability of support infrastructure, all of which critically shape an SME's decision-making regarding AI integration (Ikumoro & Jawad, 2019). This holistic perspective, integrating technological, organisational, and environmental dimensions, is essential for analysing the complex interplay of factors that drive or hinder AI adoption within SMEs (Delgado-Sánchez et al., 2025; Mathani et al., 2024). The framework provides a robust foundation for examining how AI adoption contributes to SME performance in resource-constrained environments, particularly by emphasising the influence of technological infrastructure, organisational readiness, and broader environmental conditions (Haq et al., 2025; Muhammad et al., 2025). For instance, studies employing the TOE framework have highlighted that factors such as relative advantage, compatibility, market and customer demand, and government support significantly affect AI adoption by SMEs (Badghish & Soomro, 2024). Further research has refined the TOE framework to include specific factors such as "technology readiness" and "firm size," acknowledging that these elements significantly modulate the impact of broader technological, organisational, and environmental contexts on AI adoption outcomes (Schwaeke et al., 2024). Moreover, the Resource-Based View complements the TOE framework by emphasising that a firm's unique internal resources and capabilities, such as proprietary AI algorithms or specialised human capital, are pivotal for achieving and sustaining a competitive advantage, especially in nascent technological domains (Phan et al., 2026). This perspective underscores the strategic importance of developing and leveraging inimitable resources, such as advanced AI expertise and data infrastructure, to foster innovation and differentiate SMEs in rapidly evolving markets. The RBV framework assists SMEs in identifying and developing key capabilities for AI integration, enabling them to enhance their AI readiness and effectiveness by focusing on areas such as AI competence, data analytics skills, and technological infrastructure (Rasdi & Baki, 2025).

Dynamic Capabilities Theory

Building on the RBV, Dynamic Capabilities Theory offers a complementary perspective by explaining how firms can adapt, integrate, and reconfigure their internal and external competencies to address rapidly changing environments. It is particularly relevant for understanding how SMEs can leverage AI for strategic innovation and resilience, including a firm's capacity to sense opportunities and threats, seize market advantages, and transform its resource base to sustain competitive advantage in dynamic environments, which is especially salient for SMEs navigating the complexities of AI adoption (Drydakis, 2022). Specifically, this theory underscores the processes through which SMEs can develop

absorptive capacity to integrate new AI technologies, adaptive capacity to modify existing operational processes, and innovative capacity to generate novel AI-driven solutions. Together, these theories provide a comprehensive lens for examining how SMEs can strategically implement AI, considering both their internal resource endowments and their dynamic capabilities to adapt to technological shifts and market demands (Arroyabe et al., 2024). By integrating these theoretical perspectives, a holistic framework for understanding AI readiness in SMEs can be constructed, highlighting the interplay between static resource endowments and the dynamic processes required for technological assimilation and strategic adaptation (Boikanyo, 2024; Sánchez-Rodríguez et al., 2025). This integrated approach enables a more nuanced understanding of how SMEs, despite resource constraints, can strategically navigate the complexities of AI adoption to foster inclusive growth and industrialisation within the context of the AU Agenda 2063.

Institutional Theory

Institutional Theory holds that organisations operate within a complex web of social norms, values, and governmental regulations that significantly shape their strategic decisions and operational structures. This theory is particularly salient for understanding how SMEs seek legitimacy and navigate formal and informal institutional pressures as they pursue AI integration, extending beyond mere regulatory compliance to encompass broader stakeholder expectations and societal norms (Hartati et al., 2025). For instance, mimetic pressures, in which firms emulate successful peers in AI integration due to uncertainty, can significantly drive AI adoption, even in the absence of explicit regulatory mandates (Nguyen et al., 2025). This theoretical lens is crucial for examining how regulatory frameworks, industry standards, and societal expectations shape SMEs' strategic decisions and operational adjustments when adopting AI, thereby influencing their market acceptance and long-term sustainability. Moreover, normative pressures from professional bodies and industry associations can compel SMEs to conform to established best practices and ethical guidelines in AI development and deployment, further shaping their AI readiness and implementation strategies. Furthermore, coercive pressures, often exerted by government bodies or dominant industry players, mandate compliance with specific AI-related regulations, such as data privacy laws or algorithmic transparency requirements, which directly influence an SME's AI development trajectory (Bag et al., 2020). Such external forces often dictate the terms under which AI technologies can be integrated, emphasising the necessity for SMEs to align their digital transformation efforts with prevailing institutional environments (Yuwono et al., 2024).

Integrated Theoretical Lens for AI Readiness

To fully understand the multifaceted nature of AI readiness in SMEs, it is imperative to synthesise the distinct yet complementary theoretical perspectives, TOE, RBV, Dynamic Capabilities, and Institutional Theory into a cohesive analytical framework. This integration enables a comprehensive examination of how technological affordances, organisational resources, dynamic adaptive capabilities, and institutional pressures collectively shape an SME's capacity to adopt and leverage AI technologies effectively (Yan & Ahmad, 2025). This integrated lens moves beyond a singular focus on technological adoption by foregrounding the critical interplay between internal firm-specific factors and external environmental influences, thereby providing a more robust model for assessing AI readiness (Kalleparambil & Akoum, 2025; Übellacker, 2025). Such a framework shows that AI readiness is not merely about technological acquisition but involves a complex orchestration of internal strengths, adaptive processes, and responsive strategies to external legitimising forces (Arroyabe et al., 2024; Ikumoro & Jawad, 2019). This holistic perspective enables the

development of a prescriptive framework that addresses both the foundational elements and the dynamic processes essential for SMEs to achieve sustainable AI integration, fostering inclusive growth and industrialisation in alignment with AU Agenda 2063. This integrated approach recognises that successful AI adoption by SMEs requires addressing not only technological and organisational hurdles but also strategic alignment with overarching developmental agendas (Hussain & Rizwan, 2024; Kalleparambil&Akoum, 2025). Specifically, by synthesising the contextual determinants of the TOE framework with the innovation attributes from the Diffusion of Innovation theory, along with the resource-based and dynamic capabilities views, a more granular understanding of AI adoption in resource-constrained environments can be achieved (Mpanza, 2025). This multi-theoretical lens, further augmented by insights from Institutional Theory, addresses the behavioural, structural, and institutional dimensions that are often overlooked in fragmented model studies (Mpanza, 2025). By examining the interplay between technological readiness, organisational capabilities, environmental pressures, innovation characteristics, resource endowments, dynamic capabilities, and institutional forces, this framework offers a robust analytical tool for dissecting the complex pathways through which SMEs can transition to AI-ready entities (Holland, 2026; Mpanza, 2025).

The AI-Ready SME: A Conceptual Model

This section delineates a conceptual model for the AI-Ready SME, illustrating the synergistic relationships between integrated theoretical constructs and their operational manifestations within the SME context. The model emphasises a dynamic interplay between internal organisational factors and external ecosystemic elements, extending beyond basic technological adoption to encompass strategic alignment and sustainable value creation within emerging economies. It proposes that achieving AI readiness is an evolutionary process requiring a multifaceted approach, incorporating scalable AI infrastructure, workforce upskilling, and regulatory and cultural stewardship that harmonises compliance with cultural legitimacy (Holland, 2026; Yan & Ahmad, 2025). This stewardship fosters sustainable business practices and long-term resilience in AI-enabled digital transformation within volatile, emerging economies (Yan & Ahmad, 2025). The model further posits that an AI-ready SME is characterised by its capacity for continuous innovation and adaptation, driven by a strategic orientation towards AI-enabled processes that enhance operational efficiency and market competitiveness (Damnjanović et al., 2025; Praswati et al., 2024). It underscores that effective leadership and a robust organisational culture are pivotal in mobilising the resources and capabilities required for successful AI adoption, ultimately enhancing supply chain resilience and fostering competitive advantage (Dey et al., 2023). This necessitates a shift from merely adopting AI tools to strategically embedding AI within core business functions, thereby enabling lean, green, and agile decision-making, especially within the challenging landscape of emerging markets (Dey et al., 2023). This conceptualisation aligns with the understanding that AI adoption is not merely a technological upgrade but a strategic imperative that profoundly influences innovation performance and competitiveness, particularly in resource-constrained settings (Alshammakhi& Sheikh, 2025; Sánchez-Rodríguez et al., 2025). This transformative process involves overcoming significant barriers such as limited resources, insufficient AI expertise, and inadequate data infrastructures, which are often pronounced in SMEs (Kalleparambil&Akoum, 2025). Consequently, assessing an SME's AI readiness demands a comprehensive methodological framework that evaluates technological, organisational, human, and ethical-legal dimensions (Naheed et al., 2025). Such a framework should account for an organisation's change capability, its leadership's commitment, the inherent AI readiness

of its infrastructure and personnel, and the influence of trading partners in fostering AI integration.

Dimensions of AI Readiness for SMEs

A comprehensive framework for AI readiness in SMEs must therefore extend beyond mere technological considerations to encompass a multidimensional evaluation of an organisation's preparedness across various strategic and operational domains (Farayola et al., 2023). This includes assessing foundational digital capabilities that enable the acquisition, deployment, and reconfiguration of IT resources necessary to support AI-driven innovation and business model transformation (Ştefan et al., 2024). This necessitates a robust evaluation of strategic alignment, leadership commitment, data governance, and the sophistication of existing ICT infrastructure to effectively integrate AI capabilities (Motjoloopane& Chanza, 2023). Furthermore, organisational change capacity and a data-driven culture, championed by visionary leadership, are crucial enablers of AI adoption and the successful integration of AI into supply chain operations, thereby enhancing productivity and resilience (Dey et al., 2023; Morshed et al., 2024; Roux et al., 2023). Moreover, the ethical implications of AI use, including algorithmic bias and privacy concerns, necessitate the establishment of robust ethical frameworks and continuous monitoring to ensure responsible and sustainable deployment within SMEs (Abhulimen& Ejike, 2024).

This comprehensive assessment should focus on the strategic integration of AI capabilities, rather than on piecemeal tool adoption, to ensure alignment with overarching organisational objectives and to sustain a competitive advantage (Motjoloopane& Chanza, 2023). This integrated perspective underscores that AI readiness for SMEs is a dynamic state, continuously evolving with technological advances and market demands, and requires a proactive stance on digital transformation. Therefore, a preliminary multidimensional AI readiness assessment model for SMEs should incorporate a Technology-Organisation-Environment-Human framework, comprehensively capturing the dimensions of AI readiness and their related elements at the micro-level (Naheed et al., 2025). Such a framework would enable a granular analysis of an SME's capacity to leverage AI for data-driven decision-making, which is critical for enhancing supply chain productivity, fostering low-carbon management practices, and building resilience (Roux et al., 2023). This comprehensive approach ensures that SMEs can effectively navigate the complexities of AI integration, moving beyond mere technological adoption to achieve a holistic transformation that contributes to broader economic and societal goals, as outlined in frameworks such as AU Agenda 2063 (Motjoloopane& Chanza, 2023).

This conceptualisation posits that intangible organisational capabilities, such as an organisation's change capacity, are critical for facilitating AI adoption and, in turn, driving supply chain productivity, resilience, and sustainable low-carbon management practices (Roux et al., 2023). This perspective highlights the significance of internal resources and dynamic capabilities in orchestrating digital transformation initiatives, thereby positioning SMEs as pivotal innovation intermediaries within their respective supply chains (Roux et al., 2023). This emphasises that AI readiness is not solely about technological infrastructure but also about cultivating an organisational environment that supports continuous learning, adaptation, and the ethical deployment of AI systems (Ofem, 2024; Roux et al., 2023). This deeper understanding of AI readiness, therefore, necessitates an exploration of the specific antecedents that drive effective AI integration within organisational structures and dynamics, ultimately enabling greener, leaner, and more agile decision-making processes (Dey et al., 2023). This includes cultivating a robust organisational culture and developing managerial

competencies crucial for navigating the complexities of AI implementation, thereby enhancing organisational change capacity and a digital mindset (Dey et al., 2023). Such an environment fosters the necessary conditions for SMEs to not only adopt AI but also to leverage it strategically for sustained innovation and competitive advantage within global value chains.

Technological Readiness

This dimension involves evaluating the existing IT infrastructure, data management capabilities, and the capacity to integrate AI-based systems to support green, lean, and agile practices (Dey et al., 2023). This includes assessing the scalability and robustness of current digital systems, the availability of high-quality data for training AI models, and the interoperability of technological components across the SME ecosystem. A critical aspect of technological readiness is the ability to integrate AI systems with existing operational technologies and enterprise resource planning systems, ensuring seamless data flow and process automation crucial for enhancing efficiency and sustainability (Roux et al., 2023). Furthermore, the maturity of an SME's data infrastructure, including data standardisation and governance frameworks, directly affects the efficacy of AI applications, especially given the prevalence of "data islands" and fragmented data standards across global value chains (Jing & Yang, 2025). Therefore, evaluating the capacity for robust data management, including data cleansing, integration, and security protocols, is paramount for effective AI deployment within SMEs. This technological dimension extends beyond hardware and software to encompass the strategic alignment of IT infrastructure with AI integration goals, emphasising the critical role of robust data architecture in enabling advanced analytics and machine learning applications (Übellacker, 2025). Moreover, the capacity to develop or acquire AI algorithms, coupled with the necessary computational resources, is vital for transforming raw data into actionable insights that can optimise supply chain operations and foster sustainable practices (Mathani et al., 2024). Studies indicate that enterprises with successful AI implementation typically achieve technological readiness scores averaging 6.68 on a 10-point scale, with a notable disparity between sufficient technological infrastructure (67%) and adequate data management capabilities (43%) (Chockalingam, 2025). This highlights the necessity for SMEs to invest strategically in data preparedness, encompassing robust data strategies and the infrastructure required for scalable, adaptable AI development and deployment (Yams et al., 2020). This preparedness also extends to ensuring interoperability between disparate systems, which is frequently a barrier for SMEs with historically fragmented software landscapes from fully exploiting the potential of digital technologies (Müller et al., 2023).

Organisational Readiness

This dimension focuses on the internal structures, processes, and culture that enable an SME to integrate and leverage AI effectively, encompassing leadership commitment, strategic alignment, and cross-functional teams (Pan et al., 2025). It also entails assessing organisational capacity for change management, the availability of skilled personnel, and the ethical frameworks governing AI deployment to ensure responsible innovation (Abhulimen & Ejike, 2024; Kalleparambil & Akoum, 2025). A pivotal element of organisational readiness is the careful assessment of an SME's capacity to adopt AI, which involves identifying critical pain points and evaluating the suitability of current resources for successful implementation (Eyeregba et al., 2024). Leadership commitment is paramount, as it drives the creation of a data-driven culture and strengthens employees' skills and competencies, both of which are crucial for AI adoption and subsequent improvements in supply chain resilience (Dey et al., 2023). Moreover, fostering an environment in which employees are encouraged to develop

expertise and co-create knowledge significantly facilitates the adoption of AI-based systems, enabling data-driven decision-making to enhance supply chain resilience and support low-carbon initiatives (Dey et al., 2023). Such internal mechanisms, including strong leadership and a supportive culture, are pivotal in driving business transformation through the adoption of emerging technologies and facilitating smart decision-making (Dey et al., 2023). This underscores the critical role of leadership in establishing the necessary conditions, strategies, and knowledge resources that empower employees to acquire the skills and competencies essential for embracing innovation and navigating organisational change (Dey et al., 2023). The success of AI endeavours within SMEs is further contingent on fostering an innovation and growth mindset among leadership, thereby creating the mental orientation and intangible capabilities necessary for sustainable development through AI integration (Yams et al., 2020).

Human Capital Readiness

This dimension assesses the availability of skilled personnel, their capacity for continuous learning, and the organisational strategies for talent development and retention in the context of AI adoption (Proietti & Magnani, 2025). This includes evaluating workforce proficiency in AI-related domains, such as data science, machine learning engineering, and AI ethics, as well as their adaptability to new technological paradigms. Crucially, leadership plays a significant role in developing employee knowledge, skills, and competencies, thereby facilitating the adoption of AI and the successful navigation of digital transformation (Dey et al., 2023). This also encompasses fostering an organisational culture that promotes continuous upskilling and reskilling to address the evolving demands of an AI-driven environment (Roux et al., 2023). This focus on human capital extends to developing agile learning frameworks that enable the rapid acquisition of new technical and soft skills essential for effectively interacting with and leveraging AI tools (Dey et al., 2023).

Cultivating an organisational culture that promotes continuous learning and cross-functional collaboration is essential for optimising human-AI interaction and realising the full potential of AI technologies within SMEs (Perera et al., 2024). These efforts ensure that employees understand AI capabilities, enabling a productive relationship between human intelligence and machine capabilities (Fenwick et al., 2024). The human element is critical to successful AI implementation, as employees often develop self-management abilities when provided with feedback and recognition for their achievements in AI adoption (Huseyn et al., 2024).

Strategic efforts in competency development, encompassing both formal training and informal learning, are therefore crucial for integrating organisational learning into AI design and for ensuring successful adaptation (Böhme et al., 2024). This includes a focus on enhancing employee capacity, which is critical to extracting maximum value from AI technologies, especially in contexts where prior research has indicated insufficient examination of the role of organisational learning in this process (Jamil et al., 2025). This necessitates a proactive approach to workforce upskilling and reskilling, particularly in areas impacted by AI, to ensure sustained organisational competitiveness and employee empowerment (Appiah, 2025; Fenwick et al., 2024). It also requires leaders to develop strategies to mitigate potential resistance to AI implementation by fostering trust through transparent communication and ethical AI practices (Farayola et al., 2023; Helbing et al., 2021). Furthermore, effective human capital readiness in the AI era requires re-evaluating human capital itself, extending beyond technical skills to encompass adaptability, creativity, emotional intelligence, and continuous learning, often augmented by AI-powered learning platforms (Blaique & El-Farr, 2025). Investing in employee education and developing robust

human capital management strategies are thus critical to enhancing both the efficiency and the long-term strategic potential of financial institutions in the AI landscape (Grzeszczyk, 2020). This includes strategically developing human capital not only to operate AI systems but also to critically evaluate their outputs and integrate them into existing decision-making processes (Jarrahi et al., 2022).

Data Readiness

This dimension examines the quality, accessibility, and governance of data within an SME, recognising that robust, well-managed data infrastructure is foundational for effective AI deployment and model training. This involves assessing the completeness, consistency, and accuracy of data sets, as well as establishing secure, compliant data storage, processing, and retrieval mechanisms (Xu et al., 2024). A comprehensive data strategy must encompass data aggregation, transformation, and integration from diverse sources, ensuring that data pipelines are optimised for AI model development and deployment (Jarrahi et al., 2022). Furthermore, establishing clear data governance frameworks, including data ownership, access controls, and compliance with data privacy regulations, is paramount to fostering trust and enabling ethical AI practices within the organisation (Blaique & El-Farr, 2025). Such frameworks are vital for mitigating inherent risks in AI data handling, such as bias propagation and security vulnerabilities, thereby ensuring the integrity and reliability of AI-driven insights (Alnajjar et al., 2025). Moreover, the interoperability of data infrastructures and adherence to governance standards are crucial for maximising the utility of AI, as without them, AI's potential remains significantly underutilised (Sitnicka et al., 2025). Addressing vulnerabilities such as data poisoning, manipulation, and hidden skewness early on creates a credible baseline of trust and integrity, which is essential for ethical and trustworthy AI systems (Sarker et al., 2025). This also encompasses a thorough data audit to identify critical challenges or opportunities, such as inefficient inventory management or slow customer response times, which AI solutions could address (Agbaakin, 2025). An enterprise-wide data model, coupled with federated and integrated data collections, is essential for enabling comprehensive AI applications and deriving actionable insights (Butler et al., 2023). Poor data quality, characterised by issues such as incompleteness or inconsistency, can lead to biased or incorrect AI predictions, undermining the trustworthiness of AI systems and representing a substantial missed opportunity for leveraging AI (Singh, 2025). Therefore, the establishment of robust data governance frameworks, alongside standardised formats and protocols for data integration, is crucial to prevent the introduction of biases or inaccuracies that could impact the performance of AI systems (Olutimehin et al., 2024).

Ethical and Governance Readiness

This dimension focuses on establishing comprehensive ethical guidelines, ensuring regulatory compliance, and implementing robust governance structures to ensure the responsible development, deployment, and oversight of AI systems within SMEs, thereby mitigating risks of algorithmic bias, privacy breaches, and accountability deficits (Lottu et al., 2024; Singh, 2025). This requires implementing transparent AI practices, explainability frameworks, and continuous monitoring to uphold fairness, security, and privacy, particularly given the potential for AI systems to violate regulations and engage in unethical practices without proper governance (Hiniduma et al., 2024; Soudi & Bauters, 2024). It includes developing agile, forward-thinking governance models that balance regulatory and ethical imperatives with real-time risk management (Kasneci et al., 2025). Such models must incorporate mechanisms for human oversight, ensuring that AI outputs are scrutinised for fairness, robustness, and resilience to adversarial manipulation (Sarker et al., 2025). Moreover, weak governance structures, limited regulatory awareness, and a lack of clear

accountability mechanisms can impede the embedding of responsible AI practices in SMEs, thus necessitating a proactive approach to developing such frameworks (Sarker et al., 2026). This involves integrating ethical AI principles across the entire AI lifecycle, from design to deployment, to ensure alignment with societal values and organisational objectives (Oldemeyer et al., 2024). Furthermore, the inherent complexity of AI systems requires SMEs not only to develop internal capabilities for ethical oversight but also to engage with external stakeholders, including regulators and ethicists, to collectively navigate the evolving landscape of AI ethics and compliance (Sarker et al., 2026; Soudi&Bauters, 2024). The underdeveloped mechanisms for generative AI adoption within SMEs highlight a critical need for comprehensive governance frameworks that address infrastructural, ethical, stakeholder, and regional cooperation pillars (Mweha, 2026). Establishing these governance frameworks requires a multifaceted approach that incorporates risk management, data governance, technical documentation, human oversight, transparency, and cybersecurity, as mandated by emerging regulations such as the EU AI Act (Naidu, 2025).

A Digital Transformation Framework for AI-Ready SMEs

This framework delineates a structured pathway for SMEs to systematically integrate AI capabilities, thereby fostering inclusive growth and industrialisation in line with the AU Agenda 2063. It adopts a phased approach that addresses SMEs' unique challenges, including resource constraints and limited technical expertise, while capitalising on their agility and adaptability. The framework emphasises a holistic transformation, moving beyond mere technological adoption to encompass strategic, operational, and cultural shifts necessary for sustained AI integration and value creation (Sarker et al., 2025). It integrates key considerations such as streamlined governance layers and a focus on core pillars like data integrity and ethical GenAI practices, enabling SMEs to manage AI adoption responsibly with limited resources (Gandhi et al., 2025). This scalable and customisable approach facilitates incremental adoption of advanced AI capabilities, such as formal risk management processes and sophisticated monitoring tools, ensuring that governance practices evolve in lockstep with increasing GenAI integration (Gandhi et al., 2025). It also advocates a structured, multi-phased approach to the secure and responsible use of AI, emphasising trust and ethical principles throughout the AI lifecycle (Sarker et al., 2025). This framework provides SMEs with a structured, scalable roadmap that integrates trust and ethical principles across the AI lifecycle, balancing innovation with risk mitigation to ensure systems are both operationally effective and socially responsible (Sarker et al., 2025). It also provides a systematic approach for organisations to assess risk by structuring it across causal and domain taxonomies (Gandhi et al., 2025).

This approach enables businesses to understand the root causes and potential impacts of AI-related risks, facilitating the development of targeted mitigation strategies (Lin, 2024). In this regard, integrating values such as fairness, transparency, and accountability into actionable layers of AI adoption is crucial for fostering sustainable innovation and competitiveness within SMEs (Sarker et al., 2025). To realise these objectives, the framework outlines a series of sequential phases, progressing from foundational awareness to the advanced in-house development of AI solutions, thereby addressing the multifaceted nature of AI adoption within SMEs (Hussain & Rizwan, 2024). This structured approach is designed to guide SMEs through the complexities of AI integration by addressing implementation barriers and resource constraints while adhering to responsible AI practices (Delgado-Sánchez et al., 2025). The initial phase emphasises foundational digital literacy and strategic alignment, laying the groundwork for subsequent AI adoption by fostering leadership commitment and an organisational culture receptive to technological change (Hussain & Rizwan, 2024).

Phase 1: Awareness and Assessment

This phase systematically evaluates the SME's current digital infrastructure, data readiness, and human capital capabilities to identify specific gaps and opportunities for AI integration, thereby informing tailored AI adoption strategies (Hussain & Rizwan, 2024). This preliminary assessment is crucial for establishing a baseline of AI readiness and identifying areas that require investment in infrastructure, skill development, and data governance (Hussain & Rizwan, 2024). It also encompasses a comprehensive analysis of the SME's strategic objectives and operational workflows to identify potential AI use cases that align with business goals and offer demonstrable value (Delgado-Sánchez et al., 2025). This initial stage involves evaluating the organisation's technological infrastructure, digital maturity, and workforce competencies to establish a realistic starting point for AI adoption (Delgado-Sánchez et al., 2025). Furthermore, identifying critical business processes that can benefit most from AI integration and assessing the current data landscape for availability, quality, and accessibility are integral components of this phase (OECD, 2025). This comprehensive understanding forms the bedrock for developing a tailored AI strategy that is both realistic and impactful, enabling SMEs to prioritise investments and maximise returns. This foundational phase also involves establishing a robust understanding of the ethical implications and potential biases associated with AI technologies to ensure responsible implementation from the outset (Sarker et al., 2025). Moreover, cultivating a high level of awareness among leadership regarding the potential and impact of AI is paramount for securing strategic alignment and commitment to AI initiatives (Hussain & Rizwan, 2024). This necessitates comprehensive training programmes for leadership teams to ensure they grasp AI's strategic value and ethical dimensions (Hussain & Rizwan, 2024).

Phase 2: Strategy and Planning

Building on the insights from the awareness and assessment phase, this phase focuses on translating identified opportunities into concrete, actionable AI strategies aligned with the SME's overarching business objectives. This involves defining clear AI implementation goals, prioritising use cases based on potential impact and feasibility, and developing a detailed roadmap that outlines resource allocation, timelines, and key performance indicators for success (Al-Amin et al., 2024). This also includes establishing an appropriate governance structure and risk management protocols to oversee AI deployment and ensure that ethical considerations are embedded from the outset (Syed et al., 2022). This strategic planning phase also delineates the necessary technological infrastructure upgrades, data acquisition strategies, and workforce training initiatives required to support the proposed AI solutions. Furthermore, a comprehensive understanding of the competitive landscape and market trends is integrated to ensure the AI strategy enhances the SME's unique value proposition and sustains long-term growth. This structured approach ensures that AI initiatives are not ad-hoc but rather strategically integrated into the SME's operational fabric, facilitating a seamless transition from conceptualisation to tangible implementation (Syed et al., 2022). This systematic planning is critical for managing the complexities of AI adoption, including technical challenges, data privacy concerns, and the need for continuous skill development within the workforce. Crucially, it also necessitates the development of robust internal policies and protocols to ensure AI deployments adhere to established ethical guidelines and regulatory frameworks, minimising potential liabilities while maximising societal benefit (Abhulimen & Ejike, 2024).

Phase 3: Implementation and Integration

This phase operationalises the meticulously planned AI strategies, focusing on the technical deployment of AI solutions and their seamless integration into existing business processes and IT infrastructures (Al-Amin et al., 2024). This involves careful execution of technical tasks, including data preparation, model development, system configuration, and rigorous testing to ensure optimal performance and compatibility. Rigorous validation against predefined metrics and iterative refinement based on pilot program feedback are essential to confirm the AI system's efficacy and user acceptance prior to broader deployment (Al-Amin et al., 2024). This iterative testing and refinement process is critical for identifying and rectifying any performance discrepancies or integration issues, thereby ensuring the AI solution delivers the desired outcomes effectively and efficiently (Eyeregba et al., 2024). Moreover, this stage encompasses establishing robust API integrations, data sharing protocols, and compatibility checks to ensure AI applications harmonise with existing systems and data sources without disrupting daily operations (Olutimehin et al., 2024). It also necessitates the development of comprehensive training programs for employees to ensure adept navigation and utilisation of the new AI-powered tools and workflows (Rasdi & Baki, 2025). This includes not only technical proficiency in using AI tools but also an understanding of AI-driven insights to facilitate informed decision-making (Al-Amin et al., 2024; Eyeregba et al., 2024).

Phase 4: Monitoring and Evaluation

This phase systematically assesses deployed AI solutions to ensure sustained performance, ethical compliance, and alignment with predefined objectives. It involves continuous tracking of key performance indicators, regular audits of AI model outputs for accuracy and bias, and the collection of stakeholder feedback to drive iterative improvements and adaptations (Sharma, 2024). This continuous monitoring framework also incorporates mechanisms for efficient risk management and incident response, enabling prompt and effective handling of unforeseen challenges or performance degradation (Paparic & Bodea, 2024). Furthermore, it necessitates a robust feedback loop between technical performance, business impact, and user satisfaction, enabling adaptive strategies to maximise return on investment and address evolving operational needs (Martins, 2024; Tjondronegoro et al., 2022).

This systematic evaluation ensures the long-term viability and ethical integrity of AI deployments, facilitating necessary recalibrations to optimise their impact within the dynamic operational landscape (Abdelwanis et al., 2025). This iterative process of monitoring and evaluation is crucial for closing the AI lifecycle loop, thereby setting the stage for future iterations and continuous improvement in the SME's AI capabilities (Alber et al., 2025). This entails developing sophisticated model monitoring frameworks to detect drift, decay, and anomalies, thereby ensuring the ongoing reliability and validity of AI outputs in dynamic environments (You et al., 2025). Such frameworks often incorporate A/B testing and phased deployment strategies to mitigate risks associated with new model integrations and updates (Tavasoli et al., 2025; Wang et al., 2025). Post-deployment monitoring plans, therefore, become paramount, often involving regular audits and performance assessments to maintain operational integrity and address emerging challenges (Singh et al., 2025). This continuous oversight includes collecting user feedback, conducting periodic assessments, and performing retrospective analyses of usage patterns to identify areas for improvement and validate continued alignment with organisational objectives (Jafarzadeh et al., 2024; McAlister et al., 2025; Olutimehin et al., 2024).

Enabling Factors and Critical Success Factors

The successful integration and sustained utility of AI within SMEs depend on several critical success factors that extend beyond technology. These include a robust organisational culture that fosters innovation, adaptable leadership committed to digital transformation, and a skilled workforce capable of leveraging AI technologies (Vu et al., 2025). Moreover, a robust legal and ethical framework is indispensable for guiding AI development and deployment, ensuring responsible innovation and mitigating risks associated with data privacy and algorithmic bias (Schwaeke et al., 2024). Key performance indicators and metrics, such as accuracy, reliability, and fairness, must be continuously measured and aligned with business performance, often using automated evaluation tools within CI/CD pipelines to manage computational resource consumption (Burdakov & Ahn, 2025).

This holistic approach to AI adoption extends beyond technical implementation to encompass the development of a supportive ecosystem that fosters continuous learning, cross-functional collaboration, and strategic partnerships (Rajaram & Tinguely, 2024; Schwaeke et al., 2024). Furthermore, establishing clear governance structures and developing internal competencies to manage AI initiatives are pivotal to ensuring sustainable AI integration and maximising its long-term strategic value within the SME (Rajaram & Tinguely, 2024; Yesuf & Fields, 2025). This requires a deep understanding of the unique challenges and opportunities SMEs face when adopting AI, including limited financial resources, cultural resistance to technological change, and a lack of dedicated AI expertise (Dinh et al., 2025; Proietti & Magnani, 2025).

Addressing these constraints requires strategic investments in workforce reskilling, data governance, and managerial experimentation to integrate AI into core business processes and realise transformative outcomes (Yesuf & Fields, 2025). Such investments facilitate the transition from traditional linear decision-making models to more agile, data-driven approaches, positioning SMEs for enhanced competitiveness and sustainable growth (Damjanović et al., 2025). Recognising these challenges, a comprehensive framework for AI adoption in SMEs must account for determinants such as perceived usefulness, ease of use, organisational readiness, and strategic alignment, as well as robust data management practices (Motjolo-pane & Chanza, 2023; Schwaeke et al., 2024). Together, these determinants shape an SME's AI readiness, which is crucial for overcoming inherent limitations, including insufficient AI expertise and inadequate data infrastructure (Kalleparambil & Akoum, 2025).

This also requires a nuanced understanding of how AI can create value, not merely through process automation but by generating new digital value propositions and optimising existing business models (Sarker et al., 2025). This holistic approach to AI organisational readiness, encompassing strategic, technological, and capability dimensions, is essential for SMEs to leverage AI effectively for competitive advantage and sustainable development (Kalleparambil & Akoum, 2025). Therefore, tailored models that consider SMEs' specific needs and constraints, emphasising foundational digital capabilities, are critical for successful AI implementation (Kalleparambil & Akoum, 2025). This necessitates a strategic shift from opportunistic AI application to integrating AI within an overarching strategic vision, enabling sustained benefits and competitive differentiation (Barbu & Sitnikov, 2025). Despite the recognised advantages, numerous SMEs still face substantial barriers to AI adoption, including considerable financial outlays, insufficient technical proficiency, and resistance to organisational change (Eyeregba et al., 2024; Hussain & Rizwan, 2024; Mathani et al., 2024).

Alignment with AU Agenda 2063's Inclusive Growth and Industrialisation Goals

The integration of AI within African SMEs is pivotal to achieving the ambitious targets outlined in the AU Agenda 2063, particularly those related to inclusive growth and industrialisation, by fostering economic diversification, enhancing productivity, and creating high-value employment opportunities (Holland, 2026). This alignment is crucial for translating technological advances into tangible socio-economic benefits, contributing to poverty reduction and sustainable development across the continent (Nwagbala et al., 2025). Specifically, AI can empower SMEs to overcome traditional market limitations by enabling data-driven decision-making, improving operational efficiency, and fostering innovation, thereby enhancing their competitiveness in both local and global markets (Okoye et al., 2024). By leveraging AI, African SMEs can streamline supply chains, personalise customer experiences, and develop novel products and services, thereby significantly contributing to the Agenda's aspiration for a prosperous and industrialised Africa (Yusuf et al., 2024).

Contribution to Economic Diversification and Value Addition

The strategic adoption of AI by SMEs can facilitate a transition from resource-dependent to knowledge-based economies, enabling the creation of higher-value products and services, reducing vulnerability to commodity price fluctuations, and fostering economic resilience (Holland, 2026). This technological integration not only strengthens the competitive position of individual enterprises but also contributes to broader macroeconomic growth by improving market insights and supply chain optimisation (O'Neill et al., 2024). This diversification is essential for Africa's long-term economic stability and for creating sustainable employment opportunities beyond traditional sectors (Nwagbala et al., 2025). Furthermore, AI-driven solutions empower SMEs to optimise production processes, improve product quality, and enter new markets, thereby fostering a more robust and diversified industrial base across the continent (Weilbach, 2025). This shift is pivotal for African nations striving to meet sustainable development goals, as AI integration can yield substantial productivity gains, foster innovation, and enable new business models (Ziemba et al., 2024). Such advancements align with SDG 9, which emphasises resilient infrastructure, industrialisation, and innovation, all of which are crucial for sustainable economic growth (Ziemba et al., 2024). Moreover, AI-powered systems can analyse vast datasets to identify patterns, make predictions, and uncover previously hidden opportunities, thereby fostering innovation and creating new markets (Olawale et al., 2023). For instance, AI-driven analytics can help SMEs understand product demand and market trends, allowing them to optimise product offerings and pricing strategies, thereby maximising competitiveness and profitability (Anwansedo et al., 2024). This capability not only elevates the operational efficiency of individual SMEs but also contributes significantly to the overall economic resilience and growth of African nations (Okoye et al., 2024).

Fostering Entrepreneurship and Innovation

AI serves as a powerful catalyst for entrepreneurship by enabling the development of novel products and services, streamlining operational processes, and enhancing decision-making quality for nascent enterprises (Ebuka et al., 2023). It also democratizes access to sophisticated analytical tools, allowing startups and small businesses to compete more effectively with larger corporations by leveraging data insights and automating complex tasks (Tapo et al., 2024). This fosters a vibrant entrepreneurial ecosystem in which AI-powered online marketplaces can stimulate job creation and technological advancements, thereby catalysing overall productivity gains (Anwansedo et al., 2024). Furthermore, AI technologies such as machine learning, natural language processing, and predictive analytics empower SMEs to automate repetitive tasks, improve decision-making, and generate innovative

solutions that enhance both operational efficiency and market responsiveness (Yesuf & Fields, 2025). By enabling predictive analytics, AI empowers SMEs to anticipate market trends, optimise pricing strategies, and refine product offerings, thereby bolstering their competitiveness and market share (Anwansedo et al., 2024). This improved decision-making capacity extends to areas such as credit access, where AI can evaluate alternative data sources to facilitate financing for SMEs, including those without established credit histories (Ebuka et al., 2023). Such AI-driven financial innovations are crucial for addressing the persistent challenge of limited access to finance for African SMEs, a significant impediment to their growth and contribution to economic development (Okoye et al., 2024).

Job Creation and Skill Development

While AI-driven automation may raise concerns about job displacement, it simultaneously creates new roles requiring specialised skills in data science, AI development, and maintenance, thereby necessitating robust reskilling and upskilling initiatives to prepare the workforce for an AI-enhanced job market (Folorunso et al., 2024). This necessitates strategic investments in digital literacy programs and technical vocational training to ensure that the burgeoning youth population can transition into these emerging roles, thereby mitigating potential unemployment and fostering inclusive growth (Okoye et al., 2024). Moreover, the proliferation of AI adoption is expected to stimulate economic activity by creating new markets, products, and services, contributing significantly to global economic output by 2030, with developing countries poised to benefit from this growth (Aderibigbe et al., 2023). The integration of AI into financial services, particularly in FinTech, can significantly enhance financial inclusion for underserved populations by leveraging alternative data for credit scoring and providing access to formal financial products (Okoye et al., 2024; Opeyemi et al., 2024). This integration can revolutionise financial services by facilitating seamless transactions, enhancing access to capital, and streamlining financial processes, ultimately presenting a significant opportunity for SMEs in Africa to overcome traditional barriers to growth (Okoye et al., 2024). This also includes developing AI-driven financial literacy tools that empower small businesses to manage their finances more effectively and improve tax compliance, thereby fostering long-term economic benefits. (O'Neill et al., 2024) These AI-powered financial solutions, including those for tax compliance and for improving access to formal financial services, are critical to overcoming financial barriers that have historically hindered SME growth in Africa (Okoye et al., 2024; Opeyemi et al., 2024). By democratizing access to financial services and providing personalised financial education, AI not only enhances the operational viability of SMEs but also supports the broader goals of inclusive growth and industrialisation outlined in the AU Agenda 2063 (Opeyemi et al., 2024; Oriji et al., 2023). However, the successful implementation of these AI-driven strategies requires comprehensive digital transformation frameworks that address the unique challenges African SMEs face, including limited digital literacy and insufficient infrastructure (Nwagbala et al., 2025; O'Neill et al., 2024).

Regional Integration and Competitiveness

The strategic adoption of AI across African SMEs can significantly bolster regional economic integration by standardising digital processes and facilitating cross-border trade, thereby aligning with the aspirations of the African Continental Free Trade Area (Chibebe et al., 2024). This integration can streamline supply chains, reduce transactional costs, and enhance market access for SMEs, fostering a more interconnected and competitive continental economy. Furthermore, AI-driven insights can guide investment strategies and optimise operational efficiency, enabling SMEs to reduce costs and enhance their overall competitive differentiation within the African market and beyond (Eyeregba et al., 2024). This enhanced

competitiveness is crucial for enabling African SMEs to participate more effectively in global value chains and attract foreign direct investment, ultimately contributing to the continent's industrialisation objectives. However, realising these benefits requires a robust cybersecurity infrastructure and a strategic approach to data governance to protect sensitive business information and ensure trust in AI systems (Okoye et al., 2024). The imperative for a robust cybersecurity framework is underscored by the increasing sophistication of cyber threats and the critical need to safeguard proprietary data and intellectual property within AI-driven ecosystems (Okoye et al., 2024). Effective cybersecurity measures are vital for mitigating the inherent risks associated with technological advancements, such as budget constraints and inadequate infrastructure, which are particularly pronounced for SMEs in emerging economies (Okoye et al., 2024). Such frameworks are critical for establishing secure digital environments, protecting against evolving cyber threats, and ensuring data integrity and privacy as SMEs increasingly adopt AI technologies (Raji et al., 2024). This proactive approach to cybersecurity, encompassing regulatory compliance and resource allocation, is essential for maintaining business continuity and fostering stakeholder confidence in the digital transformation journey of African SMEs (Okoye et al., 2024). This strategic integration of FinTech, AI, and cybersecurity is not merely a technological evolution but a transformative catalyst for SMEs in Africa, enabling them to enhance productivity, ensure high-quality service, and reduce costs (Okoye et al., 2024; Sarker et al., 2025).

The interplay between AI, FinTech, and cybersecurity extends beyond individual enterprise benefits, fostering a resilient digital economy capable of driving sustainable growth and achieving the industrialisation goals set out in the AU Agenda 2063 (Okoye et al., 2024). This intricate relationship underscores the need for a comprehensive framework that systematically addresses the multifaceted challenges and opportunities presented by these converging technologies for African SMEs. This paper, therefore, conceptualises an AI-Ready SME framework to guide African businesses through this complex digital landscape, integrating AI, FinTech, and cybersecurity into a coherent strategy to achieve inclusive growth and industrialisation. The framework delineates the strategic pillars and practical steps for SMEs to adopt and leverage AI technologies while navigating the critical aspects of FinTech integration and robust cybersecurity protocols. It aims to empower SMEs to harness the transformative potential of AI while mitigating associated risks, thereby facilitating their active participation in the digital economy and contributing to the continent's broader socio-economic objectives. Addressing skill gaps in cybersecurity practices and the lack of awareness among SME employees is paramount to strengthening their cybersecurity posture and ensuring effective integration of advanced digital solutions (Okoye et al., 2024). Furthermore, establishing a clear regulatory landscape and fostering public-private partnerships will be crucial to developing the infrastructure and support systems SMEs need to thrive in an AI-driven environment. This will enable SMEs not only to harness the operational efficiencies and innovative capabilities offered by AI but also to navigate the complex landscape of digital threats and regulatory requirements, ensuring sustained growth and competitiveness. The framework developed herein seeks to provide actionable insights to help SMEs leverage AI to enhance productivity and market penetration, while simultaneously building resilient cybersecurity defences against evolving threats inherent in digital transformation (Okoye et al., 2024).

Addressing Socio-Economic Inequalities through AI Adoption

By strategically deploying AI, SMEs can significantly improve service delivery to underserved populations, fostering social equity and inclusion through tailored solutions and enhanced accessibility (Ewim et al., 2024). This extends to developing AI applications that cater to local linguistic and cultural contexts, thereby promoting digital inclusion and helping

to bridge socio-economic disparities across various regions in Africa (Sheik, 2023). Moreover, AI integration can enhance operational efficiency and reduce costs for SMEs, enabling them to offer more affordable goods and services, which directly benefits lower-income segments of the population (Eyeregba et al., 2024). This approach not only democratizes access to essential services and products but also stimulates local economies by empowering a broader consumer base, aligning with the inclusive growth tenets of AU Agenda 2063. To achieve this, substantial investment in digital infrastructure is paramount to ensure widespread access to high-speed internet and reliable connectivity, particularly in rural and underserved areas (Raji et al., 2024). This infrastructure development, coupled with targeted policies for digital literacy and skill acquisition, is fundamental to SMEs effectively implementing and scaling AI solutions across diverse socio-economic landscapes (Raji et al., 2024). Furthermore, involving local stakeholders in the design and deployment of AI technologies is critical to ensure that solutions are culturally relevant and address the specific challenges faced by these communities (Folorunso et al., 2024). This collaborative approach fosters trust and ensures that AI initiatives genuinely contribute to equitable development, avoiding the imposition of generic solutions that may not align with local needs (Ewim et al., 2024). This participatory model is crucial for identifying context-specific opportunities where AI can address existing disparities in sectors such as healthcare, education, and financial services, thereby contributing directly to inclusive growth. However, disparities in digital infrastructure, access to advanced technology, and quality education can exacerbate existing inequalities, particularly in less developed regions (Nations, 2024).

Challenges and Mitigation Strategies

Recognising these potential pitfalls, this section outlines the key challenges to AI adoption among African SMEs and proposes strategic measures to foster equitable and sustainable digital transformation (Nwagbala et al., 2025; Weilbach, 2025). These challenges span infrastructural limitations, skill gaps, regulatory ambiguities, and cybersecurity vulnerabilities, each requiring tailored interventions to ensure a robust and inclusive AI ecosystem (Mhlango et al., 2024; Okoye et al., 2024). A primary obstacle is the digital divide, characterised by limited access to reliable internet, affordable devices, and digital literacy, particularly in rural and semi-urban areas (Weilbach, 2025). This divide concentrates AI applications in high-income regions, exacerbating health inequities and undermining collective security (Osasona et al., 2024). Moreover, the financial burden of AI implementation, including significant upfront investments in hardware, software, and specialised talent, presents a substantial barrier for many SMEs, particularly those operating in resource-constrained environments (Weilbach, 2025). Furthermore, a shortage of skilled personnel to develop, deploy, and maintain AI systems, coupled with organisational resistance to technological change, significantly impedes the widespread adoption of AI (Nwagbala et al., 2025; Yusuf et al., 2024). These challenges are often compounded by data security concerns and diverse regulatory frameworks across jurisdictions, which can deter SMEs from adopting AI solutions (Yusuf et al., 2024). Addressing these multifaceted challenges requires a comprehensive strategy that includes robust policy frameworks, targeted investment in digital infrastructure, and extensive human capital development programmes (Delgado-Sánchez et al., 2025; Folorunso et al., 2024). To this end, initiatives that democratise access to AI tools through open-source platforms and cloud-based solutions can significantly lower barriers to entry for SMEs (Eyeregba et al., 2024). Similarly, fostering collaborations between academic institutions, governmental bodies, and industry players can facilitate knowledge transfer and skill development, thereby bridging the prevalent talent gap (de-Lima-Santos et al., 2024). Such collaborations are vital for developing AI solutions that are not only technologically sound but also culturally and linguistically appropriate for the

diverse African context (Balogun et al., 2023). Moreover, financial constraints and the lack of internal infrastructure are significant hurdles for SMEs, often leading them to perceive AI deployment as prohibitively costly and hindering their engagement with these transformative technologies (Ebuka et al., 2023). Specifically, limited financial resources, coupled with insufficient technical expertise and inadequate access to external knowledge networks, frequently impede SMEs from investing in AI-driven research and development, acquiring new technologies, or hiring specialised personnel (Iyelolu et al., 2024).

Technological Infrastructure Gaps

These limitations are further exacerbated by pronounced knowledge and expertise deficits within SMEs, which often manifest as apprehension about integrating AI into existing business models and organisational cultures (Schönberger, 2023). This frequently leads to a significant disparity in AI adoption rates between SMEs and larger corporations (Proietti & Magnani, 2025), underscoring the urgent need for targeted interventions. Specifically, limited financial resources, a lack of technical expertise, and concerns about data security and privacy are substantial impediments to widespread AI integration within this sector (Alnajjar et al., 2025; Iyelolu et al., 2024). Moreover, the absence of robust legal frameworks for intellectual property protection and inadequate AI-specific legislation further contribute to uncertainty, discouraging investment and innovation in AI initiatives among SMEs (Závodná et al., 2024). Addressing these challenges requires a multi-pronged approach involving strategic partnerships, capacity building, and policy support to create an enabling environment for AI adoption (Aderibigbe et al., 2023). Governments and funding agencies should actively facilitate cross-disciplinary partnerships and support research that bridges the gap between AI theory and practical problem-solving for SMEs (Kondo & Diwani, 2023). Additionally, establishing open AI infrastructure can mitigate some of these challenges by providing accessible platforms and resources for SMEs to experiment with and implement AI solutions (Sinde et al., 2023). This includes offering tailored financial incentives and grants to offset the initial capital expenditure for AI implementation, as well as providing subsidies for training programmes to upskill their workforce in AI competencies (Eyeregba et al., 2024; Vilma & Booshnam, 2025). Such measures are critical, given that SMEs frequently face severe financial and human resource constraints, which make investments in advanced technologies such as AI particularly challenging (Dinh et al., 2025; Schönberger, 2023).

These resource disparities are further compounded by a pronounced deficit in AI-related governance and regulatory expertise within SMEs, which hinders their capacity to navigate complex ethical and compliance landscapes crucial for responsible AI deployment (Kasneci et al., 2025). Consequently, bespoke AI implementation plans are essential, meticulously crafted to align with the unique operational and strategic requirements of individual SMEs, and to advocate for adaptable and supportive legislative frameworks (Rasdi & Baki, 2025). Addressing these multifaceted challenges requires a strategic approach that encompasses not only financial and educational support but also the development of a comprehensive data infrastructure, given that the availability and quality of data are paramount for effective AI training and deployment in SMEs (Eyeregba et al., 2024; Proietti & Magnani, 2025). This involves developing robust data governance policies and ensuring interoperability across various data sources to maximise the utility of available information for AI applications (Par, 2025).

Skill Shortages and Talent Development

Furthermore, the acute shortage of AI-proficient personnel within SMEs significantly impedes their capacity to conceptualise, develop, and deploy sophisticated AI solutions

(Schönberger, 2023). This deficit extends beyond technical specialists to include managerial staff who possess the requisite understanding to strategically integrate AI into core business processes and identify viable use cases (Oldemeyer et al., 2024). This scarcity of specialised talent directly limits SMEs' ability to fully leverage AI's potential, often leading to a conservative approach to innovation and delayed adoption of advanced technologies (Hafiz et al., 2025; Proietti & Magnani, 2025). Consequently, initiatives focused on AI literacy and practical skill development through specialised vocational training and university partnerships are critical to addressing this talent gap, enabling SMEs to build internal capabilities for AI integration (Huseyn et al., 2024). Moreover, a significant impediment is the high upfront costs of AI implementation, including specialised hardware, software licences, and the recruitment of proficient AI personnel, which often exceed the financial capabilities of many SMEs (Alnajjar et al., 2025).

Data Availability, Quality, and Security

The effective implementation of AI within SMEs is heavily reliant on access to substantial volumes of high-quality, domain-specific data, a requirement often unmet due to fragmented data collection practices, legacy systems, and privacy concerns (Delgado-Sánchez et al., 2025). Many SMEs struggle with smaller, lower-quality datasets compared to larger corporations, hindering the development of accurate and robust AI models (Proietti & Magnani, 2025). This issue is compounded by challenges in data governance, security, and interoperability, further complicating the utilisation of existing data assets for AI training (Závodná et al., 2024). While some scholars emphasise the necessity of extensive, high-quality data for AI implementation, others argue that successful AI applications can be developed with smaller, externally sourced, or collaboratively collected datasets, challenging the perception that limited internal data is an insurmountable barrier for SMEs (Oldemeyer et al., 2024). Additionally, the financial constraints faced by SMEs often limit their ability to invest in the necessary data infrastructure and expertise required for effective data curation and management (Par, 2025). Beyond internal data challenges, concerns about data privacy and cybersecurity threats further exacerbate SMEs' hesitancy to adopt AI, necessitating robust data protection strategies and adherence to evolving regulatory frameworks (Schönberger, 2023).

This underscores the critical need for scalable, secure data infrastructure solutions tailored to SMEs' resource constraints, enabling them to harness their data assets for AI-driven innovation without compromising sensitive information. Furthermore, the substantial initial financial outlay for AI technologies, including infrastructure, software, and talent acquisition, often presents an insurmountable barrier for SMEs with constrained budgets (Oldemeyer et al., 2024). This financial hurdle is further complicated by the perception among SMEs that AI implementation is prohibitively expensive and carries uncertain returns on investment, thereby deterring initial exploration and adoption (Soomro et al., 2025; Závodná et al., 2024). This financial barrier is exacerbated by the lack of clear return-on-investment metrics for AI in SME contexts, making it difficult for these enterprises to justify the substantial initial capital outlay (Oldemeyer et al., 2024; Proietti & Magnani, 2025). Consequently, the perceived high sunk costs and uncertain immediate benefits further disincentivise SMEs from adopting AI solutions, despite their long-term potential for productivity gains (Grashof & Kopka, 2022; Proietti & Magnani, 2025).

Financial Constraints and Access to Capital

The significant capital investment required for AI projects, encompassing software development, data management, and the recruitment of specialised personnel, often exceeds

the budgetary allocations of most SMEs, acting as a critical impediment to their digital transformation (Sala-Vilar, 2024). This is particularly true for smaller enterprises that often lack access to the venture capital and institutional funding readily available to larger corporations, thereby hindering their ability to invest in cutting-edge AI technologies and expertise (Iyelolu et al., 2024). Moreover, the substantial upfront costs associated with AI, IoT, and cloud infrastructure can deter investment, especially given the difficulties in justifying digital expenditures due to intangible benefits and delayed financial returns for SMEs (Mou et al., 2022). This financial barrier is compounded by the challenge of quantifying the return on investment for AI initiatives, making it difficult for SMEs to secure funding or justify the expenditure to stakeholders (Oldemeyer et al., 2024). This economic hurdle often forces SMEs to prioritise short-term operational stability over long-term technological advancements, stifling their competitive growth and innovation capacity (Oldemeyer et al., 2024).

Regulatory and Policy Environment

The absence of clear regulatory frameworks and supportive government policies further exacerbates SMEs' challenges in adopting AI, creating uncertainty over data governance, intellectual property, and ethical AI deployment (Oldemeyer et al., 2024). Regulatory ambiguity often deters SMEs from investing in AI because of potential legal complications, compliance burdens, and reputational risks amid evolving legislation (Barbu & Sitnikov, 2025). This environment calls for agile policy instruments that balance incentives for innovation with robust safeguards for data privacy and algorithmic transparency, particularly in nascent AI ecosystems (Proietti & Magnani, 2025). Furthermore, a lack of management support and expertise within SMEs can significantly hinder effective AI adoption, as successful implementation requires not only technological prowess but also strategic leadership to navigate organisational change and integrate AI into core business processes (Enshassi et al., 2023). The absence of in-house technical expertise and limited understanding of AI's potential applications further hinder SMEs' ability to identify, implement, and manage appropriate AI solutions (Eyeregba et al., 2024; Par, 2025). This deficiency in internal capabilities often forces SMEs to seek external support, underscoring a critical gap in accessible, affordable AI consulting and implementation services tailored to their specific operational and financial contexts (Barbu & Sitnikov, 2025). Moreover, financial constraints often prevent SMEs from securing the necessary external support, creating a self-perpetuating cycle of limited AI adoption (Proietti & Magnani, 2025). This multifaceted challenge underscores the need for targeted interventions that address the economic, technological, and educational disparities SMEs face in their pursuit of AI integration (Oldemeyer et al., 2024).

Ethical Concerns and Bias in AI

The inherent risks of algorithmic bias and a lack of transparency in AI systems pose significant ethical dilemmas for SMEs, potentially leading to discriminatory outcomes, reputational damage, and erosion of customer trust (Sarker et al., 2026). These concerns are particularly acute for SMEs, which often lack the dedicated ethical AI teams, robust risk-monitoring systems, and financial flexibility of larger organisations, making them more vulnerable to operational errors and ethical oversights (Ahmed, 2025). Furthermore, the technical limitations of explainability in AI models, coupled with their vulnerability to errors and adversarial attacks, diminish trust in AI outcomes and decision-making processes within SMEs (Sarker et al., 2025, 2026). The "black box problem", where AI-generated outputs lack adequate explanation, further exacerbates this distrust, posing significant hurdles for SMEs seeking to implement AI solutions transparently and responsibly (Ashkani et al., 2026).

Consequently, SMEs struggle to ensure data privacy and comply with intricate regulatory frameworks such as the GDPR, especially given their limited resources for comprehensive data protection measures (Abhulimen& Ejike, 2024). This vulnerability is further compounded by threats such as data poisoning and model inversion attacks, which can compromise data integrity and confidentiality, as well as risks like hallucinations and prompt injection in large language models, which increase exposure to misinformation and unreliable outcomes (Sarker et al., 2025). Addressing these multifaceted ethical challenges requires a comprehensive approach, including robust data protection measures, continuous monitoring for algorithmic bias, and proactive workforce management strategies (Abhulimen& Ejike, 2024). The absence of diverse datasets and expertise in bias mitigation techniques can exacerbate these vulnerabilities, necessitating continuous monitoring and adjustment of AI systems to ensure fairness and ethical decision-making within SMEs (Abhulimen& Ejike, 2024). Many small and medium-sized enterprises are still in the nascent stages of AI adoption, leading to delayed recognition of the critical importance of ethical considerations (Oldemeyer et al., 2024). Overcoming these challenges requires a proactive integration of trust and ethical principles within AI adoption strategies, ensuring that technological innovation aligns with both societal values and regulatory expectations (Sarker et al., 2025). This proactive approach is crucial, as SMEs frequently struggle to fully leverage AI technologies due to persistent concerns surrounding trust and ethical implications (Sarker et al., 2026). For instance, a notable disparity exists in AI adoption rates across different enterprise sizes, with micro-enterprises and smaller SMEs lagging significantly behind larger counterparts (Sarker et al., 2025). This disparity is often attributed to the substantial technical, ethical, and trust-related challenges that complicate AI adoption within smaller enterprises (Sarker et al., 2026). Consequently, SMEs must embed trust and ethical principles throughout the AI lifecycle to ensure secure and responsible use of AI and LLMs, safeguarding against technical limitations, ethical risks, and trust deficits (Sarker et al., 2025, 2026). This integration is vital for balancing innovation with responsibility, emphasising transparency, explainability, accountability, and a secure-by-design approach (Sarker et al., 2026).

Implications for Policy, Practice, and Research

This section outlines the multifaceted implications of our conceptual framework for various stakeholders, offering actionable insights to help policymakers, practitioners, and researchers foster an AI-ready SME ecosystem. For policymakers, developing tailored regulatory frameworks and support mechanisms is crucial to mitigate ethical risks such as bias and lack of transparency, which are often exacerbated by SMEs' resource constraints (Sarker et al., 2026). Such frameworks must address the need for simplified explainability tools and robust yet accessible bias-detection algorithms that are practical for deployment in resource-limited SME environments (Sarker et al., 2025). Furthermore, policy initiatives should incentivise the development of AI solutions that operate effectively on smaller datasets, thereby circumventing a significant technical hurdle for SMEs. Policymakers should also consider establishing collaborative platforms that facilitate knowledge transfer and resource sharing among academic institutions, large enterprises, and SMEs, fostering an environment in which best practices in ethical AI and data governance can be disseminated effectively (Sarker et al., 2025, 2026). For practitioners, this involves strategically integrating domain-specific interpretability techniques to ensure that AI outputs are not only transparent but also actionable and ethically sound within the unique operational contexts of SMEs (Sarker et al., 2025). This also necessitates the development of practical guidelines and training programmes that empower SMEs to implement secure-by-design architectures and robust governance strategies for AI adoption (Sarker et al., 2025, 2026). These strategies should

prioritise transparency, explainability, and accountability, translating abstract ethical principles into actionable frameworks for responsible AI deployment (Sarker et al., 2025). Such initiatives should aim to cultivate a culture of responsible AI innovation, fostering trust and mitigating risks associated with emerging technologies such as large language models (Sarker et al., 2026). For instance, policymakers could facilitate specialised training programmes and foster academic partnerships to address the unique financial and digital literacy gaps prevalent in SMEs (Sheik, 2023; Soudi&Bauters, 2024). The framework also serves as a scalable blueprint for policymakers to shape SME-focused digital strategies, funding schemes, and regulatory interventions (Sarker et al., 2025). This includes aligning technological investments with business objectives and addressing regional disparities in AI adoption and infrastructure (Cao, 2025). Moreover, policy should support the development of accredited systems for AI ethical practices and provide up-to-date training for employees and managers, ensuring SMEs remain current with the latest frameworks and guidelines for risk management and quality control (Soudi&Bauters, 2024).

Policy Recommendations for African Governments and Regional Bodies

Given the unique socio-economic landscape and aspirations of AU Agenda 2063, policies must focus on fostering a supportive ecosystem that encourages responsible AI innovation while addressing specific regional challenges, such as infrastructure deficits and digital literacy gaps (Raji et al., 2024). This requires targeted investments in digital infrastructure, adaptive regulatory frameworks, and skills development to bridge the digital divide (O'Neill et al., 2024; Raji et al., 2024). Specifically, African governments should prioritise formulating AI policies responsive to African conditions rather than merely importing frameworks from other contexts, thereby fostering an ethical dialogue on AI that aligns with local values and development goals (Ormond, 2020). Such policies should promote science education and STEM fields, encouraging visible, practical initiatives to drive a revolution in scientific research and innovation across Africa (Eke &Ogoh, 2022). Additionally, these policies must account for the unique challenges SMEs face, including limited resources and personnel, when developing ethical AI guidelines and ensuring regulatory compliance (Soudi&Bauters, 2024). Furthermore, fostering knowledge exchange programmes between technologically advanced regions and emerging markets, coupled with comprehensive skills development initiatives, can bridge the AI talent gap and encourage cross-border research collaborations (Osasona et al., 2024). This can be achieved by making strategic investments in establishing AI institutes, similar to the model of national oil company R&D centres, to scale local AI research capabilities (Diallo et al., 2024). These institutions could serve as crucial hubs for developing localised AI solutions, training a specialised workforce, and integrating ethical considerations pertinent to the African context into AI development frameworks (Huriye, 2023; Mweha, 2026). Additionally, governments should explore existing policy and legislation related to algorithms, automation, data, and digital technology, drawing on these to inform the development of robust AI governance frameworks (Plantinga et al., 2024). This proactive approach ensures that AI adoption reflects local priorities and safeguards educational and societal integrity, promoting an equitable digital transformation (Leo et al., 2025; Maluleke, 2025). Furthermore, establishing AI regulatory sandboxes and incentivising public-private partnerships can accelerate the responsible development and deployment of AI technologies within African SMEs, fostering an innovation ecosystem tailored to local needs (Folorunso et al., 2024). Moreover, comprehensive AI policies are essential to ensure ethical practices, inclusivity, and responsible AI governance, necessitating frameworks that address bias, transparency, and privacy concerns while engaging diverse stakeholders (Aderibigbe et al., 2023).

Practical Implications for SME Owners and Managers

SME owners and managers must proactively engage with emerging AI technologies, shifting from a reactive stance to strategic foresight in digital transformation. This entails recognising AI not merely as a technological upgrade but as a fundamental shift in operational paradigms, requiring significant investment in human capital development and process re-engineering. They should prioritise a phased approach to AI adoption, starting with affordable applications to optimise inventory and customer relationship management, while progressively building internal capabilities for more advanced systems (Jamil et al., 2025). This gradual integration allows SMEs to mitigate initial financial and operational risks, ensuring sustainable growth and avoiding common pitfalls associated with rapid technological transitions (Holland, 2026). Furthermore, SMEs should actively seek support beyond funding, including advisory networks, regulatory clarity, tailored sectoral guidance, and platforms for collaborative problem-solving (Amanollahnejad et al., 2026).

Understanding and navigating the complexities of fragmented data governance and ensuring data quality are paramount for successful AI implementation, requiring managers to invest in robust data management strategies and infrastructure (Holland, 2026). Additionally, given the pervasive cyber threats in the digital era, SME owners and managers must prioritise robust cybersecurity measures, data protection protocols, and employee training to mitigate risks and ensure resilient infrastructure against evolving cyberattacks (Okoye et al., 2024). This proactive stance on cybersecurity is particularly crucial in developing countries, where SMEs often face unique challenges in cybersecurity practices and skill gaps (Okoye et al., 2024). Therefore, managers should invest in comprehensive cybersecurity frameworks and AI ethics training for their workforce to ensure data integrity and compliance with emerging AI regulations, particularly those concerning fairness, accountability, and transparency (Abbulimen& Ejike, 2024). This includes educating employees, updating software, implementing strong password policies and two-factor authentication, conducting regular backups, and establishing a clear security policy that outlines procedures for security breaches (Mieszajkina et al., 2025). These measures are critical for safeguarding sensitive information and maintaining operational continuity, particularly given the increasing sophistication of cyber threats (Benjamin et al., 2024).

Knowledge Contribution Framework

The proposed digital transformation framework for AI-ready SMEs offers eight distinct contributions to knowledge across theoretical, practical, ethical, governance, risk, methodological, policy, and regional development domains. Collectively, these contributions address a significant gap: the lack of a contextually relevant, ethically grounded, and operationally feasible pathway for small and medium-sized enterprises in emerging markets, particularly in Africa, to adopt artificial intelligence responsibly.

Theoretically, the framework synthesises four established theories: Stakeholder Theory, Diffusion of Innovation (DOI), the Technology-Organisation-Environment (TOE) framework, and Socio-Technical Theory into a unified model. While each theory has been applied separately in information systems research, no prior study has integrated all four specifically for AI adoption in African SMEs. This synthesis is novel because it simultaneously addresses who is affected by AI (stakeholders), how innovation spreads among resource-constrained firms (DOI), what contextual factors enable or hinder adoption (TOE), and how human intuition and AI autonomy can coexist symbiotically (socio-technical theory). The result is a holistic theoretical lens that captures the technological, organisational, societal, and ethical dimensions of AI integration.

Practically, the framework offers a five-phase adoption roadmap: Awareness and Alignment, Readiness Building, Pilot Integration, Scaling and Expansion, and In-house Development. This phased approach is significant because it respects SMEs' resource constraints while providing a clear, incremental pathway from basic digital literacy to the development of proprietary AI solutions. Unlike one-size-fits-all models, this roadmap allows SMEs to progress at their own pace, with governance practices evolving in lockstep with the increasing integration of AI.

Ethically, the framework makes a crucial contribution by contextualising global AI principles for African realities. Existing guidelines from the EU and OECD are largely abstract and tailored to large enterprises in developed economies. This framework translates values such as fairness, transparency, accountability, and trust into actionable implementation layers: bias detection, explainability, audit trails, and feedback mechanisms that are feasible in resource-constrained settings. It bridges the gap between abstract ethics and operational practice.

In governance and risk management, the framework introduces streamlined, light-touch governance layers to avoid overburdening SMEs with excessive compliance requirements. It also proposes a dual taxonomy for AI risk assessment: causal taxonomies that identify root causes of risks, such as poor data quality, skill gaps) and domain taxonomies that map potential impact areas, notably financial loss and reputational harm. This structured approach enables targeted mitigation strategies rather than generic responses.

Methodologically, the framework provides a systematic tool for assessing SMEs' AI readiness, covering digital literacy, data integrity, leadership commitment, and organisational culture. From a policy perspective, it offers actionable guidelines for national AI strategies that enable rather than hinder SME participation. At the regional level, the framework aligns with the African Union's Agenda 2063, supporting inclusive growth and industrialisation.

Table 1: The tabular breakdown of the knowledge contribution components emerging from conceptual analysis

Pillars	Scope to knowledge contribution	Summary
1	Theoretical	Synthesis of Stakeholder, DOI, TOE, and Socio-Technical theories for African SME AI adoption
2	Practical	Five-phase scalable adoption roadmap from awareness to in-house development
3	Ethical	Contextualised ethical principles operationalised into actionable layers
4	Governance	Streamlined, resource-aware governance that evolves with AI integration
5	Risk	Causal and domain taxonomies for structured AI risk assessment
6	Methodology	AI readiness assessment framework for

		SMEs
7	Policy	Actionable guidelines for national AI strategies targeting SMEs
8	Regional Development	Direct alignment with AU Agenda 2063 (inclusive growth & industrialisation)

Emerging from the tabular breakdown and extensive analysis, the research emerged with a knowledge contribution framework as elaborated in Figure 1: Diagrammatic illustration of the digital transformation framework for AI-ready SMEs towards the African Union's Agenda 2063's inclusive growth and industrialisation

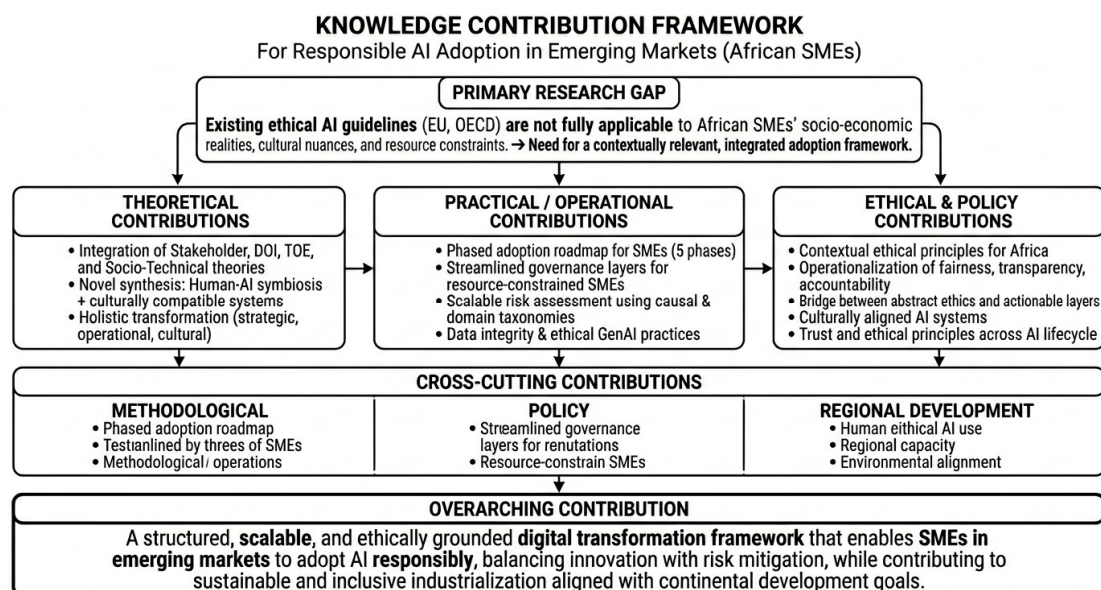


Fig 1: Diagrammatic illustration of the digital transformation framework for AI-ready SMEs towards the African Union's Agenda 2063's inclusive growth and industrialisation (Researchers' Construction 2026)

Reiteration of the Framework's Significance

This framework offers a critical lens for examining and strategising the digital transformation journey of African SMEs, emphasising their pivotal role in achieving the AU Agenda 2063's broader industrialisation and inclusive growth objectives. By synthesising FinTech, AI, and cybersecurity considerations, it provides a robust roadmap for fostering an enabling ecosystem that empowers SMEs to harness advanced technologies for sustainable development (Okoye et al., 2024). Moreover, it highlights the imperative for synergistic policy development that encourages innovation, ensures data privacy, and cultivates a secure digital environment in which SMEs can flourish (Obiki-Osafiele et al., 2024; Okoye et al., 2024). Ultimately, this comprehensive approach will position resilient and competitive SMEs to drive economic diversification and generate significant societal value across the continent (Okoye et al., 2024).

Conclusion

This paper underscores the transformative potential of AI for Small and Medium-sized Enterprises within the framework of the African Union's Agenda 2063, emphasising the need for a comprehensive digital transformation framework. By identifying key challenges and opportunities, this conceptual study lays a foundation for policymakers and SME stakeholders to foster an environment conducive to AI adoption and sustainable growth. The framework enhances understanding of how SMEs can leverage AI to improve performance and resilience, thereby advancing economic prosperity in the African context (Okoye et al., 2024). Future empirical research is necessary to validate the proposed framework and assess the impact of AI adoption on SME growth, innovation, and competitiveness across various African regions and sectors (Madondo et al., 2024; Yesuf & Fields, 2025). Further studies should examine the ethical implications of AI adoption, including concerns about data privacy, security, and the potential for AI to reinforce socio-cultural biases (Ridho, 2023). Additionally, investigating the influence of government-backed funding and innovation hubs on AI adoption and digital transformation among African SMEs would provide valuable insights for policy development (Boikanyo, 2025).

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