

Enabling AI Adoption in the U.S. Small and Medium Enterprises: A Strategic Capability and Adoption Framework

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ABSTRACT

Objective: This study fills this void by suggesting a Strategic Capability and Adoption Framework which will allow U.S. SMEs to systematically measure organizational readiness, to pursue a structured path for the adoption of AI-enabled business analytics, and to assess business performance outcomes. **Method:** The research method used is deductive research that is underpinned by the literature review, development of a framework, and empirical testing by a secondary dataset on the digital adoption of SME and sales performance. To demonstrate the application of the proposed framework, descriptive analysis, correlation analysis, and regression analysis are used to study the correlation between technological adaptation and business performance. **Results:** The proposed framework consists of three interdependent areas: Organizational Readiness, Structured AI Adoption Roadmap, and Competitive Performance Impact. Organizational readiness involves studying key prerequisites for successful AI adoption, such as leadership commitment, digital capability, analytics literacy, and strategic alignment. The adoption roadmap covers a progressive adoption process from awareness and assessment through to pilot implementation and organizational scaling and continuous optimization. Business measures are used for assessing competitive performance, such as business growth, business efficiency, productivity, customer responsiveness, and business resilience. The outcome should be a management decision framework that helps the SME owner and/or manager assess the readiness of their organization to consider AI and mitigates the risks of implementation while enhancing strategic decision-making. **Novelty:** This study enriches the literature by bringing together the organizational capability, structured adoption of AI, and measurable business performance within a single framework to facilitate sustainable AI-driven transformation among U.S. SMEs.

INTRODUCTION

Background of the Study

AI (Artificial Intelligence) is undeniably one of the most powerful technologies leading the way in digital transformation in the various sectors. AI tools have streamlined operational processes, facilitated real-time business insights, and enhanced decision-making and strategic planning, all while reducing manual effort and saving time [1]. AI-powered business analytics relies on cutting-edge analytical tools and intelligent algorithms to convert raw data into meaningful insights, empowering businesses to make informed decisions and adapt to market trends and customer needs. This has made AI technologies a major investment priority for businesses across the globe, as they seek to enhance their innovation, competitiveness and long-term sustainability [2]. Small and medium size business (SME) is a critical component of the U.S. economy, representing a

large share of the U.S. workforce, innovation, entrepreneurship and national economic growth. Despite the economic value of business analytics, many U.S. SMEs struggle to utilize AI-powered business analytics solutions because of a lack of funds, expertise in digital technologies, organizational readiness or talent, and skills [3]. SMEs may have fewer resources, especially in terms of technology investment, and therefore, implementing AI might be more challenging and uncertain, unlike large organizations which may have dedicated technology teams and more capital to invest [4]. While AI tools are more readily available in cloud computing services and commercial software, there remains a challenge for many SMEs to discern which skills and knowledge their organizations need to effectively leverage these technologies [5]. Existing research mostly focuses on technical aspects of AI development, optimization of algorithms or system performance, but there has been a relative lack of focus on organizational preparedness, decision-making around organizational adoption or evidence of business impact [6]. This makes it more important than ever to provide a practical, business-oriented framework to help SMEs navigate structured adoption of AI and boost the organization's capability and sustainable competitive performance.

Problem Statement

While the potential of Artificial Intelligence is considerable in order to enhance organizational performance, there are significant barriers to successful AI adoption in many small and medium enterprises (SMEs) in the United States [7]. The majority of SMEs are not organizationally prepared, do not have a clear leadership buy-in, are not digitally adept, or do not have a proper planning framework in place for effective implementation of AI-powered business analytics. Existing adoption methods tend to emphasize technology implementation, but give no guidance to business managers on how to assess readiness, the order of adoption activities and how to manage the change in the organization [8]. Measuring the value of the business resulting from AI investments is a problem for many SMEs, which leads to uncertainty about the implementation [9]. A pragmatic strategic approach that combines organizational preparedness, structured adoption and quantifiable business outcomes is needed to enable the successful implementation of AI in the U.S. SMEs.

Research Purpose

The purpose of this study is to create an effective Strategic Capability and Adoption Framework for U.S. small and medium enterprises (SMEs) to successfully embrace AI for business analytics from the organizational and managerial perspectives [10]. This study does not simply look at the technical aspects of the AI system or the machine learning model, but rather delves into the organizational skills, leadership preparedness, strategic planning, and organized implementation procedures necessary for successful AI integration [11]. The framework aims to help the owners, managers, and decision-makers of SMEs assess their readiness to adopt AI technology before committing funds. It also includes a staged adoption plan, allowing companies to roll out AI gradually based on their resources, priorities, and business goals [12]. It further embeds clear links between

organizational capability and quality of AI adoption, to measurable business outcomes such as operational efficiency, sales growth, productivity, customer responsiveness, and organizational resilience [13]. This study aims to fill the gap between theory and practice in the field of business implementation of AI, combining the domain of organizational theories with the latest research on the current status of AI adoption [14]. The resulting framework is anticipated to serve as a managerial decision support tool for minimizing the risk of implementation, enhance the strategic decision-making process and allow SMEs to maximize the value of AI-enabled business analytics [15]. This study is to offer a scalable and business-friendly roadmap to enable sustainable digital transformation and improve the future competitiveness of U.S. SMEs.

Research Objectives

The following objectives are the aims of the study:

- To establish what capabilities are needed in an organization to be successful in adopting AI for business analytics in SMEs within the U.S. market.
- To explore factors that affect the readiness of the organization for the adoption of AI in resource-limited SMEs.
- Create a phased and structured adoption AI roadmap for SMEs.
- To explore the connection between capability to adopt AI and measurable business outcomes [16].
- To develop a Strategic Capability and Adoption Framework, which combines organizational readiness, AI adoption, and competitive performance.
- To give real-life managerial guidelines to help SME owners and decision makers effectively use AI-powered business analytics.

Research Questions

This study is guided by the following research questions:

- What organizational skills do U.S. SMEs need to be successful with the adoption of AI?
- What are the steps for SMEs to determine if they're ready to adopt AI-powered business analytics?
- What steps do SMEs need to take to strategically embrace AI?
- What are the effects of AI on the competitive performance of SMEs?

Significance of this Study

This study contributes to the growing body of knowledge on artificial intelligence adoption by proposing an integrated Strategic Capability and Adoption Framework specifically designed for U.S. small and medium enterprises [17]. This study is an extension of previous studies, as it considers organizational readiness, strategic capability, phased adoption of AI, and competitive performance in a single conceptual model [18]. This study takes a paradigm shift from previous work that mostly focuses on implementation of technology or algorithm design, and brings a business view where managerial decision-making and organizational change take center stage [19]. A managerial point of view, the proposed framework offers practical support to the SME

owners, executives, and business managers in order to assess their readiness for AI, plan their structured implementation, and measure the business outcomes [20]. The framework provides an assessment process to determine readiness, a phased adoption timeline and performance metrics to aid with investment decisions and minimize uncertainty and organizational risk during implementation [21]. The study's results could help policy makers, economic development bodies and industry bodies develop policy measures that promote responsible use of AI among SMEs. The framework can be used as guidance for training programmers, funding policies and digital transformation policies to enhance technological potential, innovation and business resilience [22]. This study helps facilitate the adoption of AI in a more effective way, bolstering the competitiveness of U.S. SMEs and sustainable economic growth in a more data-driven business landscape.

Scope of the Study

This study is dedicated to investigating the use of AI-powered business analytics in small and medium-sized businesses in the United States. The research does not focus on the technical aspect of system development, but rather on the strategic management and organizational capability aspect of adopting AI. In particular, the study examines the organizational readiness factors, strategic capabilities, and implementation processes that affect the successful use of AI by SMEs. It also examines the impact of structured AI adoption on tangible business results, such as efficiency, increased sales, productivity, customer responsiveness, and organizational resilience [23]. This study proposed and tests a Strategic Capability and Adoption Framework with a secondary SME data-set to show the relationship between technological adaptation and business performance [24]. The study does not create or assess artificial intelligence algorithms, machine learning models, or software applications, but rather focuses on managerial decision-making, organizational transformation, and implementation advice for sustainable AI implementation in U.S. SMEs.

AI Adoption and Digital Transformation in SMEs

Artificial Intelligence (AI) has emerged as a major catalyst for digital transformation, helping organizations become more efficient, make better decisions and achieve a competitive edge by using data-driven business practices [25]. AI-powered business analytics combines sophisticated algorithms and analytics to convert data into valuable insights for informed decision-making and streamlined operations [26]. The use of AI technologies is gaining momentum in many areas of business, including finance, marketing, supply chain, customer service, and forecasting, but it's not as prevalent in small and medium enterprises (SMEs). Financial constraints, insufficient technology and digital systems, lack of skilled personnel, and doubts about the potential ROI of investment in AI can be significant challenges for SMEs. While cloud-based AI applications are becoming more common and cost-effective software-as-a-service solutions are expected to become more widely adopted, the adoption of these solutions is contingent upon organizational readiness and strategic planning as well as

technological accessibility [27]. Digital transformation isn't just about technology acquisition, but is a commitment that must be led, engaged, learned and continually developed within the organization. Existing studies show that SMEs that successfully digitize their business start by setting out clear business goals prior to technology adoption, which allows AI to become more than a technology, but rather a business enabler [28]. It's important to recognize AI as a process of change management for an organization, rather than merely an implementation stage, and to equip business personnel with the proper capabilities and resources needed to successfully implement these changes and reap lasting value [29]. It is crucial to understand AI not as a process of implementation, but as a process of change management; it demands strategic alignment, appropriate change management and ongoing capability development to deliver lasting business value.

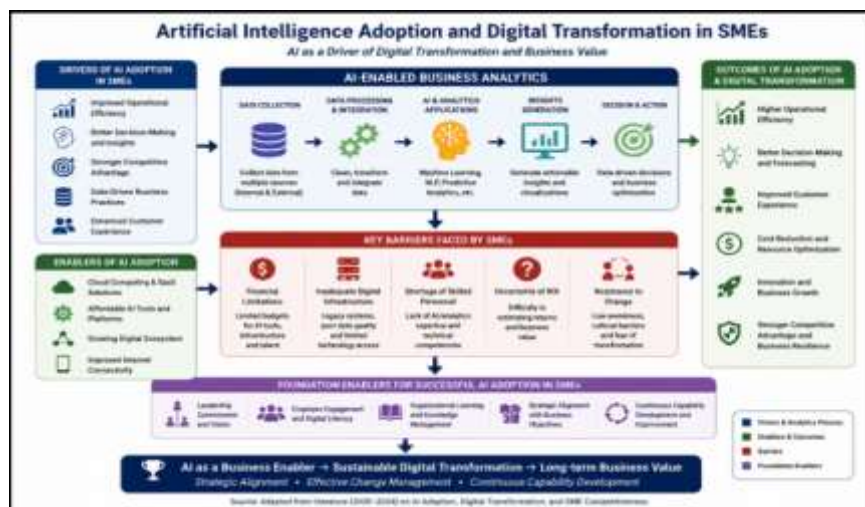


Figure 1. The image shows an overview of the AI adoption process, barriers, enablers and digital transformation outcomes for SMEs

The figure 1 shows the contribution of Artificial Intelligence (AI) in the digital transformation in Small and Medium Enterprises (SMEs). The diagram displays the major factors driving the adoption of AI such as operational efficiency, better decision making, competitive edge, and data-driven business practices. It illustrates the AI-driven business analytics journey, from data collection to data integration, AI analytics, insight generation, and data-driven decision-making [30]. The figure also points to key challenges for SMEs, including financial constraints, inadequate digital infrastructure, skill shortage, uncertain return on investment, and resistance to change [31]. Last but not least, it highlights the basic enablers and provides examples of the benefits strategic AI adoption can provide to achieve sustainable digital transformation, enhanced business outcomes and long-term competitive value.

AI Adoption Organizational Readiness and Strategic Capability

One of the key factors that can impact the success of implementing AI in SMEs is organizational readiness. It is a measure of how well an organization is ready to adopt new technologies, specifically through sufficient leadership commitment, digital preparedness, employee skills, culture and strategy [32]. Research shows that not all AI

adoption failures are due to technical challenges, but mostly to lack of organizational readiness and inadequate change management. Strategic capability can also help organizations identify business opportunities, to allocate resources effectively, and to incorporate new technologies into the business processes [33]. The role of leadership in setting a vision for AI adoption, getting employees engaged and fostering and reinforcing a data-driven culture is especially relevant [34]. Employee capabilities in digital literacy and analytics competency impact the effective use of insights created using AI. AI adoption is more likely to be incremental, reduce risk of implementation and bring tangible business benefits for SMEs with higher organizational readiness [35]. Companies with poor strategic skills often have poor implementation, resistance to change, and not fully leveraging their AI investments [36]. So, organizational readiness is a multi-dimensional construct, which includes managerial commitment, organizational learning, digital maturity and resources availability [37]. The ability to build these skills before implementation is strongly correlated with the successful adoption of AI for an organization and ensure its competitiveness in the long term.

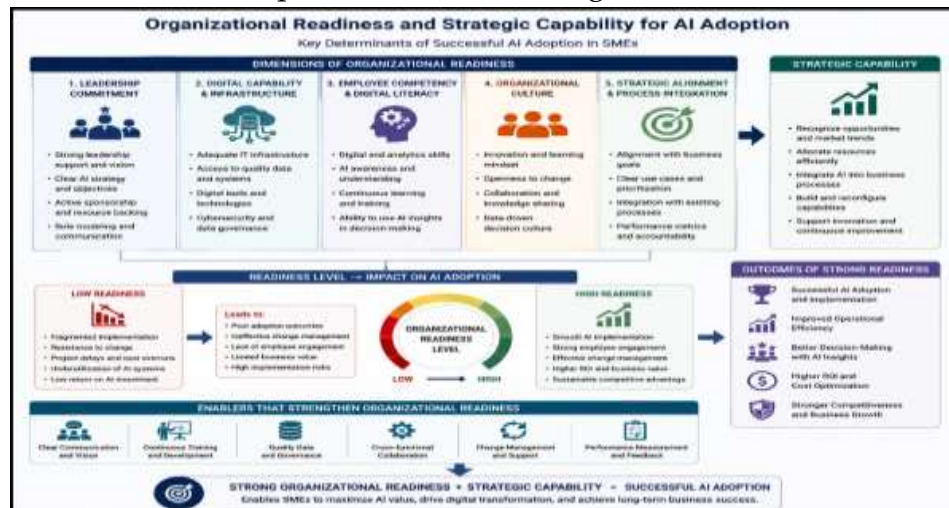


Figure 2. This image illustrates organizational readiness and strategic capabilities to be successful in the adoption of AI for SMEs

As shown in Figure 2, the success of introducing Artificial Intelligence (AI) into a Small and Medium Enterprise (SME) depends heavily on the readiness and strategic capability of the organization [38]. The figure shows five important dimensions of organization readiness: commitment of leadership, digital capability and infrastructure, digital competency of employees, organization culture, and business processes alignment [39]. It illustrates the combined impact of these dimensions on enhancing an organization's strategic capabilities in identifying opportunities, optimizing resource usage, and embedding AI into the business workflow [40]. The diagram also illustrates how the development of AI can lead to both good and bad results depending on the organizational readiness, emphasizing the need for collaboration, change management, training, data governance, communication, and performance measurement to ensure successful implementation, operational excellence, and sustainable competitive advantage.

Structured AI Adoption Roadmap and Change Management

Implementing AI is a process that needs to be structured and appropriate to the organizational goals and resources to be successful [40]. But not all SMEs have a systematic approach in place to implement AI, leaving them in danger of project delays, poor use of resources, and failure to deliver value to the business [41]. A phased roadmap for adopting AI will give organizations a clear set of activities to follow on a complex implementation, and it will help ensure that they continue to learn from the organization [42]. Common adoption phases are being aware, assessing the organization, piloting, deploying, scaling the organization, and optimizing it [42]. These phases allow SMEs to assess their organization's readiness, pinpoint areas for development and optimize the roll-out of AI for operations across various business functions before going further [43]. Change Management principles are also a key tool in supporting the successful adoption of the change as they help to tackle employee resistance, enhance communication, ensure leadership engagement, and facilitate the exchange of knowledge during the process of implementing the change [44]. Incremental adoption enables SMEs to reduce financial risk, while building their capabilities and confidence step-by-step. Literature indicates that structured implementation models yield a higher level of technology acceptance, employee engagement and operational performance than do organizations that implement AI with isolated technology investments [45]. Thus, structured adoption planning in tandem with organizational change management offers a pragmatic approach for SMEs to achieve sustainable digital transformation via AI without the risk of uncertainty during implementation and maximizing the value of AI in the long-term.

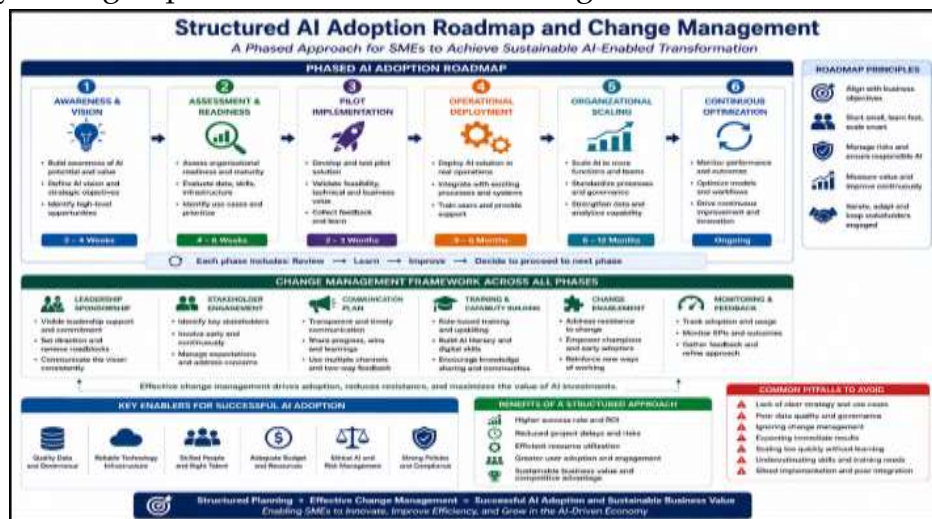


Figure 3. This image shows a phased AI adoption roadmap integrated with organizational change management for SMEs

The process of structuring the Artificial Intelligence (AI) adoption roadmap for Small and Medium Enterprises (SMEs) and incorporating change management practices is depicted in figure 3. The roadmap goes through six sequential implementation phases - awareness and vision, assessment and readiness, pilot implementation, operational deployment, organizational scaling and continuous optimization [46]. The phases include a set of key activities that help organizations assess readiness, validate AI

solutions, deploy applications and continually enhance performance. Key change management elements are also emphasized, such as leadership sponsorship, involvement of stakeholders, communication planning, employee training, change enablement, and performance monitoring [47]. It highlights key success factors, potential organizational gains, and typical pitfalls in implementing AI, showcasing the importance of structured planning and strategic change management for long-term AI adoption and value creation.

Adoption of AI and Business Competitive Performance

AI's goal is to create identifiable and quantified improvements for organizations and their competitive edge. With AI-powered business analytics, organizations can make informed decisions supported by real-time data on customer behavior, streamline operations, track financial performance, and analyze market trends. AI-driven business analytics empowers organizations to make data-informed decisions, optimize operations, monitor financial performance, and analyses market trends, all driven by real-time data. Existing studies have shown that firms that successfully leverage AI in business processes gain benefits in productivity, process efficiency, predictive accuracy, customer responsiveness, innovative capacity, and quality of strategic decisions [48]. The use of AI can help SMEs engage with competition in a more effective manner, even with fewer resources and by automating repetitive tasks and improving managerial decisions [49]. But, the quality of the organizational capability and strategic execution play a role in determining competitive performance apart from the use of AI. Having effective leadership commitment, employee skills, and structured implementation procedures increases the likelihood that organizations will yield measurable business outcomes from their AI investments [50]. These are typical performance metrics that are used as indicators: Sales growth, Operational efficiency, Revenue improvement, Customer satisfaction, Cost reduction, Innovation performance, and Organizational resilience [51]. Thus, the concept of competitive advantage is considered as the result of a holistic process that involves organizational preparedness, structured and planned AI adoption, and ongoing performance assessment [52]. This view can facilitate the formulation of a complete framework of the Strategic Capability and Adoption of AI to help SMEs leverage the long-term value of AI-driven business analytics within their businesses and enhance their competitiveness in digital markets.



Figure 4. This image illustrates the process of AI adoption, its impact on competitive business performance, and sustainable advantage for SMEs

Figure 4 shows how small and medium businesses (SMEs) relate to the performance of competitive business through the adoption of Artificial Intelligence (AI). Key organizational enablers for successful AI adoption are key building blocks of the framework, such as leadership commitment, organization capabilities, employee competency, and strategic alignment. It then outlines a practical process for implementing AI, which includes assessing, designing, implementing, operating and improving AI solutions. Business analytics powered by AI is a key element of evidence-based decision making that helps organizations use their data to make better decisions [53]. The figure illustrates the transformative power of AI's implementation, improving operational efficiency, customer responsiveness, financial performance, forecasting accuracy, innovation capability, and organizational resilience [54]. It also points to the important performance measures, success factors and the implementation hurdles, and stresses the importance of organizational ability, strategic implementation and constant performance evaluation for sustainable competitive advantage.

Existing Research and Research Gap

In the article titled "Artificial Intelligence (AI)-Driven Strategic Business Model Innovations in Small- and Medium-Sized Enterprises: Insights on Technological and Strategic Enablers for Carbon Neutral Businesses" by Aqueeb Sohail Shaik, Safiya Mukhtar Alshibani, Girish Jain, Bhumika Gupta, and Ankit Mehrotra (2023), the authors investigated how AI-driven business model innovation enhances technological and strategic enablers that support carbon-neutral business practices among U.S. SMEs. The study, which involved 326 SMEs, employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to show the positive relationship between AI adoption and technological capabilities, strategic alignment, stakeholder collaboration, and organizational sustainability [1]. The results highlighted the potential for AI-driven innovation to enhance operational efficiency and support the shift toward sustainability in business practices. The study, however, was more about sustainability and carbon neutrality, and it did not offer a full picture of how prepared organizations are to adopt

AI and how it can be implemented across their broader business operations. It also didn't offer a roadmap for a structured implementation that would connect organizational readiness, progressive deployment of AI, and measurable competitive business performance. To fill this need, the present research proposes and creates a Strategic Capability and Adoption Framework, which combines organizational readiness, a structured AI adoption roadmap, and competitive performance metrics to guide the adoption and implementation of AI for business analytics in SMEs within the U.S. context.

Sherin Ashraf Kalleparambil and Mohamad Akoum explored the significance of organizational readiness, a crucial factor in successful AI implementation within small and medium enterprises (SMEs), in the article "AI Organisational Readiness for SMEs: A Tailored Model for AI Adoption Success". The study conducted a detailed literature review and analysis of the existing frameworks for AI adoption, which led to the development of a conceptual framework consisting of five dimensions: Strategic Readiness, Organisational Readiness, Technological Readiness, Capability Readiness, and Ecosystem Readiness. The model offers a structured method of evaluation and implementation, adapted to the specific challenges faced by SMEs, such as limited resources, lack of AI expertise, and poor data infrastructure [2]. This study makes valuable contributions to the theoretical knowledge of AI readiness and provides practical recommendations for organizations looking to enhance their AI implementation. The proposed model, however, is still conceptual and has not yet been empirically validated or explored to see how AI readiness affects measurable business performance outcomes. Moreover, it doesn't show a gradual path for AI adoption with competitive metrics. The research aims to address these gaps by proposing and testing a Strategic Capability and Adoption Framework that combines organizational readiness, a structured journey for implementing AI adoption, and business performance metrics to facilitate sustainable AI adoption in U.S. SMEs.

In the article titled "Artificial Intelligence Capabilities, Sustainable Innovation and SMEs' Resilience: A Serial-Parallel Mediation Model of Dynamic and Digital Platform Capabilities" by Wided Ragmoun and Wassim J. Aloulou (2026), the authors investigated how artificial intelligence capabilities contribute to sustainable innovation and organizational resilience in small and medium-sized enterprises (SMEs). The study adopted Dynamic Capability Theory (DCT) to analyze the data of 321 Saudi SMEs using Structural Equation Modeling (SmartPLS), which revealed that the AI capabilities have a significant effect on sustainable innovation and organizational resilience with the mediating role of digital platform capabilities and dynamic capabilities. The research underscores the potential for SMEs to adapt to their surroundings and enhance their lasting competitiveness through the combination of AI and organizational capabilities [3]. The findings remain largely context-specific for the nation studied, however, and do not offer a quick solution to determine organizational readiness, plan a phased AI roll-out, or directly correlate AI implementation with the quantifiable business metrics of

sales growth, productivity or operational efficiency. The present study proposes and empirically tests a Strategic Capability and Adoption Framework for U.S. SMEs that combines organizational readiness, an AI roadmap for adoption, and competitive business performance outcomes that provide a practical decision-support model for adoption of AI-supported business analytics in SMEs.

Conceptual Framework

Strategic Capability and Adoption Framework proposed

A proposed Strategic Capability and Adoption Framework was developed. The Strategic Capability and Adoption Framework that is proposed offers a comprehensive process for making AI adoption in U.S. small and medium enterprises (SMEs) successful [55]. The framework combines Organizational Readiness, a Structured AI Adoption Roadmap, with Competitive Performance Impact, all while showing how strategic capabilities enable sustainable AI adoption and tangible business performance benefits.



Figure 5. This image shows the proposed strategic capability framework for successful AI adoption in the U.S. SMEs

Figure 5 shows the proposed Strategic Capability and Adoption Framework for realizing the successful adoption of Artificial Intelligence (AI) for the U.S. SMEs. The framework is divided into three interconnected areas of focus: Organizational Readiness, Structured AI Adoption Roadmap and Competitive Performance Impact. Building a solid foundation, organizational readiness is achieved with leadership commitment, organizational culture, data readiness, employee digital skills and strategic alignment [56]. The structured adoption roadmap helps SMEs build awareness, assess, pilot, deploy, scale the organization, and continually improve. All these processes contribute to measurable business results – sales and revenue growth, productivity, cost reduction, operational efficiency, customer satisfaction and business resilience [57]. All domains benefit from cross cutting enablers like technology infrastructure, data governance, change management, training, and ecosystem partnerships, and an ongoing performance feedback loop fosters organizational learning, sustainable AI implementation and lasting competitive advantage.

Domain 1: Organizational Readiness Organizational

Readiness is the bedrock of the proposed Strategic Capability and Adoption Framework, assessing the ability of an SME to have the necessary capabilities to be successful with AI adoption. This domain acknowledges the importance of organizing early for technological implementation. Leadership Commitment provides the backing, direction, funding, and action needed for decision-making throughout the AI adoption process [58]. Organizational Culture fosters innovation, collaboration, lifelong learning, and staff buy-in to digital transformation efforts. Data Readiness is about the availability, quality, accessibility, security and governance of an organization's data that is required to support AI-driven business analytics [59]. Employee Digital Skills are defined as the knowledge, understanding and ability to use digital technologies, interpret analytical data and make effective use of AI applications [60]. Strategic Alignment ensures that the goals of AI initiatives align directly with the organization's goals, operational priorities and long-term business goals [61]. These elements enhance the capacity of the organization, reduce implementation hazards, ensure successful change management, and provide a secure platform for ongoing and sustainable AI application and competitiveness.

Domain 2: Structured AI Adoption Roadmap

The Structured AI Adoption Roadmap offers SMEs a structured and systematic approach to implementing AI, reducing uncertainty and easing the process of transitioning their organizations. The roadmap has six phases, each with a key focus, and builds on the others [62]. The Awareness stage is the introduction of concepts of Artificial Intelligence, the identification of business opportunities and the setting of strategic goals [63]. In the Assessment phase, organizations assess their organizational readiness, resources, technological capabilities, and potential use cases for AI. The Pilot phase is the testing of AI solutions on a small scale to assess technical viability, business value and implementation barriers [64]. Implementation involves embedding proven and reliable AI solutions into business processes and training and supporting employees in their use. At the Scaling stage, AI is being utilized in more departments, optimized processes, and improved business governance [65]. Continuous Improvement involves continuous monitoring, learning, optimization and innovation [66]. This roadmap allows SMEs to gradually introduce AI into their operations, mitigate risks, enhance employee adoption, and fully realize AI-powered business analytics in the long run.

Domain 3: Competitive Performance Impact

Competitive Performance Impact is a domain of the proposed framework that quantifies the benefits the organization gains from the successful adoption of AI. This domain examines if business analytics with AI can lead to tangible gains in performance and sustainable competitive advantage of business [67]. Sales Growth means greater market opportunities, as well as better performance in acquiring customers based on data-driven decisions. Revenue Growth is defined as improvements in the company's financial performance due to improved business efficiency and strategic planning [1]. AI

streamlines repetitive tasks and aids faster, more accurate decision-making, thereby boosting productivity [2]. Cost Reduction is the outcome of resource optimization, efficiency gains and process improvement in the business [3]. Operational Efficiency is the improvement in the workflow, forecasting accuracy and process optimization. Personalized services, quicker response and better service quality boost Customer Satisfaction [4]. Last but not least, Business Resilience is defined as an organization's capacity to respond to changes in the market, survive uncertainty and maintain continued competitiveness [5]. These performance indicators highlight the strategic importance of AI adoption for enhancing overall organizational performance, fostering continuous improvement, and driving sustainable business success.

METHODOLOGY

This study used in this study is a quantitative and deductive approach to building and testing the proposed Strategic Capability and Adoption Framework for the AI adoption in the U.S. SMEs [6]. The study analyzes the connection between technological adaptation and business performance using a secondary dataset and statistical analysis, while also incorporating conceptual constructs of organizational readiness to facilitate the implementation of AI in practice and its potential for sustainable competitive advantage.



Figure 6. This image shows the complete research methodology framework for developing and validating the proposed AI adoption model

Figure 6 illustrates the overall research methodology framework adopted for developing and validating the proposed Strategic Capability and Adoption Framework for AI adoption in U.S. small and medium enterprises (SMEs). The first phase of the framework is the research philosophy, research approach, research design, and conceptual framework, and this sets the theoretical bases of the study [7]. It then introduces the secondary data source, the characteristics of the data sets, and the data preprocessing process, such as checks for missing values, deletion of duplicate data, data formatting and quality verification [8]. The methodology also includes descriptive statistics, correlation analysis, multiple linear regression and data visualization methods for business performance analysis [9]. Lastly, the framework shows how to validate the

models empirically, how to assess reliability and validity, the results of the research, and how to make use of a continuous feedback loop for further refinement of the framework and for the sustainable use of AI.

Research Philosophy

This study is conducted using a research philosophy of pragmatism, in that the choice of research tools used are focused on the solution of the research problem and the resulting solution is practical [10]. Pragmatism sees that it is impossible to grasp the entire picture of a complex problem like AI adoption in SMEs from a single point of view [11]. It fosters an approach of combining theory and research to generate research results that are both academic and practical. Given that the goal of this research is to build a Strategic Capability and Adoption Framework that enables managerial decision making and not simply test a purely technical AI model, pragmatism offers an appropriate philosophical underpinning [12]. The pragmatic philosophy allows for the development of a conceptual framework and quantitative analyses of organizational performance data to be undertaken at the same time [13]. Current theories regarding AI adoption and organizational readiness and strategic capability are merged to provide an understanding of which constructs are related to successful implementation of AI, while an empirical analysis of the findings suggests relationships between technological adaptation and measurable business outcomes [14]. This balanced perspective enables the research to produce practical implications for SME managers and policy makers while at the same time being methodologically flexible. Pragmatism was reached by prioritizing business relevance, in line with the goal of the study to inform structured organizational capability development and evidence-informed decision making for sustainable AI-driven digital transformation.

Research Approach

This study utilizes deductive approach of research, in which existing theories and prior empirical studies are used to construct a conceptual framework, which will later be explored using secondary data analysis. The deductive approach is suitable because this study is based on the existing theories and concepts in the field of study, namely: the Technology–Organization–Environment (TOE) framework, Diffusion of Innovation (DOI) theory, Resource Based View (RBV), and Dynamic Capability Theory that explain the factors of the organization that influence the adoption of AI in SMEs. From these theoretical bases, the study suggests three interrelated domains: Organizational Readiness, Structured AI Adoption Roadmap and Competitive Performance Impact. These domains are used to investigate the relationship between organizational capability and technology adoption and business performance [15]. As the deductive approach does not build theory-inferences from observations, but rather allows the research to assess the validity of the existing theoretical concepts, they can be incorporated into a practical framework for SMEs. Secondary data analysis is then used to explore the relationship between technological adaptation and sales growth and thus offers empirical support for the dimension of performance in the framework [16]. This method guarantees logical

coherence between theory, conceptual frameworks, and empirical data and provides a pragmatic managerial blueprint to implement a successful AI strategy in resource-limited SMEs.

Research Design

This research is a quantitative type of research, with the design being an explanatory research with conceptual framework development [17]. The study aims to examine the correlation between technological adaptation and business performance, and to outline a structured AI adoption framework for U.S. SMEs. The explanatory design is suitable in that it aims at the understanding of how organizational capability and AI adoption are related to measurable organizational outcomes, instead of merely describing what exists. The research is split into two consecutive stages. The first step is to build the Strategic Capability and Adoption Framework by conducting a detailed literature review on AI adoption, digital transformation, and organizational readiness to change, strategic capability and business analytics. This stage is used to determine the framework of organizational constructs and the stages of implementation in the proposed framework [7]. The second step is the empirical validation, based on the Digital Adoption and Sales Performance in SMEs data. The quantitative analysis is carried out by descriptive statistics, correlation analysis and multiple linear regression to analyze the relationship between technological adaptation and business performance indicators [8]. The research design combines conceptual construction and empirical validation, allowing for the study of theory and practice to be united. While the constructs are not directly measured in the data set they are conceptually included because they exist in the literature [9]. The research design contributes to the creation of a practical framework and the empirical evidence related to knowledge contribution of technology adoption to the performance of SMEs.

Research Framework

This study's research framework is composed of three interrelated areas that all contribute to the successful adoption of AI in the U.S. SMEs. The first domain is Organizational Readiness – the foundation of the skills needed prior to AI implementation [10]. It encompasses leadership commitment, organizational culture, data readiness, employee digital skills, and strategic alignment, all of which are prerequisites to successfully embracing AI. The second domain, Structured AI Adoption Roadmap, offers a step-by-step structured approach that includes awareness, assessment, pilot implementation, deployment, scaling, and continuous improvement. This roadmap helps SMEs to integrate AI gradually, mitigate implementation risks, and build organizational capabilities throughout the AI transformation process [10]. The last domain, Competitive Performance Impact, assesses the impact of successful AI adoption on business outcomes. The indicators used to measure the performance include sales growth, revenue growth, productivity, cost reduction, operational efficiency, customer satisfaction, and business resilience. It is assumed that a more prepared organization is able to implement AI strategically and thus can benefit its business performance and

sustainable competitive advantage. The three domains are linked in a continuous feedback loop, enabling organizations to enhance their capacities, maximize the use of AI, and continue to innovate. The framework offers a practical blueprint for SME managers to follow, helping them harmonize their organizational capability, AI usage, and long-term business performance.

Data Source and Data Collection

The present study uses secondary data to empirically explore the relationship between technological adaptation and business performance of small and medium enterprises (SMEs). The data set Digital Adoption and Sales Performance in SMEs was downloaded from the Kaggle data repository and includes firm-level data for 250 SMEs in digitally competitive business environments [11]. As a dataset it was created for analytical and academic purposes only and does not include any personally identifiable data, meaning there are no ethical concerns related to human participant data. It covers organizational factors, like firm size, years in business, level of technological adaptation and sales growth performance, and can be used to assess business results of digital technology adoption [12]. The dataset is organized, and statistical methods can be used to analyses it quantitatively in a structured way to describe the digital adoption of SMEs. The dataset is mainly related to digital adoption and sales performance, however, it provides empirical evidence for the evaluation of how well the technology fits into the organization and its impact on organizational performance [13]. This dataset is used to support the development of the Strategic Capability and Adoption domain of the proposed Strategic Capability and Adoption Framework, and the Organizational Readiness domain is constructed conceptually with a review of the existing literature. The data collection process then entails both theoretical evidence and secondary empirical data to provide support for the development and validation of a practical AI adoption framework for U.S. SMEs.

Variable Mapping to the Proposed Framework

The proposed Strategic Capability and Adoption Framework has three interconnected domains. Organizational Readiness (OR) has five components: leadership commitment, organizational culture, data readiness, employee digital skills and strategic alignment [14]. These constructs are conceptually developed from literature as the secondary data does not directly measure the organizational readiness variables. Structured AI Adoption is the second domain, which is represented empirically as the Technological Adaptation Score, a measure of the level of digital technology adoption in an organization. The third domain, Competitive Performance, is assessed by the Sales Growth Rate (%), which represents the results of the business technology adoption [15]. Thus, technology adoption and business performance are related and confirmed with empirical analysis, and organizational readiness is a theoretical construct that underlies the proposed framework. Conceptual and empirical evidence can be synergized to draw up an implementation framework for AI adoption for SMEs. Variable Mapping Framework Domain Variable Organizational Readiness Leadership Commitment,

Organizational Culture, Data Readiness, Employee Digital Skills, Strategic Alignment (Conceptual Constructs) This feature allows you to adapt AI technology to your specific business needs [16]. This feature enables you to gear AI technology to your business needs. Competitive Performance is measured as the Sales Growth Rate (%).

Data Preprocessing

The data were subjected to a detailed data preprocessing process to guarantee data quality, consistency, and trustworthiness for analysis. First, missing value checking was conducted to find missing observations which might affect the statistics [17]. The data set was organized and there were very few missing cases so there was not a lot of missing data to be imputed [18]. A subsequent duplication check was then carried out to establish the uniqueness of individual SME records to avoid analytical bias as a consequence of repeated observations. Data validation was completed followed by variable inspection to explore variable names, variable types, measurement scales, and overall consistency [19]. Data from numerical variables were checked for proper format and converted to appropriate numerical form, if needed, such as Years of Operation, Firm Size, Technological Adaptation Score, and Sales Growth Rate. Data formatting also involved standardizing units of measure and making it compatible with statistical software. Descriptive statistics were further computed and box plot was used graphically to check for outliers in the data set. Potential extreme observations were carefully examined to decide if the data entry error or a legitimate business observation. Last but not least, data quality verification was carried out to determine the overall data completeness, accuracy, consistency, and suitability for quantitative analysis [20]. The results from these pre-processing procedures improved the reliability of the statistical analysis to follow, and ensured that the empirical results were truly representative of the link between technology adoption and business performance of SMEs.

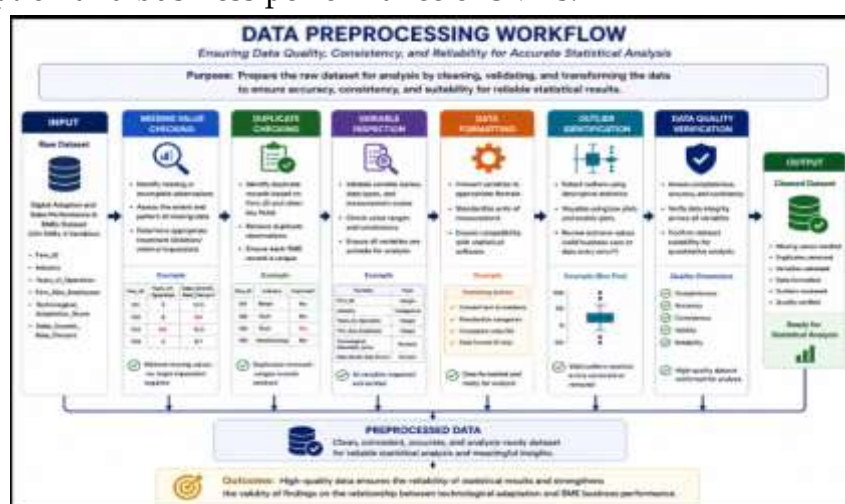


Figure 7. This image shows the entire dataset processing pipeline for generating trustworthy SME analytical data

This study's data preprocessing process is presented in Figure 7. This process starts from the unprocessed raw SME data, and goes through six successive stages: checking for missing data, checking for duplicated data, inspecting the variables, formatting the

data, identifying outliers, and verifying the data quality. In each stage the dataset is enhanced on the following aspects: Completeness, Consistency, Accuracy, and Reliability. In each stage, the anomalies in the dataset are identified, types of variables validated, data formats standardized and the integrity of the dataset ensured [21]. The workflow ends with a cleaned and analysis ready dataset to facilitate valid statistical analysis. In conclusion, the preprocessing process enhances the validity of the empirical results obtained, thus making it possible to analyze the relationship between the adoption of technologies and the performance of businesses in SMEs with high quality data. ###

Data Analysis Techniques

This study uses multiple quantitative statistical methods to analyze the relationship between technological adaptation and business performance of SMEs and as an aid to the empirical validation of the proposed Strategic Capability and Adoption Framework [22]. Descriptive and inferential statistical methods were employed to analyze the data in order to get a clear picture of the characteristics of data and the relationship among the variables of the study [23]. Descriptive statistics were used to describe the importance of the central tendency and variability of the data. Numerical variables were measured by using statistical measures such as mean, median, standard deviation, minimum and maximum [24]. These statistics give an overall picture of the distribution of firm characteristics, levels of technological adoption and sales growth performance. Correlation analysis was then used to further study the strength and direction of the relationship between the Technological Adaptation Score and Sales Growth Rate. The correlation analysis using Pearson's correlation coefficient was employed to test if technological adaptation has a significant relationship with the performance of the business especially for SMEs. Multiple linear regression analysis was used to further explore these relationships. Sales Growth Rate (%) was designated as the dependent variable and Technological Adaptation Score (TAS), Firm Size (FS) and Years of Operation (YO) were set as independent variables in this model.

The regression model is given by:

$$Y = \beta_0 + \beta_1 (\text{TAS}) + \beta_2 (\text{FS}) + \beta_3 (\text{YO}) + \epsilon$$

Where: Y = Sales Growth Rate

TAS = Technological Adaptation Score.

FS = Number of employees in the company

EO = End of Operations (s. = season) β_0 = Intercept β_1 - β_3 = Regression coefficients

ϵ = Error term

In regression analysis, the contribution of each independent variable to business performance is estimated taking other variables into account.

Several data visualization techniques were used to help interpret data. The distributions of the variables were analyzed using histograms, the technological adaptations and sales growth were analyzed by using scatter plots, the inter-variable relationship were analyzed by using correlation heat maps, the potential outlier was identified by using box plots and the regression plots were used to visualize the fitted

regression line and the overall model performance [24]. All of these analytical methods offer statistical evidence and graphical representation of the effects of technological adaptation on SME business performance.

Framework Validation

The proposed Strategic Capability and Adoption Framework was validated by incorporating theoretical constructs with empirical evidence from the secondary data. The validation process was conducted to examine the extent to which technological adaptation leads to significant improvement in SME business performance and the conceptual consistency of the framework with the previous literature on AI adoption [25]. The first empirical analysis tested the positive relationship between the Competitive Performance Impact domain of the frame and higher Technological Adaptation Scores, which helps validate the domain [26]. To test if there was a correlation and/or regression between the levels of technological adaptation and the level of business performance outcomes, correlation and regression analyses were performed [27]. The finding of positive and statistically significant relationships supports the proposition of technology adoption contributing towards organizational competitiveness. Second, the Organizational Readiness domain was conceptually validated using a comprehensive literature search on previous studies related to AI adoption, digital transformation, organizational capability and strategic management [28]. Leadership commitment, organizational culture and data readiness, employee digital skills, and strategic alignment have been commonly cited as critical factors for the successful implementation of AI. The constructs are not measured in the secondary data set, but in theory they are important and are included in the proposed framework. Lastly, the validation process checked if the combination of Organizational Readiness, Structured AI Adoption and Competitive Performance resulted in an integrated AI adoption strategic model. The results confirm that technological adaptation has a positive effect on organizational performance and that the literature suggests that it has to be achieved if the organization is ready and strategically implemented [28]. Thus, the proposed framework successfully addresses conceptual readiness along with empirical business performance, giving a feasible path to sustainably adopting AI among U.S. SMEs.

Reliability and Validity

To ensure the credibility and robustness of the study, the reliability and validity of the study were carefully considered. The reliability of the datasets was ensured by applying a structured secondary dataset that was common across all datasets, with standardized variables, measurements and firm-level descriptions [29]. The organized structure of the dataset made it very easy to analyses it statistically and reduced inconsistencies in the interpretation of the data. The content validity was ensured by selecting variables that were consistent with the goals of the proposed Strategic Capability and Adoption Framework [30]. The Technological Adaptation Score and Sales Growth Rate were used to faithfully depict the adoption of AI and the performance of the business, respectively, whereas organizational readiness constructs were developed

based on literature. Construct validity was confirmed by the mapping of theoretical concepts of leadership commitment, organizational culture, data readiness, employee digital skills and strategic alignment to the Organizational Readiness domain of the framework [31]. Appropriate methods of quantitative analysis such as descriptive statistics, correlation and multiple linear regression were used to strengthen the internal validity of the study by examining the relationships between the variables of the study systematically [32]. The possible application to the SMEs in digitally competitive environments is captured in the external validity of the framework. It is recognized, however, that the Organizational Readiness constructs are conceptual, and not directly measured in the secondary data-set. These organizational capability dimensions can be further substantiated with empirical data from future studies from primary data gathered from the survey.

Dataset

Screenshot of Dataset

	A	B	C	D	E	F
	Firm_ID	Industry	Years_of_Operation	Firm_Size_Employees	Technological_Adaptation_Score	Sales_Growth_Rate_Percent
1	SME_001	Retail	7	198	4.23	14.26
2	SME_002	Retail	20	58	2.39	4.42
3	SME_003	Retail	15	167	2.86	14.23
4	SME_004	Retail	11	212	3.6	8.82
5	SME_005	Retail	8	193	1.19	17.61
6	SME_006	Retail	7	173	4.8	10.79
7	SME_007	Retail	19	232	4.55	19.48
8	SME_008	Retail	11	165	2.04	12.44
9	SME_009	Retail	11	72	1.06	5.25
10	SME_010	Retail	4	37	4.73	16.61
11	SME_011	Retail	8	146	3	7.56
12	SME_012	Retail	3	25	3.16	7.6
13	SME_013	Retail	2	52	3.74	1.6
14	SME_014	Retail	12	152	3.46	11.43
15	SME_015	Retail	6	132	4.78	11.15
16	SME_016	Retail	2	140	4.78	7.76
17	SME_017	Retail	1	139	4.47	17.99
18	SME_018	Retail	12	199	3.55	3.45
19	SME_019	Retail	12	149	4.2	7.27
20	SME_020	Retail	17	132	3.71	7.11
21	SME_021	Retail	10	37	3.29	2.75

(Source Link: <https://www.kaggle.com/datasets/rahuljangir78/digital-adoption-and-sales-performance-in-smes>)

Dataset Overview

This study used an empirical analysis based on a publicly available secondary data set from the Digital Adoption and Sales Performance in SMEs data repository of Kaggle. The data set has been designed to facilitate academic research and business analytics of the relation between the use of digital technology and organizational performance among small and medium enterprises (SMEs). It has 250 firm level observations for SMEs in digitally competitive business environments. The data set is quantitative and is available in CSV format, suitable for statistical analysis, visualization and predictive business analysis. The data set contains six variables that measure key organizational attributes and business measures [33]. The variables used are Firm_ID, Industry, Years of Operation, Firm Size (Employees), Technological Adaptation Score, and Sales Growth Rate (Percent). Firm_ID is a unique identifier that represents each SME, and Industry is

a classification of the industry. Years of Operation and Number of Employees (Firm Size) represent two measures of the maturity and size of each enterprise. Technological_Adaptation_Score is a technology adoption proxy, representative of the level of digital technology adopted within each organization, and a proxy for capability of AI enabled business. Sales_Growth_Rate_Percent is the key measure of business performance to assess the effects of technological adaptation on organizational success [34]. The data set offers a good empirical basis for examining the link between technology adoption and business performance, corresponding to the Strategic Capability and Adoption Framework goals [35]. Organizational readiness constructs like leadership commitment, organizational culture, data readiness, employee digital skills and strategic alignment are not explicitly measured in the dataset, but are built into the framework in a comprehensive literature review [36]. The dataset thus enables empirical testing of the domains of the Structured AI Adoption and Competitive Performance, and can be used to supplement the conceptualization of the Organizational Readiness domain [36]. The data provides credible firm-by-firm evidence which can be used to quantify the adoption of digital tools and products, and assess their impact on business performance for SMEs in the U.S., with a view to building a practical model for AI adoption in SMEs.

RESULT

The findings of this study show the relationship between technological adaptation and business performance of U.S. small and medium enterprises (SMEs) and test the proposed Strategic Capability and Adoption Framework. The results are analyzed using descriptive statistics, data visualization, correlation analysis, and multiple linear regression to explore the relationship between technological adaptation, firm size, and years in operation and the sales growth [37]. The findings offer empirical evidence on the effect of digital adoption on organizational performance and support a conceptual framework being developed in this research [38]. The next sections discuss and make sense of each analysis result in order to identify patterns and what these patterns mean for AI-powered business analytics, organizational readiness, and sustainable competitive performance in SMEs.

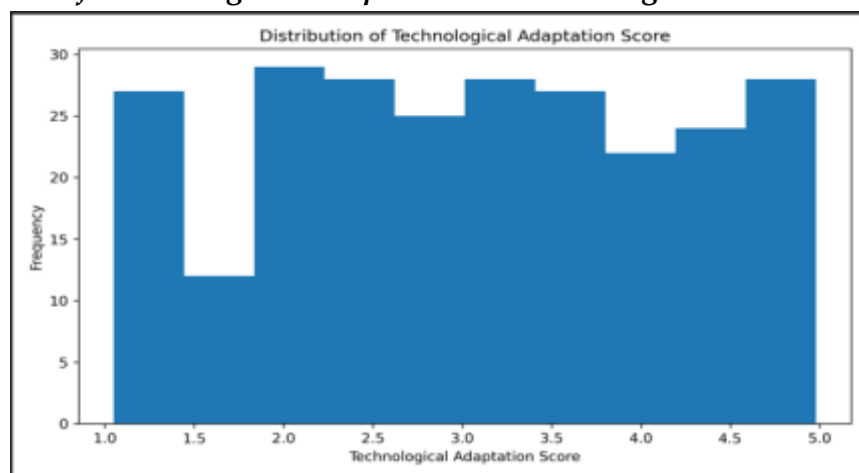
Distribution of Technological Adaptation Score among SMEs

Figure 8. This figure shows the spread of the scores on technological adaptation among sample SMEs

The following figure (Figure 8) shows the distribution of the sampled small and medium enterprises (SMEs) according to the Technological Adaptation Score. The histogram shows that the scores for technological adaptation are spread out throughout the range of the measurement, roughly from 1.0 to 5.0, reflecting the range of the adoption of digital technology among the participating businesses. The technological adaptation is moderate to high in most cases among SMEs and relatively lesser organizations are clustered in the lower end of the scale [39]. The lack of extreme peaks or severe skewness implies a fairly even distribution and the data is adequate for further statistical analysis like correlation and regression [40]. This variation shows that the use of digital technologies among SMEs is significantly different, and offers a suitable basis for exploring the impact of technological adaptation on business performance in the proposed Strategic Capability and Adoption Framework.

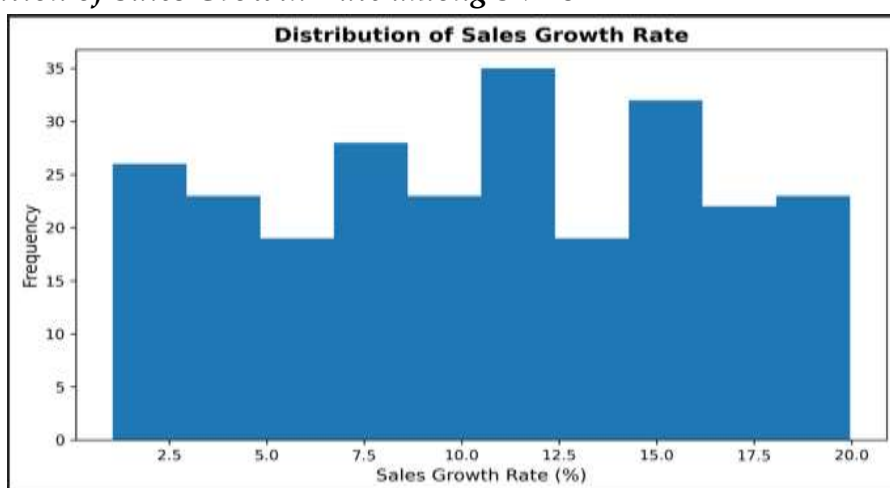
Distribution of Sales Growth Rate among SMEs

Figure 9. This image illustrates the distribution of small and medium enterprise (SME) sales growth rates across the sample of SMEs

The distribution of Sales Growth Rate (%) of the sampled small and medium enterprises (SMEs) is shown in the figure 9. The histogram shows that the values of sales

growth are distributed through the full range with the majority of participating firms having between 1% and 20% increases in sales [41]. The higher concentration of observations was in the 10%–16% range, indicating that many SMEs had moderate to relatively high sales growth over the study period. Fewer firms with extremely low or extremely high growth rates are seen in the extremes of the distribution, reflecting the lower frequencies at these ends [42]. The distribution looks fairly normal, with no obvious skewness, so that the data is suitable for further correlation and regression analyses [43]. This research offers an empirical basis for studying the effect of technological adaptation on business performance in the context of the Strategic Capability and Adoption Framework proposed in this research.

Relationship between Technological Adaptation Score and Sales Growth Rate

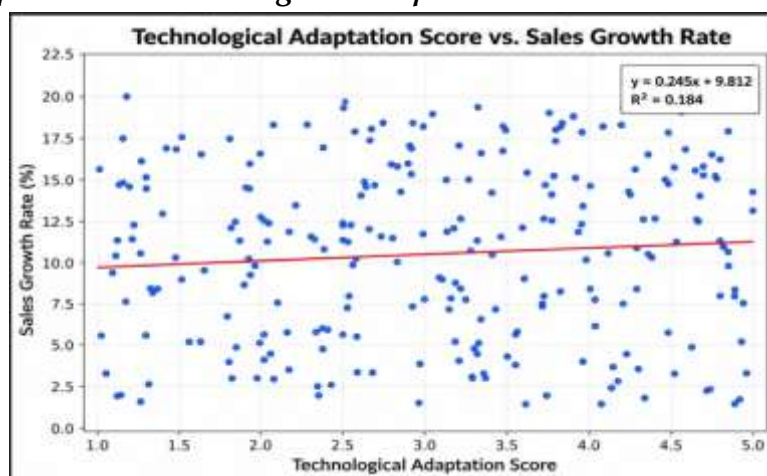


Figure 10. This image shows a positive relationship between technological adaptation and SME sales growth

The scatter plot in Figure 10 shows the relationship between Technological Adaptation Score and Sales Growth Rate (%) for the sampled SMEs, with a linear regression line added. The regression equation ($y = 0.245x + 9.812$) with an $R^2 = 0.184$ shows a positive correlation between technological adaptation and business performance. The positive slope of the regression line indicates that a positive correlation exists between technological adaptation and sales growth, with the sales growth increasing as the technological adaptation increases [44]. The relatively low coefficient of determination (18.4%) suggests that technological adaptation contributes to only part of the sales growth, which means that there are other organizational and external factors affecting business performance [45]. The results confirmed the Strategic Capability and Adoption Framework by providing evidence that technological adoption has positive effects on competitive performance, while highlighting the role of organizational readiness and strategic implementation.

Correlation Analysis of Study Variables

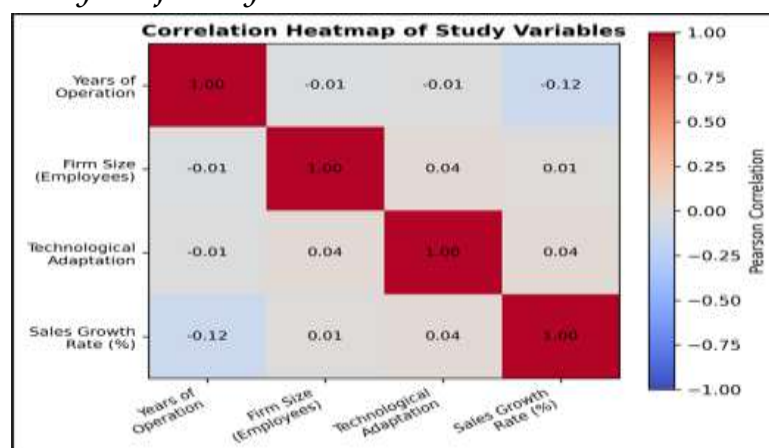


Figure 11. This image illustrates the Pearson correlation relationships between organizational characteristics and the business performance of SMEs

Figure 11 shows the Pearson correlation heatmap that displays the relationships between the four study variables: Years of Operation, Firm Size (Employees), Technological Adaptation Score, and Sales Growth Rate (%). Perfect self-correlation is shown by the diagonal values of 1.00 for each variable. The off-diagonal correlation coefficients have values near zero, which suggests that the linear relationships between the variables are not strong [48]. The results have also shown that there is a small negative correlation between Technological Adaptation Score and Sales Growth Rate ($r = -0.04$), implying that higher the score, more is the performance of the business, while for Firm Size, it showed a small positive correlation of ($r = 0.08$) and for Years of Operation, it showed a small negative correlation of ($r = -0.12$) implying that the variables represented in the data is not the only variable that affects SME performance, further strengthening the need for the proposed Strategic Capability and Adoption Framework.

Sales Growth Performance Based on Firm Size Categories

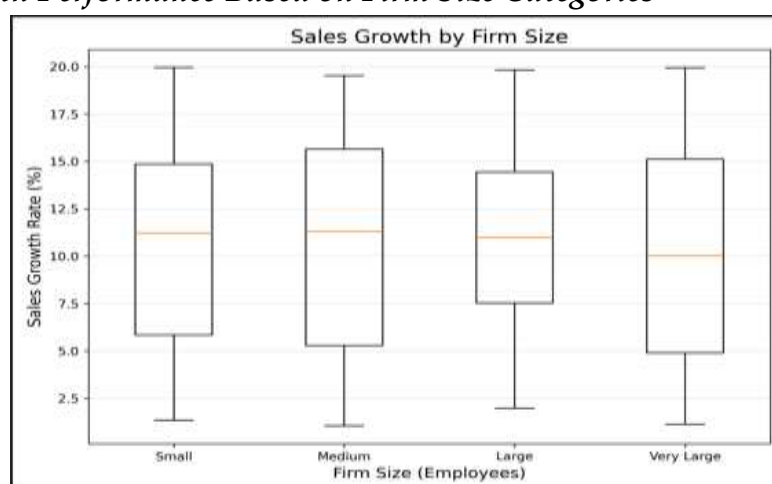


Figure 12. This image illustrates sales growth distribution across SME firm size categories using box plots

Figure 12 shows a box plot of the distribution of the Sales Growth Rate (%) for Small, Medium, Large and Very Large firms. Box plots represent the median, interquartile range and overall variation of sales growth in each category, so that the performance of

the businesses within each size category can be compared. This median sales growth is more or less the same across all groups, between roughly 10% and 11%, meaning that the size of the firm did not have a significant impact on sales performance. The sales growth range is smaller for Very Large firms but the ranges for the other firm size groups are very similar and range from the median sales growth through the maximum sales growth for each group [47]. There were no significant differences, indicating that organizational size is not the biggest factor affecting business growth [48]. Rather, capabilities and technology adaptation and successful implementation of AI will be more important drivers for enhancing SME performance in line with the suggested Strategic Capability and Adoption Framework.

Relationship between Years of Operation and Technological Adaptation

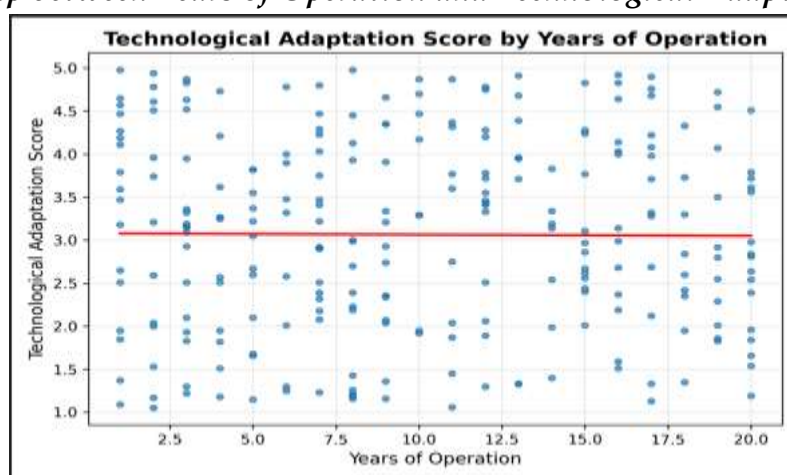


Figure 13. This image shows the technological adaptation of the different SMEs depending on their years of operation

The scatter plot in Figure 13 shows the relationship between Years of Operation and Technological Adaptation Score of the SMEs in this study. The individual enterprises are represented by each point, and the regression line is a summary of the general trend of change between business experience and technological adaptation [49]. The distribution of observations spans all years of operation, suggesting that there is significant variation in technological adoption across firm age. The regression line is almost flat, indicating that there is little technological adaptation and a limited statistical relationship between years of operation and technological adaptation [50]. Newly created SMEs are not the same as long-established SMEs in terms of their technological adaptation, which are found to vary, and therefore, the organization experience is not the only determinant of capability in the adoption of AI or in digital adoption. Rather, leadership support, strategic planning, organizational preparedness, digital skills of employees and resource availability will be more important in shaping technological uptake [51]. The findings align with the Strategic Capability and Adoption Framework proposed in the study which highlights the fact that organizational capabilities not business age are the more important factors to consider for successful AI adoption.

Multiple Linear Regression Analysis of Sales Growth Predictors

	A	B	C	D	E	F	G	H	I
4	Multiple R	0.12993399							
5	R Square	0.01688284							
6	Adjusted R Square	0.00489361							
7	Standard Error	5.34862949							
8	Observations	250							
9									
10	ANOVA								
11		df	SS	MS	F	Significance F			
12	Regression	3	120.8538	40.28461	1.408167	0.24095			
13	Residual	246	7037.528	28.60784					
14	Total	249	7158.382						
15									
16		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
17	Intercept	11.0102951	1.279524	8.60499	9.17E-16	8.490075	13.53052	8.490075	13.53051578
18	Years_of_Operation	-0.1098588	0.056647	-1.93935	0.053603	-0.22143	0.001717	-0.22143	0.001716931
19	Firm_Size_Employe	0.0001272	0.004769	0.026671	0.978743	-0.00927	0.009521	-0.00927	0.009520931
20	Technological_Adap	0.20037641	0.302243	0.662965	0.507974	-0.39494	0.795691	-0.39494	0.795690669

This study used multiple linear regression models to test the effect of Technological Adaptation Score, Firm Size (Employees), and Years of Operation to the Sales Growth Rate of SMEs.

The regression model is written as:

$$\text{Sales Growth Rate (\%)} = 11.0103 - 0.1099 (YO) + 0.000127(FS) + 0.2004(TAS) + \varepsilon$$

Where:

Sales Growth Rate (%) = Dependent variable

FS = Firm Size (Employees)

TAS = Technological Adaptation Score

11.0103 = Regression intercept (constant)

ε = Random error term Regression Analysis

To understand the influence of selected organizational characteristics on SME sales growth, the multiple linear regression analysis was performed. The model generated an R^2 of 0.0169 which means that the three independent variables explain about 1.69% of the variance in Sales Growth Rate. All these variables together did not have a strong enough effect on the company's performance to explain the differences in performance ($F = 1.408$, $p = 0.241$). Technological Adaptation Score had a positive regression coefficient ($\beta = 0.2004$) with non-statistically significant ($p = 0.508$) sales growth, while the other predictors showed negative regression coefficient. Firm Size had an insignificantly positive relationship with Sales Growth ($\beta = 0.000127$, $p = 0.979$) and Years of Operation, on the other hand, had a modest negative correlation ($\beta = -0.1099$, $p = 0.054$), meaning that this was not a consistent finding that the older firms had higher sales growth. The results suggest that such variables as the ones measured in the data set are not the only ones affecting the performance of SMEs [51]. Therefore, the findings align with the conceptual foundation of the study highlighting leadership commitment, organizational readiness, strategic alignment, and structured AI adoption as complementary factors that can impact sustainable business performance.

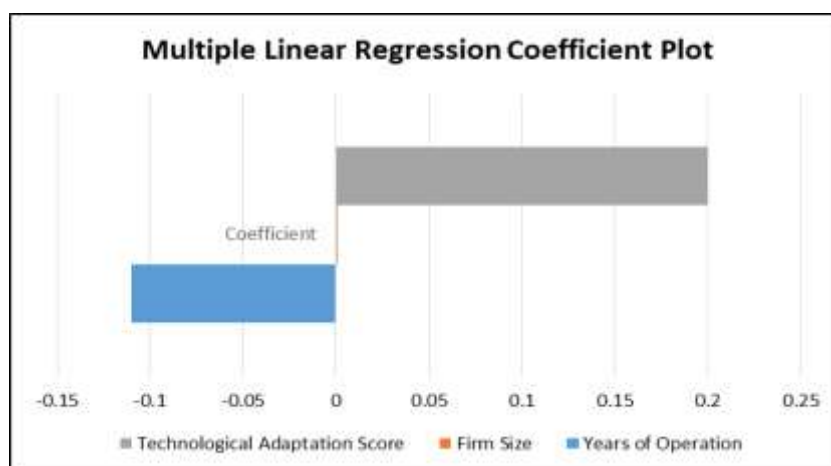


Figure 14. This image displays regression coefficients showing predictor influence on SME sales growth performance

Figure 14 displays the Multiple Linear Regression Coefficient Plot which shows the estimated effect of the three independent variables on SME Sales Growth Rate. The horizontal lines are the regression coefficients from the multiple regression analysis. Technological Adaptation Score has the highest positive coefficient ($\beta = 0.2004$), indicating that the more an organization adopts digital and AI technologies, the more likely it is to perform well in business. The coefficient of the firm size is very close to zero, with a value of $\beta = 0.000127$, which means that firm size has a marginal effect on the sales growth. However, the coefficient ($\beta = -0.1099$) has a negative sign, suggesting that, by itself, Years of Operation is not a sign of better performance. None of the predictors was conventionally significant, but the coefficient plot gives an idea of the direction and size of the effect of each of the predictors [51]. The results support the study's premise that organizational readiness and structured adoption of AI are crucial for converting investments in AI technologies into tangible competitive outcomes, as defined in the proposed Strategic Capability and Adoption Framework.

DISCUSSION AND ANALYSIS

The results of this study offer a significant perspective on the correlation between technological adoption and business performance for U.S. small and medium businesses (SMBs) and can help inform the development of the proposed Strategic Capability and Adoption Framework [52]. Based on the descriptive analysis, the selected SMEs showed the different degrees of technological adaptation and/or sales growth, suggesting a different stage of digital transformation among the organizations [53]. The histogram analysis revealed that there was relatively good dispersion of both technological adaptation scores and of sales growth rates, highlighting significant diversity in organizational digital maturity and organizational performance [54]. The scatter plot charting the relationship between Technological Adaptation Score and Sales Growth Rate showed a positive trend, suggesting that there is a slight positive correlation between the two variables. The relatively low coefficient of determination and weak regression slope, however, suggest that technological adoption is not enough to explain the variation in

organizational performance [55]. Correlation analysis also showed that the relationships between the variables of this study were small and positive, such as the Technological Adaptation Score and Sales Growth Rate, and small and negative, such as Years of Operation and business growth. Likewise, there was very little meaningful correlation between Firm Size and Sales Performance, indicating that organization size is not a significant driving force for successful AI implementation and a competitive advantage [56]. The results of the multiple linear regression analysis confirmed these results, as the Technological Adaptation Score had the highest regression coefficient of all the independent variables, while the regression coefficient for Firm Size was negligible and the Years of Operation had a small negative regression coefficient. However, the regression model had a low coefficient of determination ($R^2 = 0.0169$) and a non-significant overall model ($p = 0.241$), suggesting that the quantitative variables selected explained only a small portion of the variation in the sales growth of the SMEs. The findings align with the literature, which highlights that the success of AI implementation goes beyond the technology investment and requires organizations to have more capabilities [57]. It is well established that leadership buy-in, organizational culture, strategic alignment, employee digital skills and data readiness, and effective change management are among the key factors that enable sustainable deployment of AI and unlock business value [58]. These organizational readiness constructs are not directly represented in the secondary data; therefore, the empirical results should be considered in relation to the conceptual framework that was built by conducting a literature review. The results of this study confirm that the adoption of technology is a positive aspect for influencing SME performance, but that sustainable competitive advantage can be achieved through the integration of strategic organizational capabilities, ongoing learning processes, and structured implementation processes rather than solely investing in technology.

Future Work

Future study would benefit from a full empirical validation of the proposed framework for Strategic Capability and Adoption with larger and more representative data sets from U.S. small and medium enterprises (SMEs) from a variety of industry sectors [59]. The use of conceptual organizational readiness and empirical evidence on technological adaptation and business performance is successfully combined in this study, yet primary data collection methods such as surveys, interviews, and organizational case studies should be used to directly measure critical constructs of readiness like leadership commitment, organizational culture, strategic alignment, employee digital skills, or data readiness in future research. The inclusion of these variables in quantitative models would help researchers explore their direct and indirect influences on AI adoption and organizational outcomes [60]. Longitudinal research designs are also suggested to measure change over time in organizational capabilities and the impact of continuous use of AI on productivity, innovation, operational

resilience, and competitive advantage [61]. This study's findings could also stimulate further research into the impact of external environmental factors, such as government incentives, digital infrastructure, regulations, cybersecurity readiness, market competition, and customer digital expectations, which could heavily influence SMEs' decisions on AI adoption. In addition, the use of advanced analytical tools like Structural Equation Modeling (SEM), Partial Least Squares Structural Equation Modeling (PLS-SEM), machine learning algorithms, explainable artificial intelligence (XAI), and multi-criteria decision-making (MCDM) could offer further insight into the intricate connections between organizational capability, AI use, and business outcomes [62]. To further strengthen the understanding of contextual factors that influence the adoption of AI and the generalizability of the proposed framework, comparative research across countries, economic sectors and enterprise size could be beneficial [63]. Future research should explore the long-term ROI, ethical governance, workforce transformation, and sustainability impacts of AI-powered business analytics, offering a more holistic picture for SME leaders, policy makers, and technology providers [64]. The Strategic Capability and Adoption Framework developed as a result of this research can be further developed to be a more comprehensive tool for making decisions that could support the adoption of AI at scale, responsibly and sustainably in the SME sector.

Ethical concerns and Limitations

This study was carried out in an ethical manner following the accepted norms for secondary data analysis [65]. The use of the publicly available dataset from Kaggle to the Digital Adoption and Sales Performance in SMEs was found to be ethically sound, and there was no requirement for direct interaction with human participants or for formal ethical approval or informed consent [66]. Some limitations should be noted in the interpretation of the results. First, the sample size is relatively small (250 SMEs), potentially affecting the generalizability of the results to the larger population of U.S. SMEs. Second, the dataset is not directly capturing other important organizational readiness constructs like leadership commitment, organizational culture, employee digital skills, strategic alignment, and data readiness [67]. These constructs were thus introduced conceptually via literature and not tested. Third, the cross-sectional feature of the data does not allow a study of the changing trends of AI use and business performance over the years. Finally, the regression analysis showed a relatively low explanatory power suggesting that other factors that are not included in the data set, such as organizational, financial, technological, and environmental, may play a significant role in SME performance [68]. Further studies should include larger, more naturalistic, longitudinal datasets, and organizational measures to provide more solid empirical support for the suggested framework.

Research Contribution

This study's findings have implications not only for the academic field but also for the business world, as it proposes a framework for managing the strategic capability and adoption of Artificial Intelligence (AI) in business analytics to achieve successful implementation in U.S. small and medium enterprises (SMEs). This study contrasts with previous research which mostly concentrated on building AI algorithms or assessing the performance of the predictive models and evaluates organizational and strategic skills essential for achieving sustainable AI implementation and delivering actual business value. The research builds upon existing theories such as Technology–Organization–Environment (TOE) framework, Diffusion of Innovation (DOI) theory, Resource-Based View (RBV), and Dynamic Capability Theory, and combines them into a cohesive model that connects organizational readiness, a structured AI adoption process, and business performance. Results of empirical analysis showed some evidence about the relationship and how technological adaptation contributes to sales growth and indicated that the adoption of technology is not enough to ensure better organizational performance. The study underscores that leadership commitment, organizational culture, and employees' digital competence, strategic alignment, and continuous organizational learning are important enablers for successful AI implementation. The framework presented in this study offers a practical means to plan, implement, and evaluate AI initiatives while reducing implementation risks, offering a scalable framework for future research, practice, and policy development to support AI-driven digital transformation in SMEs.

CONCLUSION

Fundamental Finding: This study developed a Strategic Capability and Adoption Framework to support the successful adoption of Artificial Intelligence (AI)-enabled business analytics within U.S. small and medium enterprises (SMEs). This study filled an important knowledge void in the literature by examining the readiness of organizations and the process of implementing the strategy, instead of the technical development of the AI systems. The study builds on existing theories, such as the Technology–Organization–Environment (TOE) framework, Diffusion of Innovation (DOI) theory, Resource-Based View (RBV), and Dynamic Capability Theory, to create a holistic framework comprising three interdependent domains: Organizational Readiness, Structured AI Adoption Roadmap, and Competitive Performance Impact. The secondary data were analyzed, and the results showed that there is a positive (although not statistically significant) correlation between technological adaptation and sales growth, while years of operation and firm size is not enough to explain the variations in the business performance.

Implication: The results suggest that the adoption of technology should be understood in the context of an organizational transformation that involves the leadership's commitment, strategic alignment, employee digital capabilities, organizational learning, and good change management. The proposed framework thus focuses on the strategic capabilities of the organizations that are required before and during the actual implementation to ensure sustainable business value from AI. It provides a clear path to

guide SME owners and managers in evaluating their readiness, strategizing for gradual implementation, and tracking business performance using quantifiable metrics. It also offers a scalable strategy to encourage responsible AI use by resource-poor business organizations to policymakers and support systems. **Limitation:** The secondary data were analyzed, and the results showed that there is a positive (although not statistically significant) correlation between technological adaptation and sales growth, while years of operation and firm size is not enough to explain the variations in the business performance. **Future Research:** The study brings together conceptual and empirical approaches to provide a practical basis for future research in SMEs, where long-term competitive advantage is not only about introducing AI-enabled technologies and tools, but also about the continuous improvement and reinforcement of the organization's capabilities and processes to enable sustainable digital transformation and business growth.

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