Journal of Management and Research (JMR)
Volume 12 Issue 2, Fall 2025
ISSN$_{(P)}$: 2218-2705, ISSN$_{(E)}$: 2519-7924
Homepage: https://ojs.umt.edu.pk/index.php/jmr

Title:	**Multidimensional AI Readiness Framework for Small and Medium-sized Enterprises in an Emerging Economy: Evidence from Pakistan**
Author (s):	Fowad Ahmad[1], Kashaf Khurshid[2], and Wajid Ali[3]
Affiliation (s):	[1]Wuhan University of Technology, Wuhan, China [2]Henan University, Kaifeng, China. [3]Bahria University, Islamabad, Pakistan
DOI:	https://doi.org/10.29145/jmr.122.05
History:	Received: June 21, 2025, Revised: September 23, 2025, Accepted: October 25, 2025, Published: December 31, 2025
Citation:	Ahmad, F., Khurshid, K., & Ali, W. (2025). Multidimensional AI readiness framework for small and medium-sized enterprises in an emerging economy: Evidence from Pakistan. *Journal of Management and Research*, *12*(2), 130-163. https://doi.org/10.29145/jmr.122.05
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Conflict of Interest:	Author(s) declared no conflict of interest

A publication of
Dr. Hasan Murad School of Management
University of Management and Technology, Lahore, Pakistan

Multidimensional AI Readiness Framework for Small and Medium-sized Enterprises in an Emerging Economy: Evidence from Pakistan

Fowad Ahmad[1*], Kashaf Khurshid[2], and Wajid Ali[3]

[1]School of Management, Wuhan University of Technology, China
[2]Advanced Institute of Finance, Henan University, China
[3]Department of Project Management and Supply Chain Management, Bahria University, Islamabad, Pakistan

Abstract

Artificial Intelligence (AI) holds transformative potential for small and medium-sized enterprises (SMEs), yet its adoption in emerging economies remains low due to context-specific barriers. Existing AI readiness models, predominantly derived from developed economies, overemphasize technological factors. To address this gap, this study developed a comprehensive, empirically-grounded framework that captures the crucial strategic, organizational, and regulatory challenges salient in resource-constrained contexts, explicitly elevating 'Regulatory' to a standalone dimension. Evidence was drawn from Pakistani SMEs. A qualitative, multiple-case study methodology was employed, drawing on data from semi-structured interviews with management across three SME sectors (manufacturing, services, and primary). Data was analyzed using NVivo-12 for thematic coding and cross-case analysis. The research culminates in a multidimensional AI readiness framework comprising five critical dimensions: (1) Strategic, (2) Technological, (3) Organizational, (4) Environmental, and (5) Regulatory. The findings revealed a significant AI readiness gap among Pakistani SMEs, characterized by a universal lack of regulatory guidance, varying levels of technological infrastructure, and a strong dependence on top management support. Across the three sectors, only one SME progressed beyond the initial AI readiness stage, while all three showed very low regulatory preparedness, indicating a severe readiness deficit. Technological maturity ranged from minimal digitization to partial AI experimentation, indicating a pronounced technology readiness gap across these sectors. The proposed framework would provide SME managers and policymakers with a practical diagnostic tool to systematically evaluate their organizational AI readiness. Furthermore, it would also provide clear levers for intervention. This highlights the need for strategic vision, skills development, and the creation of internal AI

*Corresponding Author: fowad.ahmad@whut.edu.cn

policies in the absence of robust national frameworks.

***Keywords*:** AI adoption, Artificial Intelligence, AI readiness, digital transformation, emerging economies, multidimensional framework, small and medium-sized enterprises

Introduction

In todays dynamic business landscape, the intersection of digital transformation and Artificial Intelligence (AI) has fundamentally reshaped service delivery. Although the potential uses of AI in public organizations are widely examined, it also offers significant opportunities for small and medium-sized enterprises (SMEs) (Janssen & Kuk, 2016). AI readiness, defined as an SMEs preparedness and capability to integrate AI technologies, involves the necessary technological infrastructure, data quality and accessibility, employee competencies, and an organizational culture conducive to AI adoption (Ali et al., 2024). It represents the SMEs ability to harness AI in order to create value, drive innovation, and achieve sustainable growth.

While AI is extensively discussed in academia and has been widely implemented in sectors, such as manufacturing, logistics, and healthcare (Davenport, 2018), its deployment in other areas has encountered significant obstacles, leading to a comparatively slower rate of adoption (Hradecky et al., 2022). This trend persists even policymakers worldwide actively promote and fund AI initiatives (Alsheibani et al., 2018). This research specifically examined the role of technological infrastructure, data quality, talent development, SMEs' organizational culture, regulatory compliance, and strategic alignment in fostering AI readiness and its subsequent impact on SMEs' performance. Nevertheless, this global perspective on AI adoption overlooks a crucial gap: within emerging economies, such as Pakistan, SMEs confront a distinct set of challenges that existing models, primarily developed from the context of industrialized nations, fail to adequately capture. These models predominantly emphasize technological infrastructure and user acceptance while neglecting critical elements, such as regulatory governance, institutional voids, and leadership-driven strategic alignment. Existing models, such as the Diffusion of Innovation (DOI), Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and Technology-Organization-Environment (TOE) have largely emphasized technological adoption

determinants. This offers limited treatment of context-specific constraints, such as weak regulatory structures, limited strategic leadership, and institutional voids characteristic of emerging economies.

While global AI advancement has been rapid, a significant gap remains in comprehending the strategic adoption and application of these technologies by enterprises in emerging economies, such as Pakistan. Specifically, Pakistani SMEs encounter distinct obstacles—including restricted access to advanced technology, a shortage of digital skills, and low preparedness for AI-driven solutions. This underscores a critical void in the literature: the absence of a holistic, empirically-validated AI readiness framework tailored to the unique strategic, organizational, and regulatory hurdles of SMEs in these contexts. Predominantly derived from developed countries, the existing models frequently exhibit a techno-centric bias, overlooking the essential dimensions critical for resource-constrained environments like Pakistan.

This research addressed a critical gap in the literature by developing a comprehensive, multidimensional framework to assess AI readiness for SMEs in Pakistan, grounded in empirical evidence from key economic sectors. The need for this study was underscored by the necessity to evaluate organizational readiness, specifically concerning resources, processes, and strategic vision (Alami et al., 2024), as existing gaps hinder Pakistani SMEs from realizing the benefits of digital transformation. Although initial research has started to examine AI readiness in specific settings, such as the public sector (Ali et al., 2025), there is a lack in significant understanding of the distinct strategic, organizational, and regulatory challenges confronting SMEs in emerging economies. Prevailing models, primarily from developed nations, often place disproportionate emphasis on technological factors, thereby overlooking dimensions critical for resource-constrained environments, such as Pakistan. Consequently, this study aimed to fill this void by constructing and proposing a holistic framework derived from sector-wide empirical data.

The current research sought to deepen the understanding of AI preparedness and to develop pragmatic, dual-pronged solutions for both policymakers and corporate executives. The ultimate objective was to provide a foundational diagnostic tool to systematically evaluate the readiness of SMEs in order to capture the innovative benefits of AI. Given these omissions, a context-adapted readiness model is critically required for

economies, such as Pakistan, where SMEs operate with limited digital capacity, weak governance systems, and fragmented AI-related institutional support. This study responded directly to the operational difficulties reported by SMEs insufficient digital skills, fragmented IT systems, and absence of regulatory clarity that hinder effective AI adoption. Therefore, this study provided a contextualized framework that addresses these unique challenges and supports AI adoption by SMEs in emerging economies.

Research Questions

The current study aimed to answer the following research questions:

RQ1: What factors influence AI readiness in the context of SME organizations?

RQ2: How do these factors manifest in terms of readiness levels across different SME sectors in Pakistan?

Multidimensional AI Readiness Framework

Comparative Case Study: Framework

It is pertinent to highlight that the resulting synthesis of these factors is presented in Table 1. This synthesis outlines the multidimensional AI readiness framework for SMEs, detailing the strategic, technological, organizational, environmental, and regulatory factors alongside their supporting references.

Table 1

AI Readiness Framework for SMEs

ID	Factors	AI Readiness Factors for SMEs	References
1	Strategic Factor		
i	People Strategy	Organizations must develop their employees' understanding of AI and improve their literacy rate quickly.	(Ali & Khan, 2025; Kumar et al., 2023; Uren et al., 2023).
ii	Organizational AI Strategy	Organizations' AI readiness is due to the need for an internal-level strategy easily understood when integrating AI.	(Ali & Khan, 2025; Kumar et al., 2023; Uren et al., 2023).
iii	Process Strategy	An organizational AI readiness assessment enables technical staff to efficiently integrate AI at an initial level.	(Borges et al., 2021; Persson & Vesterlund, 2022).

ID	Factors	AI Readiness Factors for SMEs	References
2	Technological Factor		
i	IT Infrastructure	Organizational availability of IT infrastructures (Hardware, Cloud, Security, etc.), ready for AI deployment.	(Ali & Khan, 2025; Ali et al., 2024; Hofmann et al., 2020; Johnk et al., 2021).
ii	Multidisciplinary Teams	Organizational readiness requires a multidisciplinary team of experts to implement AI.	(Hofmann et al., 2020; Johnk et al., 2021).
iii	Data Management	An organization requires reliable and secure data availability to implement AI.	(Ali et al., 2025; Borges et al., 2021; Persson & Vesterlund, 2022).
3	Organizational Factor		
i	Resources Availability	The adoption of AI requires the availability of both internal and external organizational resources.	(Ali & Khan, 2025).
ii	Clarity of Goal	The organization needs clarity on the goal of AI.	(Hofmann et al., 2020; Johnk et al., 2021).
iii	Organizational AI Policies	Organizations' readiness requires an AI policy from the government's AI initiative.	(Ali & Khan, 2025; Uren et al., 2023).
4	Environmental Factor		
i	AI Awareness	To quickly understand AI and the organization, AI awareness among employees can be improved to increase the literacy rate.	(Ali & Khan, 2025).
ii	Collaborative Culture	Organizational preparation has facilitated the complete environment and knowledge exchange across the department level for AI initiative.	(Johnk et al., 2021)
iii	Competitive Advantages	The organization has pressure to implement AI and utilize its advantages.	(Ali & Khan, 2025; Ali et al., 2024).
iv	AI Acceptance	The organization needs to accept the AI implementation.	(Hafeez et al., 2023; Uren et al., 2023).

ID	Factors	AI Readiness Factors for SMEs	References
v	AI Scalability	Organizational readiness necessitates both internal and external acceptance of AI. Organizations can accelerate the rate of AI implementation while maintaining high performance.	(Eljasik-Swoboda et al., 2019).
5	Regulatory Factor		
i	Government Framework Compliance	The organization provides guidelines for the use of AI in all new initiatives.	(Kumar et al., 2023; Uren et al., 2023).
ii	Government AI-Specific Legislation and Guidelines	The organization is responsible for providing guidelines for AI usage and legislation for any new AI initiatives.	(Sjöberg & Schill, 2023).
iii	Organizational Legal Framework	Organizational requirements for government policy have been identified as a factor influencing the development of AI within the legal framework.	(Ali et al., 2024; Borges et al., 2021).
iv	Organizational Ethics	Organizational requirements for AI usage and ethical policies.	(Johnk et al., 2021).
v	Data Privacy Regulations	Organizational requirements for policy and privacy regulations.	(Sjöberg & Schill, 2023).

The research culminates in a multidimensional AI readiness framework comprising five critical dimensions: (1) Strategic, (2) Technological, (3) Organizational, (4) Environmental, and (5) Regulatory. The proposed frameworks dimensions are justified and validated by prior expert opinion from a similar emerging economy context, which also pinpointed analogous critical factors for AI adoption (Ali et al., 2024), thereby attesting to its robustness and contextual relevance. The five factors of AI readiness measure readiness in the SME sector, focusing on primary, services, and manufacturing sectors. The maturity model was utilized to fulfil this purpose (Alsheiabni et al., 2018).

In comparison with the concept of resistance to change, the concept of readiness for change received more attention. Specifically, it has been contended that preparation for change is a significant factor in determining an individuals resistance to support for a change endeavor. At this point, a

sizeable amount of literature on readiness for change discusses not just individuals but also the organization, focusing on readiness for change as a phenomenon that occurs at the organizational level. AI is a technology that has the potential to help organizations obtain a competitive advantage themselves. It is both extremely effective and highly promising. The economy and other sectors around the world are being significantly impacted by AI. The majority of public organizations are preparing for AI implementation, and many SME organizations are moving forward with it. However, Pakistan has a low readiness index rate, and there is need to first assess the readiness of SMEs that are planning to use AI.

This study defined organizational readiness for AI as "an organizations state of being prepared to successfully adopt and innovate with Artificial Intelligence". This definition is based on the readiness concept that was presented by Lokuge et al. (2019). It has been decided that AI-Readiness would serve as a formative construct that may concentrate on the organizational level of analysis to fulfill the study purpose of providing practitioners with insights that can be put into action. It is especially advantageous to utilize a construct that is formative since it can provide "specific and actionable attributes" (Ali et al., 2025). The idea of AI-Readiness is a multi-faceted concept that is made up of the sub-constructs of important readiness criteria that collectively have a favorable impact on the level of AI-Readiness when taken as a whole. The term "key readiness factors" refers to the variables that assist businesses in overcoming significant obstacles to the implementation of AI. These elements boost the possibility of successful adoption of Machine Learning (ML). Furthermore, as was said in the section in which the scope of the research was discussed, the preparedness factors are the ones that are susceptible to being altered by an organizational effort. When it comes to identifying a sub-construct of the research construct, the conventional method involves selecting from the current studies and using an inductive technique. However, a significant amount of the literature has not yet discussed the readiness notion in the context of AI. It is important to highlight that to identify the limited number of relevant preparation elements, iteration takes place between the reading of the relevant literature and interviews with subject matter experts.

Relevant literature that addresses organizational innovation or readiness is consulted to select the factors to be considered. According to Uren et al. (2023) the authors thought to accommodate the subsequent context

involved in the use of ML in businesses. Those important readiness variables are anticipated, although they can be different at the actual time. The basic model is therefore subject to empirical testing that would take place during the subsequent research phase, consisting of many case studies.

Barriers to AI Readiness in SMEs Organizations

The adoption of AI in SMEs organizations holds the promise of improved efficiency and enhanced service delivery. Organizational readiness for AI is often obstructed by internal inflexibility, such as rigid hierarchies, and by the absence of a clear strategic roadmap, which may lead to insufficient planning and resource allocation (Carlson & Viklund, 2022).

SMEs face significant technological challenges, including outdated IT infrastructure that is often incompatible with contemporary AI applications (Mutawa et al., 2020). Compounding this are human resource constraints, characterized by a marked scarcity of personnel possessing essential AI expertise. This skills gap is frequently worsened by insufficient training and a lack of professional development in emerging technologies. Non-standardized data formats and issues of poor data quality further complicate AI adoption (Stenberg & Nilsson, 2020). Additionally, SMEs must navigate complex ethical and regulatory concerns, such as data privacy and algorithmic transparency, with the absence of comprehensive regulatory frameworks for AI use presenting a further impediment (Sirait et al., 2025). Overcoming these barriers necessitates a multifaceted strategy involving organizational change management, investment in modern infrastructure, capacity building, and the development of robust ethical and regulatory guidelines. This is particularly relevant for SMEs in contexts, such as Pakistan, where despite various reform initiatives to improve performance, the path to AI readiness remains fraught with obstacles that require comprehensive strategies to overcome.

Multidimensional AI Readiness Framework

Building upon the preceding theoretical synthesis, this study formulated a five-dimensional AI readiness framework. This framework was developed by integrating the lens of Organizational Readiness for Change (ORC) (Weiner, 2009) with the TOE framework, directly addressing an identified gap in the literature. A principal novelty of this proposed framework is its treatment of the regulatory dimension as a critical, standalone component, rather than a subsidiary element of the environment. The study argued that

this is a pivotal barrier for SMEs in emerging economies, which frequently operate in contexts where comprehensive national AI strategies are absent or nascent. The literature confirms that AI readiness is multidimensional. While prior research has pinpointed various factors, an integrated model capturing the interplay between strategic intent, technological capability, organizational resources, environmental pressures, and regulatory compliance is lacking, particularly for an SME context in emerging economies. The subsequent sections elaborate on the theoretical foundations and the specific dimensions of this framework.

Theory of Organizational Readiness Change (ORC)

Based on Weiner (2009) theory, organizational readiness for change is a collective state, defined by the degree to which organizational members share a positive valuation of a specific change and possess a shared belief in their collective capacity to execute it. This state of readiness is shaped by an assessment of three primary drivers: implementation capability, resource availability, and situational factors. Implementation capability pertains to the organizations managed processes and activities for goal achievement, which is grounded in its resource-based view and structural configuration. Resource availability includes both technical assets such as computing power and financial investment for AI and the necessary human expertise (Duan et al., 2019; Dwivedi et al., 2021). Situational factors involve external elements, such as competitive market forces and regulatory mandates. The collective assessment by members ultimately centers on whether the perceived task demands are commensurate with the organizations available resources and situational context (Weiner, 2009). Furthermore, organizational characteristics, including top management support and firm size, are also influential in determining this readiness.

Theoretical Foundations for AI Readiness

This section synthesizes the theoretical foundations required to construct the multidimensional AI readiness framework.

Integration of ORC and TOE for Framework Development

The current study established its foundational lens by integrating the ORC (Weiner, 2009) with the TOE framework. The ORC theory, which centers on an organizations psychological and structural facets of being prepared to undertake a new endeavor, supplies the core components of readiness. These components are translated into the dimensions of strategic

readiness, which manifests leaderships commitment to the change, and organizational readiness, which embodies the change efficacy afforded by available resources, skills, and internal policies.

Building upon the robust and widely recognized TOE framework, the study adapted and extended it to more effectively capture the subtleties of AI adoption within SMEs. A key refinement involves dividing the broad organization context into two separate dimensions, strategic and organizational, to enhance granularity and analytical power. A central theoretical contribution of the study's adapted framework is the elevation of the regulatory dimension to a position of parity with the established strategic, technological, organizational, and environmental factors. Whereas the traditional TOE framework typically treats regulation as a component of the broader environment , the study's empirical context, specifically in emerging economies such as Pakistan, demands this distinction. In such settings, the lack of a national AI strategy or clear data governance laws acts not as a passive background condition but as an active, resource-intensive challenge. This compels SMEs to create ad-hoc internal policies, thereby making regulatory navigation a critical and independent facet of their readiness. This perspective aligns with the ORC theorys concept of situational factors, wherein the absence of external support directly hinders an organizations capacity for effective change.

This theoretical synthesis, integrating the change-centric view of ORC with the contextual structure of the TOE framework, directly informs the selection and organization of the factors presented in the multidimensional AI readiness framework in Table 1.

Technology Adoption Models and Theories

Some studies suggest that the adoption of AI has been influenced by individual-level exploration readiness at various organizational levels (Aboelmaged, 2014). Innovation adoption theories, such as the DOI, the TAM), the Theory of Reasoned Action (TRA), and the TPB), have been extensively used in IT innovation and AI adoption studies. A study suggested that the DOI theory was more extensively used in studies that performed organizational AI readiness analysis. In contrast, the TAM, TRA, and TPB were primarily used for individual-level AI readiness analysis. Moreover, organizations at various levels of AI readiness have unanimously approved the TOE framework for investigating AI adoption (Ali et al.,

2024). Three stages are involved in innovation adoption: initiation, adoption decision, and AI implementation for organizational-level analysis. The study's framework is conceptually aligned with and extends the TOE framework. Here, the organization context is refined into distinct strategic and organizational dimensions to provide more granularity. In addition to that, the study extracted the regulatory aspects from the broader environment to give it the emphasis required in the context.

In this study, DOI and TAM inform the technological and people-related dimensions, TPB supports the organizational and strategic components, while TOE provides the structural foundation to integrate environmental influences. The regulatory dimension is elevated from the TOE environmental category since empirical evidence shows that regulatory voids constitute an independent barrier in emerging economies. Specifically, DOI informs the technological dimension (innovation characteristics), TAM informs the people and technology dimensions (ease-of-use, perceived usefulness), TPB informs strategic and organizational dimensions (intentions, cultural support), while TOE provides the environmental foundation adapted in this study.

Organizational AI Readiness

This study used the maturity model, developed by Alsheiabni et al. (2019) to assess the progression of AI readiness. This model, detailed in Table 2, provides a clear scoring mechanism to evaluate an SMEs position on its AI adoption journey.

Table 2

Maturity Model According to AI Foundations (Alsheiabni et al., 2019).

Level	AI Foundations	Scoring
Initial	Very limited or no AI function, and the organization has no plans to use AI.	Low
Assessing	Discovery of AI technology	Moderate
Determined	The AI project is at an advanced stage; the determination of infrastructure is needed to implement AI further.	Average
Managed	Specific AI processes are defined throughout the organization's preparation for a large-scale AI application.	High
Optimized	The full AI infrastructure is ready for a large-scale AI application.	Excellent

At this level, the necessary processes for organization-wide, large-scale AI applications are defined. Finally, at the optimization level, the organization has the infrastructure and architecture suitable for large-scale AI applications.

Methodology

This study employed a qualitative multiple-case study design, appropriate when prior research is insufficient for hypotheses and general questions guide the inquiry (Yin, 2018). A qualitative methodology was selected to collect data through participant dialogue, generate thematic insights, and answer "how" questions (Saunders et al., 2012). This contrasts with quantitative methods suited for hypothesis testing.

Purposive sampling was used to select participants with direct knowledge of AI readiness (Saunders et al., 2012), supplemented by snowball sampling. Data was collected via semi-structured interviews with experts from Pakistani SMEs in the primary, services, and manufacturing sectors (Saunders et al., 2012). Case selection was based on organizational AI readiness and regional diversity within Pakistan to explore strategic, technological, organizational, and environmental factors affecting AI adoption. The primary, services, and manufacturing sectors were selected because they represent the dominant SME categories in Pakistan and differ significantly in digital maturity. This contrast allowed the study to capture sectoral variation in readiness levels. Participants were selected using purposive sampling to ensure direct involvement in digital or strategic operations. Interviews were semi-structured, recorded, and transcribed to ensure accuracy. The final selection of cases, including their sector, industry, sample size, location, and data sources, is summarized in Table 3. The number of interviews per case (7–12) was determined by data saturation, which was reached at different points due to the varying size and complexity of each SME.

Table 3

Interview Sample Size and Details

Case	Sectors	Industry	Sample	Location	Additional Material/Interview
A	Primary	Agriculture and Live Stock	07	Punjab, GB, and AJK Pakistan	Documents/interview. Internal policy provides. Written documents provide.

Case	Sectors	Industry	Sample	Location	Additional Material/Interview
B	Services	Trading, IT, and E-Commerce etc.	08	Punjab, KP, GB Pakistan	Documents/interview. Internal policy provides. Written documents provide. Some of the pictures and videos are provided.
C	Manufacturing	Textiles	12	Sindh, Punjab Pakistan	Documents/interview. Internal policy provides. Written documents provide.

In qualitative studies, a smaller sample size is sufficient as data is drawn from diverse sources, such as interviews and observations, eliminating the need for a large sample (Dworkin, 2012). For this study on organizational readiness for AI, adequate formal and informal interviews were conducted with a defined population, including top, middle, and lower management, IT/operational engineers, technical specialists, and other key roles (Terrell, 2022; Yin, 2018). Here, the study used NVivo-12, following process, for thematic analysis. By following cross-case analysis to identify patterns and variations, each participant was engaged for within-case analysis. NVivo-12 was used due to its capacity to systematically code and categorize large volumes of qualitative data, improving analytical transparency.

Results

Keeping the conceptualizations mentioned above in mind, AI key readiness factors define AI readiness as an organizations readiness to implement and adopt AI and the suitability of its strategic, technological, organizational, and environmental factors for its adoption and operation. The current research underpins this definition, which broadens the notion of organizational readiness for change, based on an organizations preparedness for a specific issue (Weiner, 2009). There is a need to explore how these different types of readiness relate to and impact various organizational dimensions. Thus, a suitable framework was required to describe the dimensions of an organization that may potentially affect AI readiness. Organizations adopting AI into their systems need to analyze an IT-reliant work system.

The current study identified the readiness factors of AI in the context of SMEs into which AI would be integrated. The study also introduced the most significant readiness factors that may mitigate the aforementioned adoption barriers. The five key readiness factors that can contribute to successful AI implementation were finalized: (i) Strategic factors, (ii) Technological factors, (iii) Organizational factors, (iv) Environmental factors, and (V) Regulatory factors. Having these factors as sub-constructs, a formative construct of organizational readiness for AI was developed. The empirical findings from the cross-sector case analysis are synthesized in **Table 4**, revealing stark contrasts in readiness levels across the three sectors (agriculture and livestock, trading and e-commerce, and textiles). and the findings also highlight the most salient challenges and implications for each dimension.

Table 4

Cross-sector Case Analysis of AI Readiness Factors

AI Readiness Dimension	Key Factors	Sector A (Agriculture and Live Stock)	Sector B (Trading and E-Commerce)	Sector C (Textiles)	Cross-sector Case Insight and Implication
Strategic	People Strategy	High	Moderate	Low	Top-down literacy programs are a key differentiator for readiness.
Strategic	Organizational Strategy	High	Average	Low	A clear, internal AI roadmap is pivotal for guiding integration efforts.
Technological	IT Infrastructure	High	Average	Low	Foundational cloud-based infrastructure is a non-negotiable prerequisite.
Technological	Data Management	High	Average	Low	Data governance and security protocols are a major barrier for most.
Organizational	Resource Availability	High	Moderate	Low	Financial and human resource constraints are the most significant barriers.

AI Readiness Dimension	Key Factors	Sector A (Agriculture and Live Stock)	Sector B (Trading and E-Commerce)	Sector C (Textiles)	Cross-sector Case Insight and Implication
Environmental	AI Acceptance	High	Average	Low	Cultural resistance and fear of job displacement hinder bottom-up adoption.
Regulatory	Government Framework	Low	Low	Low	A universal, critical gap; all sector cases rely on internal, ad-hoc policies.

Across the strategic dimension, only Sector C demonstrated a clear AI strategy. Technologically, Case A lagged due to basic digitization, while Sector C possessed advanced data systems. Organizationally, differences emerged in senior leadership support and availability of technical staff. The environmental dimension showed moderate cultural readiness in Sector B and weak in Sector A. Regulatory readiness was uniformly low across all sector cases.

Strategic Factors

AI awareness is the awareness of AI readiness, such as natural language processing (NLP), robots, ML, and algorithms. Employees with higher AI awareness are worried about the security of their jobs in the future in both organizations and industries due to the implementation of AI (Kong et al., 2019). AI awareness causes employees to feel anxious and insecure which lowers their job-related self-efficacy and impairs their occupation-related self-management (Kong et al., 2019). Organizations in the SMEs must establish an effective AI strategy to capitalize on the potential of AI technologies. An AI strategy should provide a roadmap for the organization's vision, objectives, and the integration of AI into its operations. Organizations can effectively integrate AI technologies by following a defined roadmap provided by an AI strategy. As stated by senior management "*organization primarily possesses a training department dedicated to AI project planning. These resources are designed to educate employees and staff on various IT tasks and business processes and to integrate artificial intelligence (AI) into these processes".* As said by the Project Director: **"***Yes, Organization B plans to develop programs focusing*

on AI-related medical tools, including diagnostic imaging and robotic-assisted surgery training. Workshops will also focus on how AI can aid patient care and improve operational efficiency".

Figure 1

Strategic Factors

A summary of the key strategic factors and their interrelationships, as identified in the analysis, is visualized in Figure 1.

It is a challenging task for Organization B to hold workshops on IT awareness in other organizations. Additionally, Organization B is committed to promoting employee literacy to improve AI consciousness. Additionally, Organization B is committed to increasing literary awareness about AI in various phases. The personnel of this company is strongly committed to increase their awareness of AI and encourage training at various intervals around the organization. Involving AI technologies heightens awareness within the organization to improve AI literacy, leading to a substantial increase in management commitment.

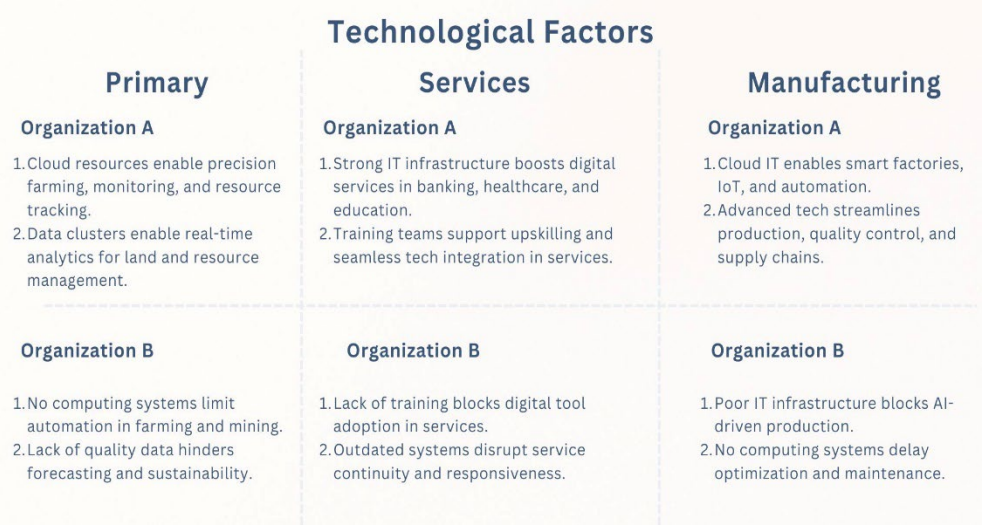
Technological Factor

A robust AI infrastructure depends on several key components: storage, substantial computing power, bandwidth, and integrated platforms to successfully operationalize AI applications. This foundational infrastructure

must be reinforced with stringent security protocols, incorporating enhanced encryption and access controls specifically for AI systems. Furthermore, the availability of appropriate and varied data is critical, with structured data being suitable for standardized AI, while more sophisticated applications, such as object recognition require unstructured data (Ali et al., 2024; Ali et al., 2025). Organizations must also ensure a high-quality data transformation infrastructure to build unbiased AI models. Infrastructure readiness can be viewed through IT readiness for new initiatives, digital applications, and technology partnerships, reflecting a resource-based view of organizational capability.

Figure 2

Technological Factor



- The organization maintains a readily available IT structure and an operationally supportive IT infrastructure for implementing AI, ensuring that most data transfers are digital.
- The organization utilizes both hardware and data in the cloud, and it is concerned about the security of its IT cloud systems. To continuously improve cloud services, deploying AI in any system or IT infrastructure may be more manageable.
- Changes to the IT infrastructure depend on the AI use case; organization A can utilize AI-specific work. Organization A requires cloud databases and data-centralized unit systems for the IT infrastructure.

- When it comes to hardware changes, organization A requires high-tech computerized systems, which are easier to modify than AI deployments. Organization A can easily change to an AI deployment. The core technological components and requirements identified as critical for AI readiness, including IT infrastructure, data management, and multidisciplinary teams, are depicted in Figure 2.

Organization As ability to rapidly deploy AI hinges on its multi-disciplinary and technical teams, without which adaptation fails. Organization B has secure cloud data systems but requires further investment in advanced encryption and access controls for AI. Both organizations rely on their foundational structures—teams for A and data systems for B—to enable effective AI deployment.

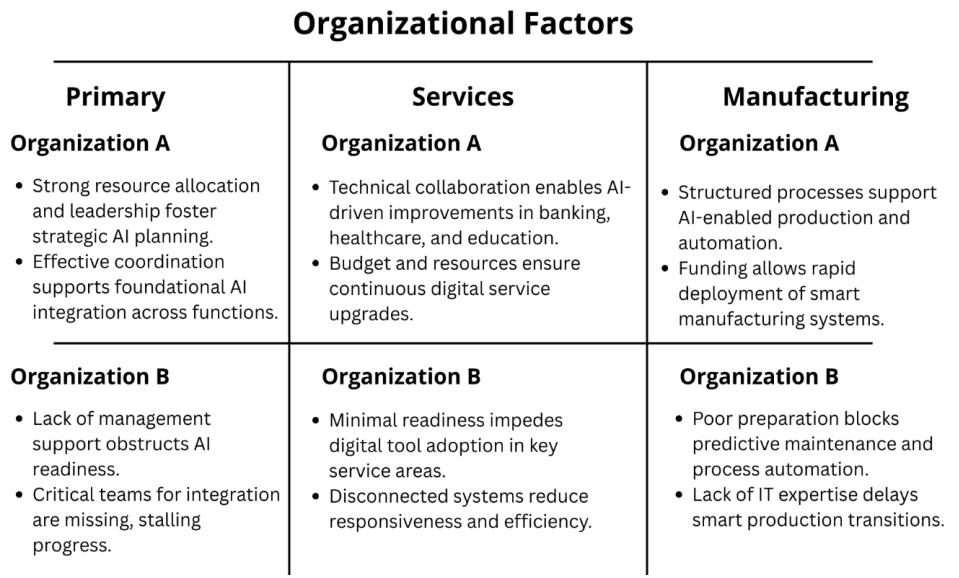
Organizational Factor

Adopting AI in a company depends on the culture and the availability of slack resources, which should be further subdivided. Comparable to other innovations the availability of financial resources through a budget is an essential aspect that generally determines the implementation of new technologies in projects. A high budget can enable capacities, create financial freedom, and help to build know-how. On the other hand, obligations also arise from financial resources (Pumplun et al., 2019).

One of the senior managements said: "*Our organization has a one-year budget, not a five-year budget, because this is a government organization with a finance budget for AI initiatives, yes, new AI technology initiatives, and international funding required for launching the latest technology".* Senior management stated: "*Yes, our top management supports any initiatives not related to AI. They are earnest about AI implementation and influence AI projects. They help with the allocation of resources, teamwork, and budget allocation for the implementation of AI.*

Top management support is quite important for new initiatives in an SME organization. Top management support refers to the degree to which the top management budget allocation from the finance division and team upholds the activities needed for the AI initiatives by mobilizing resources and promoting the entrepreneurial behavior of relevant actors. As with AI initiatives requiring relatively high investment, large-scale adoption is held back if the final decision-makers are reluctant to mobilize the necessary resources and support infrastructures.

Figure 3
Organizational Factors



Organizations require two key elements for successful AI adoption: resource availability and top management support. Organization A has a financial budget but must manage the responsibilities that come with it, noting that AI projects are unpredictable. In contrast, Organization B lacks essential IT expertise, data scientists, and software engineers, making a skills development program and new hiring critical (Stenberg & Nilsson, 2020).

Top management support is of utmost importance, as AI initiatives require more time than other digital projects. Management must have a look on AI as a strategic opportunity, secure financing, and establish platforms that foster a bottom-up innovative environment. The study found that all experts agreed that changing infrastructure and empowering team is not possible without the support of top management. AI adoption is unfeasible while allocating crucial resources and nurturing a creative culture. These organizational elements actually established the foundation in an organization for transforming the AI process.

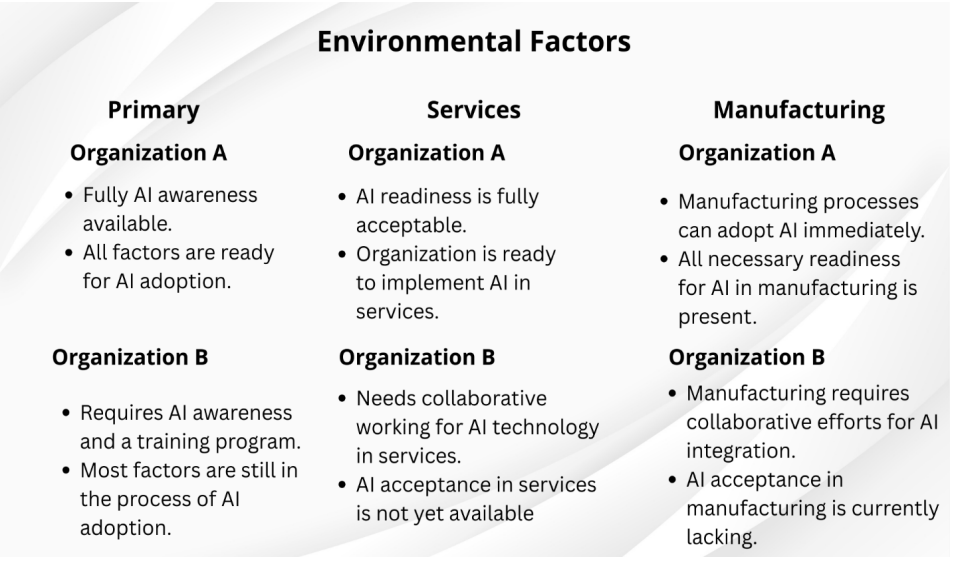
Environmental Factor

Organizational environment explains the degree to which domain

experts, AI specialists, and IT departments actively communicate and work together in cross-functional teams (Davenport, 2018). The collaborative work is crucial to overcome siloed work and identify new cases that benefit the organization (Fountaine et al., 2022). Thus, the organizational environment should promote different forms of collaboration so that employees with various skills may complement each other. Organizational dynamics are a collection of processes that managers can use to conduct operations efficiently and comprehensively manage organizational AI goals. Organizational dynamics may vary significantly from one organization to another as these entities could have different needs and AI goals. The external and internal environmental pressures, such as collaborative culture and competitive advantages, that influence AI readiness are captured in Figure 4.

Figure 4

Environmental Factors



Regulatory Factor

The federal government aims to advance responsible AI safety and security principles in collaboration with other nations, including competitors, while spearheading essential global conversations and partnerships to ensure that AI serves the international community, rather than intensifying disparities and threatening human rights. Government

regulation constitutes a series of requirements imposed on private enterprises and individuals to fulfill governmental objectives. These encompass improved and more affordable services and products; safeguarding of current enterprises from "unfair" and equitable competition; enhanced water and air quality; and increased safety in workplaces and products (Ali et al., 2024). One senior management said: "*The AI readiness framework is currently unavailable. As a government organization, we align with the federal government policy, which is currently unavailable, and we adopt new artificial intelligence frameworks, policies, and best practices at the international level.* One of PM said: *Government regulations are not readily available. As a government organization, we work on various projects, and the nature of each project determines how we can establish policies, rules, and regulations. An organization needs a legal policy, but internally develops the policy about AI deployment, without adopting from any external policies. No guidelines have been developed for AI in the legal framework, but different procedures have been adopted. In some projects, we establish the rules and policies required for privacy, basis, data storage, data protection, data sources, and privacy security".*

Organizations require an AI policy to regulate its use, ensure legal compliance, protect sensitive data, maintain quality and accuracy, mitigate bias, promote accountability, and build employee trust. An organization implements AI policies to manage tasks effectively, adhering to specific rules and internal guidelines for AI initiatives. These policies are periodically adjusted based on project requirements for public or private sector operations.

According to a senior manager: "*Currently, organization A has no policy, and the Ministry of Information Technology is responsible for overall AI policy development at the public and country levels.* As reported by another senior authority: "*Organization B has no AI policy. Still, our internal organization has a policy on AI adoption, and we change the policy sometime during the AI project".* Similarly, according to some heads: "*Organizations A and B do not have an AI policy. However, it is possible to develop policies, rules, and internal policies at the organizational level specifically for AI projects and modify them at any point during the project. There is currently no AI policy in Pakistan".*

The government is yet to establish a framework for compliance; however, our organization has implemented its AI framework. While most

businesses have developed internal AI guidelines, Organization A lacks a formal government policy. Instead, it relies on internally devised AI policies tailored to the specific requirements of each project "*Microsoft has reportedly developed a responsible AI standard", as stated by an SMEs sector entity*. Fairness, reliability, safety, privacy and security, inclusiveness, openness, and accountability are the six principles that serve as the basis for the design of AI systems. This foundation is based on these concepts (Figueras et al., 2022).

As reported by a senior management, "*Organization A uses government guidelines and organizational ethics available for end users and is also working on developing guidelines for utilizing AI. Organization A creates the ethics and privacy policy, whereas the organizational AI policy does not concern public privacy or ethics.* To safeguard public organizational data and uphold ethical standards, Organization A has established a policy on data privacy and ethical considerations. The policy prohibits the use of specific government data for AI applications and prevents its public exposure. The following are AI usage guidelines:

- Organizations need to develop rules about data privacy and ethical considerations for internal and external users. As a government organization, we have no AI adoption and implementation policies or framework. Secondly, the government has not provided any guidelines or regulations about AI.
- We develop internal policies about AI projects and change the policies and regulations about implementation during different phases.
- Most participants said that policy is a key factor but is not available. The regulations in their government are not available.
- As an entity that falls under the purview of the government, we must formulate policies, rules, and regulations whenever required.
- Since data sources are of utmost significance, the business requires the laws and policies necessary for privacy, in addition to the basis of data storage, protection, and security.

Organizational AI Readiness Results

The data collected from the three sectors was analyzed using the Maturity model presented by Alsheiabni et al. (2019) to determine their AI readiness

level. The results of this assessment are presented in Table 5, which show the varying levels of readiness (initial, assessing, determined, managed, optimized) achieved by the different organizations within the primary, services, and manufacturing sectors.

Table 5
Organizational AI Readiness

Organizational level	Primary		Services		Manufacturing	
Sectors	A	B	A	B	A	B
Initial						
Assessing	✓				✓	
Determined		✓	✓			✓
managed				✓		
Optimized						

Primary organizations remained at the ‘Assessing’ stage due to minimal IT infrastructure and limited data availability. Service-sector firms reached the ‘Determined’ stage because they possessed moderate digital tools but lacked a formal AI roadmap. Manufacturing organizations showed ‘Managed’ readiness owing to advanced IT systems and strong top-management sponsorship.

According to Alsheiabni et al. (2019), maturity models were applied in two organizations, which were at the ‘assessing and determining’ level of AI maturity. The results obtained from these cases were secondary in nature. Both organizations within the services sector were assessed which were at the maximum level of AI readiness, with most factors deemed ready for implementation. Similarly, the two organizations in the manufacturing sector were also fully assessed.

Discussion

This study investigated the pre-implementation phase of AI adoption, directly complementing the previous empirical work that established a positive link between AI adoption, dynamic capabilities, and innovation in Pakistani SMEs (Ahmad et al., 2025). The prior research answered "why" SMEs should adopt AI by demonstrating its benefits for firm performance, a relationship further substantiated by findings that digital transformation enabled by digital innovation and competencies—drives business

performance (Ahmad et al., 2024).

The current study established a framework to address the fundamental question of how organizations can prepare for successful AI adoption. Significant readiness gaps were identified, with a universal regulatory void being highlighted as a primary barrier that prevents the broad realization of the innovative and performance benefits documented in prior research. The findings confirmed that AI readiness is a multidimensional construct. In direct response to RQ1, five key dimensions were identified: strategic, technological, organizational, environmental, and regulatory. Addressing RQ2, the cross-case analysis yields a critical insight: while technological and strategic readiness levels vary considerably between organizations, the regulatory void is a universal and critical challenge across all sectors. This underscores the primacy of environmental constraints within an emerging economy context.

A principal theoretical contribution of this study was the establishment of regulatory readiness as a standalone dimension. This serves to extend the traditional TOE framework, which has typically subsumed such factors under the broader Environment category. In contexts , such as Pakistan, the absence of a national AI strategy or clear data governance laws compels individual SMEs to develop ad-hoc internal policies. As a result, regulatory navigation transforms into an active and resource-intensive challenge for each firm, rather than remaining a passive environmental condition to which they simply adapt. This finding aligns with the ORC concept of situational factors, illustrating how a lack of external guidance and support directly impedes an organizations perceived efficacy and ability to change (Lokuge et al., 2019).

From an empirical standpoint, the analysis of the strategic dimension reveals that while top management support and a strategic vision are often present, their execution is frequently hampered. Organizations may possess planning strategies with AI implementation targets, but detailed components, such as risk mitigation, change management, and communication strategies, are frequently underdeveloped or absent. This disconnection between intent and detailed planning poses a substantial risk to smooth integration. Technologically, organizations display varying capabilities in data governance and IT infrastructure, with issues, such as data accessibility between databases being a common hurdle. Organizationally, while the presence of technical experts and funding—

even if project-specific provides a foundation, the lack of a cohesive strategic roadmap remains a significant weakness.

This discussion confirms that for Pakistani SMEs, the path to AI adoption is not merely a technological upgrade but a complex organizational transformation. The journey is shaped by a combination of internal strategic and technological preparations and is critically constrained by the external regulatory environment. The universal nature of this regulatory gap suggests that macro-level policy interventions are just as crucial as micro-level organizational efforts in unlocking the full innovative potential of AI for SMEs.

Table 6

Multidimensional Findings and Levels

Dimension	Factors	Findings	Assessing Level	Determined Level	Managed Level
Strategy Factor	People Strategy	Organizations must train their employees to quickly understand AI and improve their literacy rate.	Moderate		
	Organizational AI Strategy	Organizational AI readiness is due to the need for an internal-level strategy that is easily understood when integrating AI.		Average	
	Process strategy	Organizational AI readiness assessment and the technical staff can efficiently operate to integrate AI at an initial level.			High
Technological Factor	IT Infrastructure	Organizational availability of IT infrastructures (Hardware, Cloud, Security, etc.), ready for AI deployment.			High

Dimension	Factors	Findings	Assessing Level	Determined Level	Managed Level
Organizational Factor	Multidisciplinary Teams	Organizational readiness requires multidisciplinary team of experts to implement AI.			High
	Data Management	An organization requires reliable and secure data availability to implement AI.		Average	
	Resources Availability	The adoption of AI requires the availability of both internal and external organizational resources.		Average	
	Clarity Of Goal	The organization needs clarity on the goal of AI.		Average	
Environmental Factor	Organizational AI Policies	Organizations' readiness requires an AI policy from the government's AI initiative.	Moderate		
	AI Awareness	To quickly understand AI and the organization, AI awareness among employees can be improved to increase literacy.		Average	
	Collaborative Culture	Organizational preparation has facilitated the complete environment and knowledge exchange across the department level for the AI initiative.		Average	
	Competitive Advantages	The organization has pressure to implement AI and utilize its advantages.	Moderate		

Dimension	Factors	Findings	Assessing Level	Determined Level	Managed Level
Regulatory Factor	AI Acceptance	The organization needs to accept the AI implementation.	Moderate	Average	
	AI Scalability	Organizational readiness necessitated both internal and external AI acceptance. Organizations can increase the rate of AI implementation while still performing well.	Moderate		
	Government Framework Compliance	The organization provides AI usage guidelines for any new AI initiatives.	Moderate		
	Government AI-Specific Legislation and Guidelines	The organization is responsible for providing AI usage guidelines and legislation for any new AI initiatives.			
	Organizational Legal Framework	Organizational requirements for government policy have been identified as a factor influencing the AI of the legal framework.	Moderate		
	Organizational Ethics	Organizational requirements for AI usage and ethical policies are required.			
	Data Privacy Regulations	Organizational requirement for policy to privacy regulations.	Moderate		

Theoretical and Practical Contributions

From a theoretical standpoint, this research offered a significant

contribution by proposing a novel and empirically grounded framework. This model refines existing understandings by introducing regulatory readiness as a pivotal dimension that is particularly critical in the context of emerging economies.

On a practical level, the study delivered valuable tools for SME managers. It equipped them with a diagnostic instrument to evaluate their organizations readiness and to pinpoint specific areas requiring intervention. Furthermore, for policymakers, the findings underscore the urgent necessity to formulate comprehensive national AI strategies and clear regulatory guidelines. Such actions are vital to creating a supportive and enabling environment that allows SMEs to successfully adopt and integrate new technologies.

Limitations

Furthermore, the current study investigated multiple benefits of organizational readiness, which inspires deployments from various firms to apply AI in their enterprises in order to obtain a competitive advantage. The factors within the technological context were widely discussed in both the literature and the interviews and are necessary for evaluating the organization's AI readiness journey. The organizations that have started their AI journey have all seen AI technologies as a potential solution, and the needs of these organizations have been guiding them in determining if AI is the right technology, in other words, evaluating the relative advantage. Complexity is a two-fold concept of the usage and understanding of the new AI tools and the development and maintenance of these tools. The academic field of the specific technology in its particular context has not been widely explored beforehand. Thus, this study contributed to the empirical literature regarding implementing cutting-edge technology in a developed country with strong institutions. The empirical results of this study are primarily aligned with and confirm findings from previous research regarding adopting new technology.

Conclusion

This study showed that AI readiness in Pakistan's SMEs is shaped by a combination of strategic vision, technological maturity, resource availability, environmental pressures, and regulatory structures. By incorporating a standalone regulatory dimension, the framework advances existing AI readiness theory and provides a diagnostic tool for SMEs. This

study explored AI readiness factors in the context of SMEs' comparative organizations. Case study data was analyzed on two levels throughout this research conclusion. Within-case analyses initially provided in-depth explanations for the activation of the readiness factors. The findings also revealed a high failure rate in case-based organizations, highlighting the need for AI readiness factors to support the implementation of AI in any organization and reduce the low failure rate. The findings of this research indicated that AI readiness factors are highly important for implementing AI in organizations. This study contributed to the literature by offering an empirically validated, SME-specific framework that extends the existing AI readiness models by elevating regulatory readiness as an independent dimension. This advances readiness theory for emerging markets. Future studies should (1) quantitatively validate the proposed framework using a larger sample, (2) examine policy interventions that may strengthen regulatory readiness, and (3) compare findings with SMEs from other emerging economies to test contextual applicability.

Author Contribution

Fowad Ahmad: Conceptualization, Writing, Methodology, Data Analysis, and Results. **Kashaf Khurshid**: Writing - Review & Editing and Data Collection. **Wajid Ali**: Conceptualization, Writing, Methodology, Data Analysis, and Results.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability Statement

Data supporting the findings of this study will be made available by the corresponding author upon request.

Funding Details

No funding has been received for this research.

Generative AI Disclosure Statement

The authors did not used any type of generative artificial intelligence software for this research.

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