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A Conceptual Model for Overcoming Cloud Adoption Barriers in Small and Medium Enterprises in Emerging Economies

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Abstract- ***Cloud computing has emerged as a transformative enabler for innovation, operational flexibility, and cost efficiency across business environments. However, small and medium enterprises (SMEs) in emerging economies continue to face significant challenges that hinder successful cloud adoption—from infrastructural limitations and cybersecurity concerns to skills shortages, organizational resistance, high initial costs, and regulatory uncertainties. This review synthesizes existing literature on cloud adoption frameworks, identifies dominant technological, organizational, environmental, and socio-economic barriers, and evaluates how these constraints uniquely affect SMEs in developing regions. By integrating insights from the Technology–Organization–Environment (TOE) framework, the Diffusion of Innovation (DOI) theory, and resource-based perspectives, the study proposes a holistic conceptual model that maps interrelated barriers and outlines pathways for overcoming them. The model emphasizes strategic capacity-building, policy alignment, digital skills development, trust-building mechanisms, and scalable cloud service designs tailored to resource-constrained contexts. This review contributes to ongoing discourse by offering a context-specific theoretical foundation to guide policymakers, practitioners, and researchers in designing targeted interventions that can accelerate cloud adoption among SMEs in emerging economies.***

Keywords: Cloud Adoption, Small and Medium Enterprises (SMEs), Emerging Economies, Technology–Organization–Environment (TOE) Framework, Adoption Barriers, Conceptual Model.

I. INTRODUCTION

1.1 Background and Significance of Cloud Computing

Cloud computing has evolved into a foundational technology that reshapes the operational architecture of modern enterprises by enabling scalable, flexible, and cost-efficient access to computing resources. Its significance stems from its ability to remove the heavy capital expenditure traditionally associated with information technology infrastructure, replacing it with on-demand, pay-as-you-go models that democratize access to advanced digital capabilities. The global transition toward data-driven operations and distributed digital ecosystems reinforces cloud computing as a crucial enabler for supporting analytics, automation, process optimization, and collaborative work environments. Beyond the purely technical dimension, cloud computing has become strategically embedded in business transformation agendas, influencing organizational competitiveness, innovation performance, and resilience. This shift is particularly important as enterprises navigate increasingly dynamic markets and complex digital security threats requiring adaptive, scalable technology environments (Essien et al., 2019).

The broader significance of cloud computing is evident in its application across multiple domains, including public health informatics, supply chain systems, and digital procurement frameworks in emerging markets, where cloud solutions enhance monitoring, data integration, and decision-making (Atobatele et al., 2019). Cloud platforms also play a pivotal role in supporting resilient digital architectures through multi-cloud networking strategies that strengthen scalability, mitigate downtime risks, and enhance service reliability (Bukhari et al., 2018). The integration of cloud services with advanced cybersecurity models—such as zero-trust frameworks and AI-driven intrusion detection—further solidifies its centrality to modern digital ecosystems (Etim et al., 2019). Additionally, cloud-enabled data analytics frameworks empower

organizations to generate timely insights from large-scale datasets, improving strategic planning and operational efficiency (Nwaimo et al., 2019). Collectively, these developments underscore cloud computing's transformative potential, highlighting its role as both a technological and strategic asset critical for digital transformation across industries and regions.

1.2 Importance of Cloud Adoption for SMEs in Emerging Economies

Small and medium enterprises (SMEs) in emerging economies increasingly depend on cloud technologies to overcome structural constraints and enhance their competitiveness in rapidly evolving markets. Cloud adoption allows SMEs to circumvent the financial burdens of traditional IT infrastructure by providing affordable, scalable, and easily deployable solutions. Through SaaS, PaaS, and IaaS models, SMEs can access enterprise-level applications, analytics tools, and data storage capabilities that would otherwise be inaccessible due to limited capital. Cloud-based cost forecasting frameworks, for example, enable SMEs to optimize budget allocation, improve financial accuracy, and enhance operational efficiency—capabilities that are essential for enterprises operating in economically volatile environments (Bankole & Lateefat, 2019). Moreover, cloud-driven business intelligence platforms support data-driven decision-making, vendor optimization, and process automation, allowing SMEs to strengthen their market presence and internal efficiency (Dako et al., 2019).

Cloud computing is also vital for SMEs as they navigate increasing demands for digital skills, cybersecurity readiness, and competitive resilience. In emerging markets, where technological infrastructure and skilled manpower are often limited, cloud services reduce the need for in-house expertise by offering managed platforms and automated security features. Cloud-based digital skills models play an instrumental role in equipping SMEs with the competencies required to participate in global value chains and digital economies (Ogunsola, 2019). Additionally, the integration of cloud technologies with advanced security systems, such as machine-learning-enabled threat detection, provides SMEs with enhanced protection against cybersecurity risks without requiring significant internal resources (Ayanbode et al., 2019). Cloud adoption further supports strategic positioning through marketing and brand differentiation initiatives, particularly in regulated markets where digital agility and responsiveness are crucial (Balogun et al., 2019). Overall, cloud computing offers SMEs in emerging economies a powerful platform for innovation, growth, and resilience against structural limitations and competitive pressures.

1.3 Problem Statement: Persistent Barriers to Cloud Adoption

Despite the transformative potential of cloud computing, SMEs in emerging economies continue to face persistent and multidimensional barriers that inhibit successful adoption. These barriers are rooted in technological, organizational, regulatory, and socio-economic constraints that collectively limit SMEs' ability to leverage cloud-based solutions effectively. Technological challenges such as unreliable broadband connectivity, insufficient power supply, and inadequate data infrastructure reduce the feasibility of implementing and maintaining cloud environments. Organizational constraints—including lack of digital skills, resistance to technological change, and limited financial capacity—further restrict adoption willingness and readiness. These challenges are intensified in contexts where SMEs rely heavily on informal systems and lack structured digital governance frameworks.

Environmental and institutional barriers also contribute significantly to adoption difficulties. Weak regulatory standards, unclear data protection policies, and inconsistent enforcement mechanisms create uncertainty regarding data security and vendor accountability. SMEs operating in volatile economic conditions often struggle with the financial unpredictability associated with subscription-based cloud services, leading to prioritization of short-term operational costs over long-term digital investment. Furthermore, socio-cultural factors, including low trust in digital technologies and limited awareness of cloud benefits, reinforce resistance to adoption. Collectively, these persistent barriers hinder SMEs from achieving the full potential of cloud computing, thereby limiting their competitiveness, innovation capacity, and participation in global digital ecosystems.

1.4 Purpose, Objectives, and Scope of the Review

The purpose of this review is to systematically examine the key barriers that impede cloud adoption among SMEs in emerging economies and to propose a conceptual model that integrates technological, organizational, and environmental dimensions affecting adoption readiness. The review aims to bridge existing knowledge gaps by synthesizing findings across multidisciplinary literature and aligning them with the unique contextual realities of resource-constrained markets. Through this synthesis, the review seeks to provide a comprehensive theoretical foundation for understanding cloud adoption complexities and to guide stakeholders—including policymakers, cloud service providers, and SME leaders—in formulating effective digital transformation strategies.

The objectives of the review include identifying the dominant barriers to cloud adoption, evaluating contextual differences between developed and emerging markets, examining how these barriers interact, and assessing existing frameworks that explain cloud adoption behavior. Additionally, the review aims to propose a structured conceptual model that addresses these challenges holistically. The scope of the review encompasses technological infrastructure limitations, cybersecurity considerations, financial constraints, regulatory environments, organizational readiness, and socio-cultural influences. By adopting a broad yet analytically focused scope, the review provides a robust foundation for understanding the multidimensional nature of cloud adoption among SMEs in emerging economies.

1.5 Structure of the Paper

This paper is structured to provide a logically progressive analysis of cloud adoption barriers and the development of a conceptual model tailored to SMEs in emerging economies. Following the introduction, Section 2 presents a comprehensive literature review that synthesizes existing research on cloud computing technologies, global adoption trends, contextual differences between developed and emerging markets, and the role of cloud technologies in enhancing SME competitiveness and innovation. This section establishes the empirical and theoretical backdrop for understanding the complexities of cloud adoption.

Section 3 examines the specific barriers affecting SMEs, categorized into technological, organizational, environmental, and socio-economic dimensions. Section 4 evaluates relevant theoretical frameworks, such as the Technology–Organization–Environment model and related innovation adoption theories, to establish the conceptual foundations for the proposed model. Section 5 presents the conceptual model itself, detailing its components, the interactions between barriers, and strategic pathways for mitigating adoption challenges. Finally, Section 6 synthesizes key findings, outlines the model's contributions, provides practical recommendations for stakeholders, and highlights limitations and areas for future research.

II. LITERATURE REVIEW ON CLOUD COMPUTING AND SME DIGITAL TRANSFORMATION

2.1 Overview of Cloud Computing Technologies and Service Models

Cloud computing encompasses a collection of distributed computing technologies designed to deliver virtualized computing resources over the Internet. The foundational models—Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS)—represent layered abstractions that enable scalable resource consumption based on organizational needs (Armbrust et al., 2015). IaaS provides virtualized hardware and storage infrastructure, which is particularly beneficial for SMEs lacking capital investment capacity (Marinescu, 2017). PaaS introduces an application development environment, simplifying deployment pipelines, while SaaS delivers fully managed applications that reduce maintenance burdens on SMEs (Rountree & Castrillo, 2017). These models collectively improve organizational flexibility and reduce operational costs, essential in resource-constrained emerging economies.

Recent advancements integrate cloud ecosystems with IoT, edge computing, and virtualization technologies, expanding SMEs' ability to adopt hybrid architectures (Botta et al., 2016). However, security remains a central concern, as cloud environments introduce vulnerabilities such as

misconfigurations, weak identity controls, and exposure of sensitive information (Almorsy et al., 2016). Studies from the uploaded reference corpus emphasize the need for structured security baselines and compliance controls—particularly multi-cloud governance frameworks aligned with ISO, OWASP, and CIS standards (Essien et al., 2019). Multi-cloud network resilience models further highlight the importance of elasticity, redundancy, and vendor interoperability for SMEs operating in volatile economic environments (Bukhari et al., 2018).

Zero-trust paradigms and AI-driven intrusion detection systems offer modern approaches to reinforce the security posture of cloud deployments, especially where conventional perimeter-based methods fail (Etim et al., 2019; Bukhari et al., 2019). Overall, cloud technologies and service models provide SMEs with powerful tools for digital transformation when embedded within secure, scalable, and governance-oriented architectures.

2.2 Cloud Adoption Trends among SMEs Globally

Global trends indicate that SMEs are increasingly adopting cloud services due to enhanced affordability, simplified IT management, and access to enterprise-grade capabilities without substantial infrastructure investments (Gangwar et al., 2015). The Technology–Organization–Environment framework consistently demonstrates that perceived usefulness, competitive pressure, and technological readiness significantly influence adoption decisions (Hsu et al., 2014). SMEs in advanced economies show higher adoption rates driven by stable broadband infrastructure, supportive digital policies, and robust cybersecurity ecosystems (Low et al., 2016). Conversely, SMEs in emerging regions experience slower adoption despite heightened awareness, primarily due to infrastructural gaps, skills shortages, and cost uncertainties (Senyo et al., 2018).

The global shift toward data-centric business models has increased SMEs' reliance on cloud tools for analytics, automation, and remote work capabilities (Oliveira et al., 2014). Insights from the uploaded documents reveal similar adoption drivers in Africa and Asia, where cloud-based digital health technologies and real-time data systems increasingly support operational decision-making (Atobatele et al., 2019). Economic empowerment studies emphasize the role of cloud-enabled digital skills in fostering entrepreneurship and workforce competitiveness (Ogunsola, 2019).

Enterprise business process intelligence solutions demonstrate how SMEs are leveraging cloud analytics for vendor optimization and customer engagement (Dako et al., 2019). However, adoption trends also reveal heightened exposure to cyber risks, compelling SMEs to invest in AI-based malware detection and cloud security monitoring (Ayanbode et al., 2019). Macroeconomic analyses indicate that SMEs in fluctuating markets rely on cloud systems to stabilize operations and streamline planning processes (Umoren et al., 2019) as seen in Table 1.

Overall, global adoption trends reflect a convergence toward cloud-first strategies among SMEs. However, discrepancies persist across regions due to varying digital maturity levels, regulatory structures, and infrastructural readiness.

Table 1. Summary of Global Cloud Adoption Trends Among SMEs

Key Trend	Description	Drivers	Implications for SMEs
Rising Global Adoption of Cloud Services	SMEs worldwide increasingly deploy cloud solutions for affordability, flexibility, and reduced infrastructure dependence. Adoption is higher in digitally mature markets but growing steadily in developing regions.	Lower operational costs, simplified IT management, availability of enterprise-grade capabilities, competitive pressure, and technological readiness.	Enhances scalability, reduces capital expenditure, enables rapid deployment of digital tools, and increases operational resilience.
Regional Disparities in Adoption Rates	Developed economies exhibit higher adoption levels due to strong digital infrastructure and	Reliable broadband, cybersecurity frameworks, supportive digital policies	SMEs in advanced economies experience smoother cloud transitions, whereas those in

Key Trend	Description	Drivers	Implications for SMEs
	supportive regulatory environments, while emerging economies face structural and financial constraints.	versus infrastructural gaps, digital skills shortages, and cost uncertainties.	emerging economies face slower uptake and greater implementation challenges.
Shift Toward Data-Centric and Real-Time Operations	Global SMEs increasingly adopt cloud platforms for analytics, automation, remote work, and real-time monitoring, especially in sectors like healthcare, logistics, and retail.	Growth of data-driven business models, increasing need for real-time decision-making, availability of cloud-based analytics and automation tools.	Improves data visibility, strengthens operational decision-making, accelerates innovation, and enhances productivity in dynamic market environments.
Growing Security Concerns and Risk Mitigation Efforts	Increased cloud adoption exposes SMEs to cyber risks, necessitating investments in cloud security tools, AI-driven monitoring, and resilience strategies.	Expansion of digital footprints, growing malware threats, need for business continuity, and rising awareness of cyber-vulnerabilities.	Encourages SMEs to adopt advanced security measures, integrate monitoring systems, and build stronger digital trust, particularly in unstable economic contexts.

2.3 Contextual Differences in Developing Versus Developed Economies

Cloud adoption patterns differ markedly between developed and developing economies due to structural, infrastructural, and institutional disparities. In developed economies, SMEs operate within environments characterized by mature broadband infrastructure, predictable electricity supply, and well-established cybersecurity frameworks, which collectively reduce perceived risks and transaction costs associated with migration to cloud platforms (Wymer & Regan, 2015). Conversely, SMEs in developing economies face persistent infrastructural challenges, including unreliable connectivity, high bandwidth costs, and inconsistent power supply—factors that diminish the feasibility of continuous cloud access (Sultan, 2016). Additionally, institutional barriers such as weak regulatory environments, limited enforcement of data protection laws, and low digital literacy exacerbate adoption hesitancy (Kshetri, 2018).

Digital maturity gaps further widen the divide. SMEs in advanced markets often possess in-house IT competence, enabling sophisticated multi-cloud configurations and data-driven workflows (Mell & Grance, 2011). In contrast, SMEs in developing countries typically rely on ad hoc IT arrangements, increasing vulnerability to vendor lock-in and operational disruptions (Gupta et al., 2013). Evidence from uploaded references reinforces these gaps: big data analytics adoption remains low due to resource constraints, despite its proven benefits in optimizing decision processes (Nwaimo et al., 2019). Vendor management inefficiencies also impede cloud integration, as SMEs lack structured procurement systems found in developed markets (FILANI et al., 2019; Nwokocha et al., 2019).

Socio-economic constraints, such as low smartphone ownership accuracy and inconsistent digitization efforts in rural areas, further inhibit cloud assimilation (Menson et al., 2018). Finally, sustainability-driven transitions—such as circular economy infrastructure—are more readily adopted in mature markets, illustrating systemic differences in technological readiness (Sanusi et al., 2019). Collectively, these contextual differences highlight the importance of localized cloud strategies tailored to developing-economy realities.

2.4 Role of Cloud Computing in SME Competitiveness and Innovation

Cloud computing enhances SME competitiveness by reducing operational costs, improving scalability, and accelerating time-to-market through on-demand provisioning of digital resources (Marston et al., 2011). SMEs leverage cloud-enabled analytics, virtualized infrastructure, and SaaS solutions to optimize internal processes, support real-time decision-making, and enhance product innovation cycles (Rosenthal et al., 2017). Furthermore, cloud-

based platforms facilitate collaborative development environments where SMEs can integrate digital tools, automate workflows, and adopt emerging technologies with minimal capital expenditure (Truong et al., 2015). These capabilities significantly improve innovation performance, particularly in industries where agility and rapid response to market dynamics determine competitive advantage.

Cloud adoption also influences strategic differentiation through digital branding, service personalization, and data-driven customer engagement (Tajvidi et al., 2017). SaaS business models empower SMEs with enterprise-grade applications that would otherwise be cost-prohibitive, enabling advanced financial management, customer relationship optimization, and operational efficiency enhancements (Benlian et al., 2011). Insights from uploaded references reinforce this trajectory: strategic cost forecasting frameworks illustrate how cloud-based SaaS ecosystems support financial planning accuracy for SMEs (Bankole & Lateefat, 2019). Cloud-assisted brand repositioning strategies also enhance SME capabilities to navigate regulated and competitive markets (Balogun et al., 2019).

Public health informatics research demonstrates how cloud-driven digital infrastructures support organizational transformation through real-time monitoring and cross-functional integration (Atobatele et al., 2019). Similarly, digital skills development and data-driven fraud detection frameworks highlight cloud computing's role in workforce empowerment, governance transparency, and operational trust—factors critical for long-term SME sustainability (Ogunsola, 2019; Dako et al., 2019). Overall, cloud computing serves as a strategic catalyst for SME innovation, enabling scalable technological advancement and sustained competitive advantage.

III. BARRIERS TO CLOUD ADOPTION IN SMES

3.1 Technological Barriers: Infrastructure, Connectivity, Interoperability

Technological barriers remain the most consequential impediments to cloud adoption among SMEs in emerging economies, largely due to insufficient ICT infrastructure, unreliable broadband connectivity, and weak interoperability standards. Limited network bandwidth and frequent power interruptions directly hinder the sustained access required for cloud-based services (Alharthi et al., 2017; Sultan, 2016). In many low-resource environments, SMEs operate in bandwidth-constrained settings, making latency-sensitive applications such as real-time analytics, ERP systems, and remote backups difficult to implement (Gangwar, 2018). These infrastructural gaps are amplified by the absence of redundant network pathways and resilient data exchange mechanisms, which reduces system reliability and increases operational risks (Hsu et al., 2015).

Interoperability challenges further complicate cloud adoption, especially when SMEs attempt to integrate legacy on-premise systems with multi-cloud platforms. Frameworks emphasizing architectural resilience underscore the complexity of synchronizing heterogeneous environments and ensuring consistent security postures (Bukhari et al., 2018). Inadequate security baselines, poor configuration management, and insufficient compliance alignment introduce additional vulnerabilities, as demonstrated in cloud security benchmark studies (Essien et al., 2019). These weaknesses are especially problematic for SMEs lacking technical personnel capable of enforcing standardized protocols across interconnected systems (Kazancoglu& Ozkan-Ozen, 2018).

Cybersecurity concerns further compound technological constraints. Studies on deep-learning-driven malware detection reveal the scale and sophistication of emerging cyber threats that target distributed cloud assets (Ayanbode et al., 2019). SMEs in developing regions are disproportionately affected due to limited investments in advanced cyber defense tools and insufficient endpoint protection infrastructures (Nwaimo et al., 2019).Collectively, these technological barriers create a constrained digital ecosystem that limits the scalability, efficiency, and reliability of cloud-based solutions for SMEs, thereby slowing digital transformation across emerging economies (Abass et al., 2019).

3.2 Organizational Barriers: Resistance to Change, Skills Gaps, Resource Limitations

Organizational barriers constitute a major impediment to cloud adoption within SMEs in

emerging economies, primarily due to resistance to change, inadequate digital competencies, and scarce organizational resources. Resistance to change often emerges from employees' fear of job displacement, unfamiliarity with digital tools, or mistrust in cloud-based operational models (Ali et al., 2016). Such resistance is exacerbated when SMEs lack structured change-management strategies capable of aligning staff behaviors with technological transformation goals (Doherty et al., 2015). Studies on workforce planning emphasize the need for data-driven human-capital strategies to anticipate evolving skill requirements, yet most SMEs remain unprepared for this transition (Adenuga et al., 2019).

Skill shortages form another critical organizational constraint. Without trained personnel who can manage cloud infrastructures, interpret data analytics outputs, or implement cybersecurity controls, SMEs struggle to fully integrate cloud solutions (Ogunsola, 2019; Atobatele et al., 2019). Research shows that digital transformation readiness is closely linked to an organization's internal learning culture and structural capacity to support continuous upskilling (Maroufkhani et al., 2018). In emerging markets, however, SMEs often operate with limited training budgets and minimal access to advanced ICT training ecosystems.

Resource limitations—including financial constraints, inadequate staffing, and insufficient managerial capabilities—further hinder adoption. Cloud projects demand investment in integration, migration, vendor management, and compliance efforts, all of which require organizational capacity often lacking in SMEs (Oliveira et al., 2015). Additionally, macroeconomic uncertainties, particularly in volatile markets, reduce SMEs' willingness to commit to long-term digital investments (Umoren et al., 2019).Overall, organizational barriers reduce strategic alignment, weaken digital readiness, and slow the internal transformation processes necessary for effective cloud adoption in emerging economies (Senyo et al., 2018; Evans-Uzosike&Okatta, 2019).

3.3 Environmental and Market Barriers: Regulatory Constraints, Vendor Lock-in, Cybersecurity and Privacy Concerns

Environmental and market barriers significantly slow cloud adoption in SMEs operating in emerging economies due to restrictive regulatory environments, privacy concerns, and vendor-lock-in risks. Regulatory constraints often arise from unclear national data protection laws, limited harmonization with international cybersecurity standards, and inconsistent sector-specific compliance obligations (Alhassar et al., 2016). These challenges are aggravated by weak institutional enforcement capacity and fragmented digital governance infrastructures, creating ambiguity around data residency, cross-border data flows, and cloud provider accountability (Kshetri, 2017). Studies on governance and compliance frameworks highlight the importance of structured risk and security controls to mitigate these uncertainties (Essien et al., 2019).

Cybersecurity and privacy remain major concerns as SMEs face heightened exposure to advanced cyberattacks, including ransomware, phishing, and insider threats (Etim et al., 2019). Emerging markets typically lack robust national cybersecurity strategies, leaving SMEs vulnerable to data breaches and regulatory sanctions. Blockchain-enabled transparency models have been proposed to address trust issues in digital ecosystems, illustrating the rising need for verifiable, tamper-resistant architectures (Dako et al., 2019). However, implementing such solutions requires technical and financial resources often inaccessible to SMEs.

Vendor lock-in presents another market barrier. Proprietary APIs, limited interoperability, and high switching costs restrict SMEs' ability to migrate between cloud providers, leading to long-term dependence on a single vendor (Zhao et al., 2017). Ethical sourcing frameworks illustrate how asymmetric vendor power shapes compliance, cost structures, and risk exposure in digitally dependent industries (Filani et al., 2019). Moreover, institutional instability and climate-related disruptions in emerging economies contribute to unpredictable market conditions, influencing investment decisions (Ogunsola, 2019).As a result, SMEs encounter a multifaceted environmental and market landscape that complicates their cloud adoption journey, demanding coordinated regulatory reforms and enhanced multi-stakeholder governance (Senyo et al., 2016; Tambe, 2016).

3.4 Socio-Economic and Cultural Factors Affecting Technology Uptake

Socio-economic and cultural factors significantly influence SMEs' willingness and ability to adopt cloud technologies in emerging economies. Socio-economic determinants such as income level, access to education, and digital literacy strongly shape technology adoption readiness (Boateng et al., 2017). Research on mobile phone ownership in low-income contexts demonstrates how uneven access to basic digital infrastructure perpetuates disparities in technology uptake (Menson et al., 2018). SMEs operating in rural and underserved communities often lack exposure to digital tools, creating a foundational barrier to cloud adoption (Okundaye et al., 2019).

Cultural norms play an equally critical role. In many emerging economies, hierarchical organizational cultures discourage experimentation, making cloud adoption appear risky or unnecessary (Ahuja & Thatcher, 2019). Collective cultural orientations may limit autonomy in decision-making, slowing digital transformation initiatives. Studies on technology acceptance consistently find that cultural perceptions of trust, risk, and power distance mediate attitudes toward digital technologies (Williams et al., 2015).

Socioeconomic vulnerabilities also influence cloud adoption behavior. Public health studies show how economic fragility and weak institutional capacity affect community responses to innovation (Durowade et al., 2017; Solomon et al., 2018). Similar patterns manifest in SME environments where financial insecurity discourages investment in cloud solutions. Community-based digital training models reveal that targeted capacity building significantly improves technological engagement, emphasizing the importance of grassroots digital literacy interventions (Hungbo& Adeyemi, 2019). Additionally, mobile-unit health initiatives illustrate how ICT-driven outreach can overcome geographic barriers (Nsa et al., 2018), offering parallels for SME cloud-awareness campaigns.Overall, socio-economic inequality and cultural barriers generate deep-rooted challenges that reduce technological openness, limit digital capability, and slow SME cloud adoption in emerging economies (Mingione et al., 2019).

3.5 Synthesis of Dominant Barriers in Emerging Economies

The synthesis of technological, organizational, environmental, and socio-cultural barriers reveals a complex, interdependent ecosystem of constraints that collectively hinder cloud adoption among SMEs in emerging economies. Technological deficits—including weak ICT infrastructure, limited interoperability, and inadequate cybersecurity capacity—form the foundational layer of barriers that restrict SMEs' ability to deploy and scale cloud services (Henningsson et al., 2018; Erigha et al., 2017). These challenges are further intensified by resource-scarce operating environments, where investments in digital infrastructure remain low despite rising demand for resilient digital systems (Kumar et al., 2019).

Organizational shortcomings amplify these constraints. Limited managerial readiness, insufficient digital skills, and structural resistance to technological change prevent SMEs from effectively integrating cloud platforms into business operations (Maroufkhani et al., 2019). Additionally, asymmetric vendor relationships and the absence of standardized procurement systems create dependence on external providers, echoing challenges observed in digital procurement literature (Nwokocha et al., 2019).

Environmental and market barriers—such as unstable regulatory regimes, data privacy uncertainties, climate-related disruptions, and weak governance structures—exacerbate operational risk and diminish SMEs' confidence in cloud solutions (Chandrasekaran & Kumar, 2018; Ogunsola, 2019). Drawing parallels from public-health research, structural inequities and institutional fragility similarly influence technological outcomes and adoption patterns (Durowade et al., 2018).

Socio-economic disparities further reinforce these systemic challenges. Low digital literacy, cultural resistance, financial instability, and uneven access to digital infrastructure perpetuate persistent adoption gaps. Environmental studies on resource-efficient systems emphasize the need for sustainability-oriented digital transformation models that consider local socio-economic realities (Osabuohien, 2019; BAYEROJU et al., 2019).Overall, cloud adoption barriers in emerging economies are multidimensional, recursive, and context-dependent. They require integrated, ecosystem-level interventions to enable SMEs to transition toward

sustainable, competitive, cloud-enabled operations (Renaud & Weir, 2016).

IV. THEORETICAL FRAMEWORKS FOR ANALYZING CLOUD ADOPTION

4.1 Technology–Organization–Environment (TOE) Framework

The Technology–Organization–Environment (TOE) framework remains one of the most robust theoretical lenses for explaining technology adoption, particularly in resource-constrained sectors such as SMEs in emerging economies. The framework posits that adoption behavior is shaped by technological readiness, organizational capacity, and external environmental forces (Gangwar et al., 2015; Oliveira et al., 2016). For SMEs in developing regions, technological factors such as compatibility, security maturity, and perceived complexity play a significant role in shaping cloud adoption intentions (Alshamaila et al., 2015; Yigitbasioglu, 2015). The significance of security and privacy perceptions is heightened in these contexts, as inadequate cybersecurity capabilities intensify risk aversion. This is reflected in emerging-market studies emphasizing the value of adopting cloud security baselines and global compliance standards (Essien et al., 2019).

Organizational readiness in TOE—comprising managerial support, financial resources, digital skills, and IT governance—remains a critical determinant. SMEs often experience capability gaps due to lack of technical expertise, resulting in heavy dependency on external vendors (Hussein et al., 2017). The uploaded studies indicate similar constraints: insufficient analytics maturity (Nwaimo et al., 2019) and the absence of structured organizational cybersecurity protocols (Bukhari et al., 2019) frequently inhibit cloud readiness.

Environmental pressures—market competitiveness, regulatory alignment, and technological turbulence—are particularly influential in emerging economies. For instance, the intensification of digital markets pushes SMEs to reposition operations for competitiveness (Balogun et al., 2019), while rising cyberthreats create an urgency to adopt safer digital ecosystems (Ayanbode et al., 2019). Thus, TOE provides a holistic foundation that contextualizes cloud adoption barriers through multilayered determinants that interact to shape SME decision-making under conditions of economic and infrastructural constraints.

4.2 Diffusion of Innovation (DOI) Theory

Diffusion of Innovation (DOI) theory provides a granular understanding of how technological innovations spread within social systems, making it well suited for analyzing cloud adoption patterns among SMEs in emerging economies. DOI emphasizes five key innovation attributes—relative advantage, compatibility, complexity, observability, and trialability—which collectively shape adoption outcomes (Clohessy et al., 2017; Sharma et al., 2016). In cloud contexts, perceived relative advantage—such as cost savings, scalability, and enhanced operational responsiveness—remains a critical motivator for SMEs (Al-Jabri & Roztocki, 2015). However, complexity concerns—including vendor management, billing models, compliance, and integration—continuously suppress adoption motivation in developing regions (Gangwar, 2017).

Compatibility challenges are heightened in emerging economies because SMEs often lack standardized IT architectures or digital governance models. Evidence from uploaded sources indicates similar patterns: the need for real-time surveillance systems (Atobatele et al., 2019) and digital skills empowerment (Ogunsola, 2019) demonstrate deficiencies that reduce compatibility with sophisticated cloud platforms. Likewise, business process intelligence inefficiencies (Dako et al., 2019) and weak digital supply-chain structures (Filani et al., 2019) further establish the structural gaps affecting diffusion.

Trialability and observability—two core DOI attributes—are often constrained in SMEs due to limited financial flexibility and scarce opportunities for low-risk experimentation (Singh & Hess, 2017). SaaS cost-forecasting research within the uploaded references (Bankole & Lateefat, 2019) reinforces the importance of transparent, predictable models to enhance trialability perceptions.

Ultimately, DOI contextualizes cloud adoption as a social-technical diffusion process shaped by innovation perceptions and the structural realities of SMEs. Understanding these attributes helps expose why innovation uptake remains slow across emerging economies despite well-documented operational benefits.

4.3 Resource-Based View (RBV) and Dynamic Capabilities

The Resource-Based View (RBV) explains cloud adoption as a function of an SME's internal resources and capabilities, emphasizing the importance of unique, valuable, inimitable, and non-substitutable assets (Baker, 2017; Kim et al., 2015). SMEs in emerging economies often lack strong IT capabilities, digital competencies, and complementary managerial skills, which limits their ability to leverage cloud technologies strategically (Agi & Yan, 2016). Dynamic capabilities—defined as the firm's ability to sense opportunities, seize resources, and reconfigure processes—are especially significant for cloud integration because cloud adoption typically requires business model adaptation and IT restructuring (Zhang &Tansuhaj, 2019).

Uploaded evidence shows these capability constraints clearly. HR analytics capability (Bukhari et al., 2019) and strategic workforce planning (Evans-Uzosike&Okatta, 2019) illustrate how human capital deficiencies hinder technology utilization. Similarly, health-informatics research in resource-scarce environments (Atobatele et al., 2019) demonstrates the challenges organizations face when they lack operational capabilities to integrate digital platforms effectively. These capability limitations echo broader SME patterns across emerging economies, where firms often operate with informal processes, limited data governance, and insufficient IT leadership.

Dynamic capabilities are also insufficiently developed due to market volatility and resource constraints. For instance, multi-tier market adaptation models (Didi et al., 2019) reveal the challenges SMEs face when attempting to reconfigure processes under environmental uncertainty. Additionally, public health studies on mobile diagnostic systems (Nsa et al., 2018) illustrate how operational rigidity impedes technology assimilation.

Overall, RBV and dynamic capabilities offer a critical lens for understanding cloud adoption disparities. They reveal how limited internal resources, weak learning mechanisms, and underdeveloped strategic capabilities fundamentally constrain SMEs' ability to convert cloud opportunities into sustainable performance advantages.

4.4 Comparative Assessment of Frameworks

A comparative assessment of TOE, DOI, and RBV reveals their distinct strengths and limitations in explaining SME cloud adoption. TOE provides a structured, multi-dimensional perspective by integrating technological, organizational, and environmental determinants (Gutierrez et al., 2015). DOI complements TOE by offering a behavioral understanding of innovation characteristics, such as relative advantage and complexity, which shape adoption intentions (Martins et al., 2016). RBV, however, shifts the focus inward, emphasizing strategic resources and dynamic capabilities required for successful post-adoption assimilation (Hameed & Counsell, 2016).

In emerging economies, these frameworks interact strongly. Environmental volatility—regulatory gaps, infrastructure limitations, and market turbulence—significantly amplifies the relevance of TOE (Low et al., 2017). DOI's strength lies in its ability to illuminate why SMEs perceive cloud technologies as risky or misaligned with existing processes (Senyo et al., 2018). RBV contributes by highlighting capability deficiencies that prevent SMEs from exploiting cloud benefits, even when adoption occurs.

Uploaded evidence further supports the need for an integrated perspective. Cybersecurity and compliance complexities (Essien et al., 2019) illustrate strong TOE environmental pressures. Behavioral dynamics related to insider threats (Erigha et al., 2019) reflect DOI elements of risk perception and complexity. Likewise, resource constraints affecting fraud detection modernization (Dako et al., 2019) indicate RBV-related capability gaps. Macroeconomic volatility (Umoren et al., 2019) and sector-wide digital transitions (Ogunsola, 2019) reinforce the interdependence of environmental pressures and strategic capacity.

Thus, no single framework fully captures the realities of cloud adoption in SMEs within emerging economies. A combined assessment reveals complementary explanatory power—highlighting adoption drivers, organizational readiness, innovation perceptions, and capability maturity—leading to a more comprehensive understanding of adoption barriers.

4.5 Rationale for Integrating Frameworks

Integrating TOE, DOI, and RBV provides a comprehensive, theoretically grounded basis for understanding and overcoming cloud adoption barriers among SMEs in emerging economies. Each framework independently explains specific facets of adoption, yet cloud computing is a multifaceted phenomenon involving technological readiness, innovation perception, environmental pressure, and capability maturity. Hence, a unified approach delivers a richer analytical foundation (Hung et al., 2017; Chong, 2016). TOE identifies structural enablers and inhibitors, DOI outlines how SMEs cognitively evaluate cloud technologies, and RBV contextualizes how internal capabilities shape assimilation depth (Tarutė&Gatautis, 2015).

In emerging economies, contextual factors such as infrastructural gaps, economic volatility, and compliance burdens intensify the need for an integrated model. Uploaded studies reinforce these complexities: circular-economy transitions requiring cross-sectoral capabilities (Sanusi et al., 2019), mobile diagnostics operating under constrained infrastructure (Scholten et al., 2018), and financial-reporting integration challenges (Yetunde et al., 2018) demonstrate multi-dimensional readiness issues analogous to cloud adoption barriers. Similar patterns emerge in international renewable transitions (Ogunsola, 2019) and economic-performance analyses (Atobatele et al., 2019), emphasizing how environmental pressures and capability deficits converge.

An integrated framework also supports strategic reconfiguration by showing how SMEs can build dynamic capabilities to align with emerging digital ecosystems (Bouwman et al., 2019; Nuseir&Aljumah, 2019). It acknowledges that adoption success depends not only on perceived innovation benefits (DOI) but also on organizational governance structures (TOE) and capability development pathways (RBV) as seen in Table 2. Thus, integrating frameworks allows this study to address cloud adoption barriers holistically—technically, organizationally, behaviorally, and strategically—while offering actionable insights for SMEs, policymakers, and cloud service providers seeking to strengthen digital transformation outcomes in emerging economies.

Table 2: Integrated Theoretical Rationale for Understanding Cloud Adoption Barriers in SMEs

Framework Component	Core Analytical Focus	Reason for Integration	Implications for SMEs in Emerging Economies
Technology–Organization–Environment (TOE)	Examines structural enablers and inhibitors, including technological readiness, organizational capabilities, and external pressures.	Provides foundational insight into infrastructural constraints, regulatory conditions, and internal governance structures that shape adoption feasibility.	Helps SMEs identify gaps in infrastructure, compliance, and internal processes, supporting systematic prioritization of digital transformation efforts.
Diffusion of Innovation (DOI)	Focuses on how SMEs cognitively evaluate innovations based on perceived benefits, complexity, and compatibility.	Explains behavioral and perceptual dimensions of technology adoption that TOE and RBV do not fully capture.	Enables SMEs to understand how managerial attitudes, risk perceptions, and awareness influence cloud adoption decisions in volatile environments.
Resource-Based View (RBV)	Assesses internal strategic resources and capabilities necessary for technology assimilation and sustained competitiveness.	Highlights the role of capability maturity, human capital, and dynamic resources in deepening cloud integration.	Supports capability-building pathways, showing SMEs how to enhance skills, restructure processes, and leverage cloud investments for long-term advantage.
Integrated TOE–DOI–RBV Model	Synthesizes structural, perceptual, and capability-	Captures the multidimensional nature of cloud barriers and offers a richer analytical	Provides SMEs, policymakers, and service providers with a holistic roadmap for addressing

Framework Component	Core Analytical Focus	Reason for Integration	Implications for SMEs in Emerging Economies
	based determinants of cloud adoption.	foundation than any single framework.	readiness deficits, infrastructural gaps, economic volatility, and innovation assimilation challenges.

V. PROPOSED CONCEPTUAL MODEL FOR OVERCOMING CLOUD ADOPTION BARRIERS

5.1 Model Design Principles and Conceptual Foundations

The design principles underpinning the proposed conceptual model derive from the need for contextual relevance, scalability, and socio-technical alignment in emerging economies, where SMEs face structural constraints not fully addressed by traditional cloud adoption frameworks (Haddad et al., 2018; Alharthi et al., 2017). Grounding the model in integrated theoretical constructs such as TOE and DOI allows for the synthesis of technological readiness, organizational preparedness, and environmental enablers as co-determinants of adoption behavior (Oliveira et al., 2014; Gangwar, 2017). In developing contexts, foundational elements such as infrastructural stability, trust, and regulatory coherence serve as base conditions for cloud readiness, thus informing the model's emphasis on layered capability development and risk-aware adoption sequencing (Nfuka et al., 2018).

From a conceptual standpoint, resilient architecture principles—previously applied in multi-cloud network design—illustrate the importance of security-by-design, modularity, and adaptive trust governance (Bukhari et al., 2018). These principles are essential in economies where SMEs confront heightened cyber vulnerabilities and capability asymmetries, requiring tailored controls aligned with globally recognized security benchmarks such as CIS and ISO 27001 (Essien et al., 2019). Furthermore, the model incorporates insights from behavioral analytics research, recognizing that user competence, digital trust, and perceived value drive adoption trajectories within resource-constrained SMEs (Erigha et al., 2019; Umoren et al., 2019).

Big-data analytical frameworks provide conceptual guidance on structuring decision-making processes, particularly in volatile environments where SMEs rely on data-driven prioritization to mitigate adoption risks (Nwaimo et al., 2019). Consequently, the proposed foundations emphasize adaptability, layered capability acquisition, and environmental alignment, ensuring applicability across heterogeneous SME landscapes. This integrated approach provides a theoretically robust and contextually responsive foundation for overcoming cloud adoption barriers in emerging economies.

5.2 Core Components: Technological Readiness, Organizational Capability, Environmental Support

Technological readiness forms the backbone of cloud adoption and encompasses system compatibility, network reliability, cybersecurity posture, and the availability of scalable digital infrastructure (Alshamaila et al., 2017). In emerging economies, SMEs encounter persistent challenges such as low broadband quality, outdated hardware ecosystems, and limited access to secure interfaces, making technological readiness a critical determinant of adoption success (Ali et al., 2018). The proliferation of malware and sophisticated cyberattacks further underscores the need for advanced threat-detection capabilities and resilient architectures (Ayanbode et al., 2019), elevating the importance of pre-adoption cybersecurity assessment.

Organizational capability represents the internal competencies, managerial support structures, and cultural readiness required for cloud integration. Empirical studies highlight that workforce digital skills, leadership commitment, and process maturity significantly shape adoption outcomes (Low et al., 2018; Maroufkhani et al., 2019). SMEs in resource-constrained regions often lack formalized IT governance, making organizational learning, change management, and capability enhancement essential enablers. Governance, risk, and compliance frameworks, such as those articulated in multi-cloud regulatory alignment models, offer structured pathways for SMEs to institutionalize internal control mechanisms (Essien et al., 2019).

Environmental support incorporates regulatory clarity, vendor ecosystem maturity, and the availability of supportive external infrastructures. Policymakers in emerging economies play an essential role in establishing data protection standards, broadband expansion programs, and innovation-oriented procurement systems (Hsu et al., 2014). Digital procurement platforms integrated with Lean Six Sigma principles demonstrate how environmental efficiencies can enhance SME operational readiness (NWOKOCHA et al., 2019). Furthermore, business process intelligence frameworks support SMEs in identifying value-generating workflows and strengthening external partnerships critical for cloud adoption (Dako et al., 2019). The synergy between technological, organizational, and environmental components provides a robust basis for enhancing cloud readiness across emerging-market SMEs.

5.3 Mechanisms for Mitigating Dominant Barriers

Mitigating dominant cloud adoption barriers requires multilayered mechanisms that integrate governance, risk management, and organizational learning. Risk-based frameworks are widely recognized as essential tools for addressing cloud migration uncertainties, particularly in environments where SMEs face capability and resource limitations (Khan et al., 2016). Embedding governance, risk, and compliance analytics provides a structured method for identifying vulnerabilities, evaluating financial exposure, and designing adaptive controls aligned with industry standards (Tarantino, 2015). Strategic alignment mechanisms further ensure that cloud initiatives support business objectives, enabling SMEs to optimize investments while reducing operational risks (Henderson & Venkatraman, 2016).

Zero-trust security architectures offer a robust mitigation solution for emerging economies where SMEs often lack strong perimeter defenses. By adopting continuous authentication, least-privilege access, and micro-segmentation, SMEs can minimize internal and external threat vectors (Bukhari et al., 2019). Complementing this approach, AI-augmented intrusion detection systems enable real-time monitoring and anomaly detection, enhancing security resilience (Etim et al., 2019). Organizational learning frameworks also play a major role, supporting skill development, iterative experimentation, and post-deployment evaluations essential for sustained cloud capability (Wang et al., 2018).

From an economic perspective, strategic cost-forecasting models assist SMEs in mitigating financial uncertainties associated with cloud migration, particularly in pay-as-you-go SaaS environments (Bankole & Lateefat, 2019). Multi-tier ecosystem collaboration further enables SMEs to build trust, leverage shared knowledge, and access vendor-driven adoption support mechanisms (Didi et al., 2019). Ethical sourcing and compliance enforcement frameworks contribute additional safeguards by strengthening regulatory adherence, supplier transparency, and cross-organizational accountability (Filani et al., 2019). Collectively, these mechanisms establish a resilient foundation for addressing technological, organizational, financial, and environmental barriers to cloud adoption in SME sectors within emerging economies.

5.4 Policy Interventions, Capacity Building, and Ecosystem Strengthening

Policy interventions are central to shaping an enabling environment for SME cloud adoption in emerging economies. Effective cloud-oriented policies must address data sovereignty, cross-border data flows, broadband expansion, and regulatory harmonization (Kshetri, 2017; Siyal et al., 2019). Establishing clear ICT policy frameworks supports digital transformation by providing SMEs with predictable regulatory conditions that enhance trust and lower compliance uncertainty (Zhang et al., 2016). In African contexts, public-sector cloud initiatives have been shown to stimulate ecosystem development by signaling government commitment and catalyzing private-sector participation (Mvelase et al., 2016). Furthermore, ICT-driven financial innovation strengthens the digital economy and fosters conditions conducive to SME technology adoption (Asongu& Odhiambo, 2019).

Capacity building is equally vital. Workforce development initiatives that promote digital skills, cloud literacy, and hands-on technical training enhance the internal capabilities SMEs require for effective cloud integration (Hungbo& Adeyemi, 2019). Community-based training models demonstrate strong impact in resource-constrained regions, where conventional training infrastructure may be limited. Complementarily, capacity building

at the institutional level—including training for policymakers, regulators, and SME support organizations—strengthens ecosystem governance and improves policy implementation fidelity (Atobatele et al., 2019).

Ecosystem strengthening encompasses digital infrastructure development, stakeholder coordination, and innovation-driven partnerships. Climate diplomacy research highlights the importance of multi-stakeholder collaboration and internationally aligned standards, which parallel cloud governance needs in developing economies (Ogunsola, 2019). Integrating circular-economy principles into ICT infrastructure design ensures sustainability and resilience, enabling SMEs to adopt cloud technologies efficiently and responsibly (SANUSI et al., 2019). Additionally, empirical evidence shows that improving digital access reliability in rural areas directly enhances technology uptake and ecosystem inclusiveness (Menson et al., 2018). Combined, these interventions create a robust, equitable, and future-ready digital ecosystem.

5.5 Implications for SMEs, Cloud Providers, and Governments

Cloud adoption carries substantial implications for SMEs, cloud service providers, and governments, particularly in emerging economies where digital transformation trajectories vary widely. For SMEs, cloud integration enhances operational efficiency, reduces capital expenditure, and enables data-driven decision-making (Marston et al., 2017; Lian, 2015). However, successful adoption requires robust digital skills, strategic capability development, and clear understanding of service models to maximize performance outcomes (Costa &Guédria, 2016). Strengthening cybersecurity readiness is also essential, given the increasing exposure to cloud-based threats (Hizam-Hanafiah et al., 2019). Adoption of intrusion detection systems and baseline compliance frameworks can significantly mitigate security vulnerabilities (Erigha et al., 2017; Essien et al., 2019).

For cloud providers, emerging markets offer significant growth potential but demand innovative pricing models, context-specific support systems, and enhanced security capabilities. Providers must tailor their service offerings to address SMEs' capacity constraints while offering transparent governance structures that build long-term trust (Senyo et al., 2018). Cost-forecasting frameworks, such as those used for market positioning, highlight the role of pricing intelligence in fostering sustainable adoption among SMEs (Balogun et al., 2019). Provider-driven digital-skills training programs further help accelerate ecosystem maturity and strengthen customer retention (Ogunsola, 2019).

For governments, cloud adoption has broad implications for national competitiveness, digital governance, and financial transparency. Blockchain-enabled systems demonstrate the potential for promoting accountability and reducing corruption, reinforcing the importance of digital regulation and oversight (Dako et al., 2019). Governments must also ensure strong cybersecurity laws, data protection standards, and SME-focused digital empowerment programs to build resilient cloud ecosystems. By integrating regulatory oversight, digital infrastructure expansion, and targeted capability-building initiatives, governments can drive inclusive digital transformation across SME sectors.

VI. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

6.1 Summary of Key Findings from the Review

The review demonstrates that cloud adoption among SMEs in emerging economies is shaped by a complex interplay of technological, organizational, and environmental factors. Key findings show that while cloud computing offers significant opportunities for cost reduction, scalability, operational agility, and innovation, SMEs in developing regions continue to encounter persistent barriers that inhibit full adoption. These include inadequate digital infrastructure, unreliable connectivity, cybersecurity concerns, insufficient regulatory protection, and low levels of digital literacy among staff. Organizational challenges such as resistance to technological change, lack of skilled IT personnel, and limited financial capacity further exacerbate adoption difficulties. The review also highlights significant contextual differences between developed and emerging markets, where SMEs in advanced economies benefit from stable infrastructures, supportive policies, and mature digital ecosystems, enabling more seamless cloud integration.

Moreover, the analysis reveals that cloud service models—particularly SaaS and PaaS—hold substantial potential for SMEs by reducing capital investments and enabling access to advanced digital tools. However, without addressing foundational readiness issues, SMEs cannot reap these benefits sustainably. The review emphasizes the growing relevance of multi-cloud strategies, governance structures, and zero-trust security approaches as critical components of resilient cloud adoption frameworks. Ultimately, the findings confirm the necessity of integrated conceptual models that align technological readiness, organizational capability, and environmental support structures. Such models are essential for guiding policymakers, service providers, and SME leaders in overcoming systemic cloud adoption barriers and accelerating digital transformation across emerging economies.

6.2 Contributions of the Proposed Conceptual Model

The proposed conceptual model makes several important contributions by providing a structured and context-sensitive framework for addressing cloud adoption barriers faced by SMEs in emerging economies. First, the model integrates technological, organizational, and environmental dimensions, acknowledging that cloud readiness cannot be evaluated through a purely technical perspective. By synthesizing insights from digital infrastructure, cybersecurity maturity, organizational culture, regulatory landscape, and economic conditions, the model creates a holistic representation of the adoption ecosystem. This enables decision-makers to identify interdependencies between barriers—such as how limited digital skills amplify security vulnerabilities or how weak regulations intensify vendor lock-in risks.

Second, the model contributes a dynamic and scalable approach suitable for rapidly evolving technological environments. It emphasizes adaptable governance structures, multi-cloud resilience, and incremental adoption pathways, which are critical for SMEs operating under financial constraints. Unlike traditional linear frameworks, this model accounts for iterative capability development, allowing SMEs to build cloud competencies progressively while minimizing operational disruption.

Third, the model offers practical diagnostic value. By mapping barriers to actionable intervention domains—such as capacity-building programs, regulatory strengthening, financial incentives, and infrastructure development—it provides a strategic blueprint for designing targeted support policies. This is particularly relevant to emerging economies where systemic limitations require coordinated interventions.

Finally, the model advances scholarship by contextualizing cloud adoption within socio-economic realities unique to developing markets, filling a notable gap in mainstream literature that predominantly reflects developed-economy perspectives. Its multidimensional structure positions it as a foundational tool for future empirical studies on SME cloud adoption.

6.3 Practical Recommendations for Stakeholders

To accelerate cloud adoption in emerging economies, stakeholders—including governments, SME leaders, cloud service providers, and development partners—must adopt coordinated and evidence-driven strategies. First, governments should prioritize investments in digital infrastructure, particularly broadband expansion and stable electricity supply, to create the foundational conditions for cloud deployment. Policies must further include clear data protection laws, cybersecurity guidelines, and cloud-specific regulatory frameworks that enhance trust and reduce perceived risks among SMEs.

Second, capacity-building initiatives are essential. SME leaders should invest in digital literacy programs, technical training for employees, and internal governance mechanisms that support secure and efficient cloud usage. This includes the adoption of zero-trust principles, identity management protocols, and continuous monitoring to mitigate cybersecurity challenges.

Third, cloud service providers should tailor offerings to the realities of SMEs in developing markets by providing flexible pricing models, localized support, and simplified onboarding processes. Providers should also implement transparent service-level agreements and offer modular cloud solutions that allow SMEs to scale progressively.

Fourth, financial institutions and development agencies can support cloud adoption by deploying incentive-based financing models, including credit

facilities, grants, and subsidies targeted at digital transformation initiatives.

Finally, multistakeholder innovation hubs and public–private partnerships can play a crucial role in accelerating ecosystem-wide readiness by fostering knowledge exchange, enabling shared infrastructure, and promoting collaborative problem-solving. Collectively, these recommendations empower SMEs to overcome structural barriers, enhance operational capabilities, and leverage cloud technologies for long-term competitiveness and economic growth.

6.4 Limitations of the Review

Although comprehensive, this review has several limitations that must be acknowledged. First, the analysis synthesizes findings primarily from secondary literature, meaning that the conclusions are dependent on the quality, scope, and methodological rigor of the existing studies. The absence of primary empirical data limits the ability to validate the conceptual model in real-world SME environments across various emerging economies.

Second, cloud adoption barriers are highly context-dependent and evolve rapidly with advances in technology. Therefore, some insights may not fully capture the most recent developments in cloud security architectures, regulatory reforms, or emerging digital infrastructures. Additionally, the diversity of emerging economies means that structural barriers differ significantly across regions; this review generalizes trends where country-specific conditions may require customized interpretations.

Third, many existing studies emphasize technological factors, resulting in limited academic literature on socio-cultural influences, leadership dynamics, or microeconomic variables specific to SMEs in developing markets. This constrains the extent to which the proposed model can capture nuanced behavioral and contextual determinants.

Lastly, the review does not quantify the relative weight of each barrier or enabler, as such analysis requires extensive empirical modeling and cross-country datasets. Consequently, the model remains conceptual rather than predictive. These limitations highlight the need for more granular, context-specific, and empirical research to validate and expand the insights presented in this review.

6.5 Areas for Future Research

Future research should focus on empirically validating the proposed conceptual model across diverse emerging economies to determine its applicability and refine its components. Longitudinal studies involving SMEs actively transitioning to cloud environments would provide insight into how technological, organizational, and environmental factors interact over time and which interventions generate the greatest measurable impact. Additionally, comparative cross-country studies could reveal how variations in regulatory maturity, digital infrastructure, political stability, and economic development shape cloud adoption pathways.

Further investigation is needed into the role of socio-cultural factors, including risk perceptions, trust in digital technologies, managerial attitudes, and informal institutional pressures that influence cloud adoption behavior. These human and behavioral dimensions remain understudied despite their significant impact on decision-making in SMEs.

Future research should also explore advanced cloud deployment strategies—such as hyper-converged infrastructures, containerization, serverless computing, and edge–cloud integration—to understand their relevance and adoption feasibility for SMEs in resource-constrained environments. Another critical area involves assessing the economic and developmental impacts of cloud adoption, particularly how cloud-enabled SMEs contribute to job creation, productivity growth, and digital inclusion.

Finally, researchers should develop predictive models and decision-support tools that quantify cloud adoption readiness and identify optimal adoption pathways based on SME characteristics. These tools would offer practical value for policymakers and business leaders seeking to accelerate digital transformation in emerging economies.

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