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Barriers and enablers of cloud computing adoption in Syria: a literature review grounded in the TOE framework

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A B S T R A C T

The adoption of cloud computing in Syria is shaped by a complex set of socio technical factors, exacerbated by the nation's prolonged conflict and fragile economic landscape. Utilizing the Technology–Organization–Environment (TOE) framework, this study systematically investigates the key drivers and impediments influencing cloud computing uptake among Syrian enterprises. This study employs a qualitative systematic review based on the TOE framework to identify and classify adoption factors. Through an integrative review of academic literature, regional case studies, and sector specific data, the analysis identifies several enabling factors, including cost efficiency, scalability, and operational flexibility. However, the diffusion of cloud technologies remains constrained by infrastructural deficiencies, heightened security and privacy concerns, regulatory uncertainty, and limited organizational readiness. The findings underscore that successful adoption in such contexts requires a strategic alignment between technological capability, organizational capacity, and a supportive policy environment. Implications are presented for policymakers, industry stakeholders, and future research initiatives focused on advancing digital transformation in frozen conflict economies.

1. Introduction

Cloud computing has significantly altered how organizations manage and deploy IT resources, offering benefits such as operational efficiency, cost reduction, and scalability (Marston *et al.*, 2011). However, its adoption is uneven, particularly in conflict affected and resource constrained economies where technological and institutional readiness remains low. Syria represents a critical case in this regard, having faced prolonged conflict and infrastructural collapse that hinder digital transformation. Syria presents a unique case for studying cloud computing adoption. Since the outbreak of civil conflict in 2011, the country has experienced substantial disruption to its telecommunications infrastructure, a reduction in skilled labor, and economic sanctions that have collectively hindered digital transformation efforts (World Bank, 2020). Despite occasional diplomatic developments, Syria remains in a frozen conflict marked by territorial fragmentation, foreign military presence, and low-intensity clashes conditions that produce ongoing environmental volatility rather than a post-conflict recovery (Council of the European Union, 2025). Nevertheless, as the Syrian economy seeks recovery and modernization, cloud computing offers a pathway to rebuilding enterprise capacity while fostering innovation with minimal upfront capital investment (Gupta, Seetharaman and Raj, 2013).Understanding the factors influencing cloud adoption in Syria is essential for both academic inquiry and effective policy making. The present study applies the Technology–Organization–Environment (TOE) framework originally developed by Tornatzky and Fleischer (1990) to systematically assess the enablers and barriers to cloud adoption in Syrian enterprises. The TOE framework categorizes adoption determinants into three broad dimensions: technological context (e.g., perceived benefits, security risks), organizational context (e.g., firm size, IT capability), and environmental context (e.g., government policies, market conditions).While prior studies have examined cloud computing adoption in advanced economies and some emerging markets (Oliveira,

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Thomas and Espadanal, 2014; Gangwar, Date and Ramaswamy, 2015), there remains a critical gap in understanding its dynamics in frozen conflict environments. This study addresses this gap by focusing on Syria and aims to answer the following research questions:

- What are the key technological, organizational, and environmental factors influencing cloud adoption in Syria?
- How do the challenges faced by Syrian enterprises compare with those in other developing economies?
- What strategies can facilitate more effective cloud adoption in the Syrian context?

The paper proceeds with a literature review on cloud computing concepts, followed by a TOE based analysis of adoption challenges and opportunities in Syria. The discussion concludes with policy recommendations and future research directions.

1.1. Research Gap

While cloud computing has been widely studied in developed and emerging markets, there remains a significant lack of empirical and contextspecific research examining its adoption in conflict-affected and unstable environments such as Syria. Most existing literature on cloud computing adoption has centered on technologically advanced or economically stable nations, often utilizing frameworks like TAM, TOE, and DOI to explore adoption determinants in relatively predictable environments (Davis, 1989; Rogers, 2003; Oliveira, Thomas and Espadanal, 2014; Gangwar, Date and Ramaswamy, 2015). However, these models have rarely been applied in fragile, post-crisis economies where infrastructural degradation, institutional instability, and economic sanctions create unique constraints (El-Gazzar, 2014; World Bank, 2020).

Studies that do focus on developing countries tend to generalize the region or rely on aggregated data without adequately addressing the micro level organizational realities of businesses operating under conflict conditions (Alshamaila, Papagiannidis and Li, 2013; Gupta, Seetharaman and Raj, 2013). Additionally, the literature lacks an integrated analysis of how the technological, organizational, and environmental (TOE) factors interact in contexts where both infrastructural rebuilding and digital transformation are occurring simultaneously (Low, Chen and Wu, 2011; Géczy, Izumi and Hasida, 2012).

In Syria's case, the absence of a national ICT strategy, low cloud readiness, and limited cybersecurity capacity remain underexplored in scholarly research (Alassaf et al., 2020; Bahna et al., 2022). Furthermore, there is little empirical data on how local enterprises perceive cloud computing, assess its risks, or access implementation support. These gaps restrict our ability to formulate targeted policies or design adoption frameworks suited to fragile and transitional economies.

Therefore, this study addresses a critical void in the literature by applying the TOE framework to analyze cloud computing adoption in the Syrian business environment. Unlike previous studies in the MENA region that often generalize findings across countries or focus on relatively stable contexts like Jordan or Egypt (Alshamaila, Papagiannidis and Li, 2013; Gupta, Seetharaman and Raj, 2013), this research uniquely situates Syria within its fragile and geopolitically fragmentedrecovery phase, marked by infrastructural collapse, economic sanctions, and institutional fragility. By grounding the analysis in this context, the study extends the applicability of the TOE model to extreme conditions and contributes original insights into how cloud adoption can be enabled in fragile, sanctioned, and transitional economies.

This study contributes to the literature by examining cloud computing adoption in a frozen conflict setting an underexplored context in technology adoption research. Applying the TOE framework to the Syrian case, it offers theoretical and empirical insights into the interplay between infrastructural collapse, institutional fragility, and international sanctions in shaping digital transformation.

1.2. Literature review

1.2.1. Cloud Computing: Definition and Strategic Relevance

Cloud computing is broadly defined as the delivery of computing services such as storage, networking, software, and analytics over the internet ("the cloud") to offer flexible resources, rapid innovation, and economies of scale (Mell and Grance, 2011). By moving IT services off-premises, organizations can scale infrastructure based on demand, minimize capital expenditure, and enhance business continuity (Armbrust *et al.*, 2010). These features are particularly attractive to businesses in resource constrained environments like Syria, where traditional IT systems are costly to maintain and vulnerable to physical disruption.

1.2.2. Theoretical Frameworks for Technology Adoption

Several models have been developed to explain how and why organizations adopt new technologies. The most prominent among them are the Technology Acceptance Model (TAM), the Diffusion of Innovation (DOI) theory, and the Technology–Organization–Environment (TOE) framework.

a) Technology Acceptance Model (TAM)

Proposed by Davis (1989), TAM posits that two factors: perceived usefulness and perceived ease of use determine users' intention to adopt a technology. While TAM has been widely applied in IT adoption research, it primarily focuses on individual level behavior and lacks organizational and environmental dimensions (Venkatesh and Davis, 2000).

b) Diffusion of Innovation (DOI) Theory

Developed by Rogers (2003), DOI theory emphasizes how innovations spread through populations. It identifies five attributes that influence adoption: relative advantage, compatibility, complexity, trialability, and observability. DOI has been applied in cloud computing studies to understand how perceived innovation characteristics influence adoption across industries (Alshamaila, Papagiannidis and Li, 2013).

c) Technology–Organization–Environment (TOE) Framework

The TOE framework, introduced by Tornatzky and Fleischer (1990), provides a comprehensive structure for analyzing technology adoption. It categorizes influencing factors into three contexts: technological (e.g., innovation characteristics such as complexity, compatibility, and security), organizational (e.g., firm size, IT infrastructure, and human capital), and environmental (e.g., competitive pressure, regulation, and external support). It has been widely applied in studies from Pakistan, Saudi Arabia, and Nigeria to examine cloud adoption among SMEs in resource-constrained settings (Abubakar, Bala and Udoudoh, 2020; Ahmed and Waqar, 2020; Alzahrani and Alamri, 2021). Its broad applicability makes it especially useful for evaluating adoption in volatile or emerging economies, as it accommodates institutional and infrastructural variability (Oliveira and Martins, 2011; Gangwar, Date and Ramaswamy, 2015).

Hiba! A hivatkozási forrás nem található. presents a concise comparison of the three main technology adoption frameworks TAM, DOI, and TOE commonly used in cloud computing research. It highlights their core features and justifies the selection of the TOE framework for this study, given its broader organizational and environmental focus.

Table 1. Comparative overview of the three dominant technology adoption frameworks used in cloud computing

Feature	TAM (Technology Acceptance Model)	DOI (Diffusion of Innovation)	TOE (Technology–Organization–Environment)
Primary Focus	User acceptance	Innovation diffusion in a population	Organizational adoption context
Level of Analysis	Individual	Individual, social systems	Organizational/systemic

Key Determinants	- Perceived usefulness - Ease of use	- Relative advantage - Compatibility - Complexity - Trialability - Observability	- Technological factors - Organizational factors - Environmental factors
Strengths	Simple, widely applied in IT adoption	Captures how innovations spread over time	Holistic, context sensitive for firms
Limitations	Ignores organizational/environmental factors	Less focus on organizational structures	Requires detailed contextual data
Best Applied In	User focused systems (e.g., apps)	Social adoption trends and innovation uptake	Business technology adoption strategies

Source: Adapted from Davis (1989); Rogers (2003); Tornatzky & Fleischer (1990); Oliveira et al. (2014)

Recent studies continue to apply the TOE framework in volatile or emerging contexts. For example, (Al-Okaily *et al.*, 2024) used mixed methods to examine cloud adoption in SMEs operating under disruptive conditions, reinforcing the importance of environmental turbulence in TOE models.

1.2.3. Cloud Computing Adoption in Developing and Conflict-Affected Countries

Research on cloud computing adoption in developing countries has consistently highlighted key determinants such as cost efficiency, inadequate infrastructure, data security concerns, and the influence of government policy (Low, Chen and Wu, 2011; Gupta, Seetharaman and Raj, 2013). In contexts such as Jordan, Egypt, and Kenya, studies have revealed additional barriers including limited awareness, unreliable internet connectivity, and organizational resistance to technological change (Alzahrani and Alamri, 2021; Atobishi *et al.*, 2021). Barriers include limited ICT infrastructure, regulatory gaps, and low digital literacy, a pattern echoed in developing and fragile economies across the Middle East and Africa (World Bank, 2023).In post-conflict environments, cloud computing is increasingly viewed as a strategic tool for circumventing damaged physical infrastructure, offering remote access and decentralized services (El-Gazzar, 2014). Nevertheless, the absence of coherent ICT policies, persistent regulatory ambiguity, and a shortage of skilled professionals due to brain drain present formidable obstacles to implementation. In the Syrian context, these issues are further compounded by organizational fragility and environmental instability. Although empirical studies remain scarce, existing research suggests that Syrian enterprises face significant challenges, including weak organizational readiness, lack of digital infrastructure, and a limited pool of qualified IT personnel (Alassaf et al., 2020). At the same time, emerging trends indicate a growing recognition of cloud computing's potential, particularly among urban based startups and younger IT professionals (Alassaf et al., 2020). Given this complexity, the Technology–Organization–Environment (TOE) framework offers a particularly suitable analytical lens, as it enables the categorization of these challenges into three dimensions: technological (e.g., limited bandwidth, security risks), organizational (e.g., lack of resources and IT skills), and environmental (e.g., regulatory uncertainty, political instability), providing a comprehensive basis for evaluating cloud adoption in fragile states like Syria.

1.2.4. TOE Framework Analysis: Challenges and Opportunities in Syria

The Technology–Organization–Environment (TOE) framework offers a comprehensive lens for analyzing cloud computing adoption, particularly in fragile contexts such as Syria, where institutional and infrastructural weaknesses are prevalent. Additionally, civil society organizations and public institutions face distinct challenges, with NGO operations in Syria highlighting barriers tied to funding instability and data sovereignty (Alharbi, Atkins and Stanier, 2016). In the Syrian case, the technological dimension is constrained by limited broadband coverage, outdated telecommunications infrastructure, and unreliable electricity, all of which impede stable access to cloud services (International Telecommunication Union, 2021). Moreover, low awareness of cloud computing's

strategic benefits, particularly among small and medium sized enterprises (SMEs), limits adoption despite the known advantages of scalability, cost efficiency, and operational flexibility (Marston *et al.*, 2011; Gupta, Seetharaman and Raj, 2013). Nevertheless, rising mobile internet penetration and increased uptake of cloud based tools by startups and NGOs in cities such as Damascus and Aleppo suggest uneven but growing technological readiness (Bahna, Takács-György and Fogarassy, 2021). Organizationally, Syrian firms face severe resource constraints and a shortage of skilled IT personnel due to emigration and sectoral collapse, making investments in digital infrastructure challenging (Alshamaila, Papagiannidis and Li, 2013; World Bank, 2020). Resistance to change, particularly in traditional family run businesses, further inhibits the transition to cloud-based systems (Oliveira, Thomas and Espadanal, 2014). Still, innovative organizations in the education and nonprofit sectors have emerged as early adopters, often benefiting from subsidized cloud services and international partnerships. The environmental context adds additional complexity, with the absence of a national digital strategy, fragmented data protection laws, and minimal governmental ICT

engagement contributing to a climate of legal ambiguity (Low, Chen and Wu, 2011). Political instability and international sanctions further deter investment and cooperation with global cloud providers (El-Gazzar, 2014). However, reconstruction initiatives in the context of Syria's frozen conflict and donor-led infrastructure projects provide a unique opportunity to align cloud adoption with national development goals, particularly in critical sectors such as education, healthcare, and logistics (Alassaf et al., 2020).

2. Material and method

This study employs a qualitative systematic review design, grounded in the Technology–Organization–Environment (TOE) framework (Tornatzky and Fleischer, 1990), to explore the key determinants of cloud computing adoption in Syria within the context of its frozen conflict recovery. The research adopts an interpretive and exploratory approach, synthesizing academic literature, regional case studies, and policy reports. Data was collected from scholarly databases such as Google Scholar, ResearchGate, ScienceDirect, and SpringerLink. The literature search followed a structured keyword strategy using title-level queries to ensure relevance, applying the syntax: TL=("cloud computing" OR "cloud adoption") AND TL=("TOE framework" OR "TAM" OR "DOI") AND TL=("Syria" OR "post-conflict" OR "developing countries" OR "fragile states"). The inclusion criteria required sources to (a) be published between 2010 and 2025, (b) be aligned with the TOE, TAM, or DOI frameworks, and (c) be relevant to developing or fragile economies. After applying screening and relevance filters, 68 peer reviewed articles and policy reports were retained for analysis. From these, only the most thematically relevant and methodologically rigorous sources were cited in the final manuscript to maintain analytical clarity and avoid redundancy; others informed the analysis indirectly but were excluded from the reference list.

Using the TOE model as the analytical lens, findings were categorized into technological (e.g., infrastructure, security, complexity), organizational (e.g., IT capability, firm size, change resistance), and environmental (e.g., policy, market pressures, instability) domains. A thematic content analysis was conducted in three stages: first, open coding of relevant text fragments; second, axial coding to cluster codes under TOE dimensions; and third, selective coding to refine subthemes and identify patterns specific to the Syrian context. To improve reliability, triangulation was applied across academic sources, regional reports, and institutional data from organizations such as the World Bank, ITU, and UNDP. While the study is limited by its reliance on secondary sources and the underrepresentation of Syrian enterprise level field data, the structured coding process offers a robust synthesis of current knowledge and forms a solid foundation for future empirical research.

3. Results

The synthesis of literature, case studies, and regional data reveals that cloud computing adoption in Syria is influenced by a combination of technological, organizational, and environmental factors, each presenting both opportunities and barriers. The results, categorized under the TOE framework, demonstrate how these dimensions interact uniquely in a frozen conflict context.

3.1. Technological Factors

The technological readiness of Syrian enterprises remains uneven. While the strategic benefits of cloud computing such as cost efficiency, scalability, and remote access are widely recognized in the literature (Marston *et al.*, 2011; Mell and Grance, 2011), Syrian firms face significant infrastructural limitations. These include unreliable electricity, limited broadband coverage, and poor server access (International Telecommunication Union, 2021). On the enabling side, increased adoption of cloud based tools by startups and NGOs in Damascus and Aleppo demonstrates growing awareness and local innovation (Bahna, Takács-György and Fogarassy, 2021).

3.2. Organizational Factors

From an organizational perspective, SMEs dominate the Syrian business landscape, yet these entities often operate with limited IT budgets and lack in house expertise (Alshamaila, Papagiannidis and Li, 2013). The shortage of skilled professionals intensified by migration and economic disruption limits technical readiness (World Bank, 2020). In addition, resistance to change is widespread, especially among traditional businesses with legacy systems (Oliveira, Thomas and Espadanal, 2014). Despite these challenges, several pilot initiatives and externally funded programs have facilitated early adoption, especially within universities, non profits, and IT startups, indicating a segmented yet promising trend of digital uptake (Almomani and Basri, 2022).

However, certain sectors demonstrate early momentum. For example, private universities such as the Syrian Virtual University (SVU) have piloted cloud based learning management systems to support remote instruction amid infrastructure disruptions. Similarly, some IT startups in Damascus and Latakia, often led by repatriated or diasporatrained entrepreneurs have leveraged platforms like AWS Educate and Google Cloud for Startups to build scalable applications for logistics and e-commerce. A handful of NGOs, including those focused on humanitarian logistics and health informatics, have adopted cloud based data collection tools (e.g., KoboToolbox, DHIS2) to streamline reporting and coordination with international donors. These instances suggest that despite systemic constraints, digital experimentation is occurring within resourceful and externally supported organizational pockets.

3.3. Environmental Factors

The external environment remains the most critical dimension influencing adoption. The lack of a national ICT strategy, inconsistent regulatory frameworks, and absence of cybersecurity laws create a fragmented legal landscape that deters investment and trust (Oliveira and Martins, 2011; El-Gazzar, 2014). Economic sanctions and international political isolation further limit access to global vendors and scalable infrastructure. However, post-conflict reconstruction initiatives driven by donor organizations and NGOs have begun to rebuild basic digital infrastructure and foster interest in modern ICT systems, providing a window of opportunity (Alassaf et al., 2020).

3.4. Comparative Insights

When compared with other developing or conflict affected nations such as Iraq, Egypt, and Kenya, Syria shares many adoption barriers, including poor connectivity, regulatory ambiguity, and cost concerns (Alzahrani and Alamri, 2021; Atobishi *et al.*, 2021). However, the depth of infrastructural collapse and institutional fragmentation in Syria presents a more acute set of constraints. The results confirm that cloud adoption in Syria is feasible but will require a coordinated strategy that addresses the TOE domains concurrently.

Hiba! A hivatkozási forrás nem található. summarizes the key barriers and enablers of cloud computing adoption in Syria, categorized according to the Technology–Organization–Environment (TOE) framework. This structured overview reflects the thematic findings of the literature review and highlights context specific factors shaping adoption in a conflict-affected environment.

Table 2. TOE-Based Results for Cloud Computing Adoption in Syria

TOE Dimension	Enablers	Barriers
Technological	- Cost efficiency and scalability of	- Limited broadband and

	cloud solutions - Mobile internet adoption in urban areas - Flexibility and remote access benefits (Marston *et al.*, 2011; Bahna, Takács-György and Fogarassy, 2021)	electricity - Data security and privacy concerns - Low awareness among SMEs (Gupta, Seetharaman and Raj, 2013)
Organizational	- Adoption by startups, NGOs, and universities - Free/low-cost platforms from global vendors (e.g., Google Cloud for Startups)	- Shortage of skilled IT personnel (World Bank, 2020) - Budget constraints among SMEs - Cultural resistance to change (Oliveira, Thomas and Espadanal, 2014)
Environmental	- Donor-funded digital infrastructure rebuilding - Opportunities via frozen conflict reconstruction programs	- Absence of national ICT policy - Regulatory uncertainty - International sanctions and vendor access limits (Low, Chen and Wu, 2011; El-Gazzar, 2014)

Source: Author's own elaboration (2025)

3.5. Discussion: Strategic Insights and Policy Implications

The TOE based analysis highlights that cloud computing adoption in Syria is shaped by a complex intersection of technological limitations, organizational constraints, and environmental instability, all of which are intensified by the country's frozen conflict conditions. Although many of these issues are common in other developing countries, Syria's situation is uniquely compounded by prolonged infrastructure collapse, international sanctions, and institutional fragility. Technological readiness remains a critical barrier, as consistent internet access and electricity both prerequisites for cloud functionality, are often unreliable. Additionally, concerns about data sovereignty and privacy are elevated in fragile states, where data management practices and hosting locations remain ambiguous and under regulated (Géczy, Izumi and Hasida, 2012). On the organizational side, the scarcity of skilled IT personnel, limited financial resources, and poor digital literacy hinder cloud readiness, particularly among small and medium sized enterprises (SMEs), which dominate the Syrian private sector (Oliveira, Thomas and Espadanal, 2014). The risks of poor implementation and overdependence on unsecured solutions are heightened in this context. Moreover, the external environment lacks the policy infrastructure necessary to encourage digital innovation. The absence of data protection laws, weak public private collaboration, and minimal regulatory incentives further restrict adoption potential. To unlock the developmental potential of cloud computing, a multi pronged policy strategy is required. This includes developing a national cloud policy framework to clarify standards for procurement, data security, and vendor engagement; investing in digital infrastructure rebuilding through donor funding and partnerships; launching capacity building programs to enhance IT and cybersecurity skills; incentivizing SMEs to adopt cloud services via tax relief and subsidized access; and empowering early adopters such as universities, NGOs, and startups to serve as demonstrative innovation leader. By addressing these barriers across all TOE dimensions, Syria can better leverage cloud computing as a strategic tool for national reconstruction and sustainable digital transformation.

While Syria faces exceptional challenges linked to its frozen conflict status, many of the barriers identified such as weak infrastructure, data security concerns, and regulatory uncertainty are also prevalent in other developing nations. For instance, similar issues have been reported in Kenya, Bangladesh, and parts of Latin America, where SMEs cite limited broadband and lack of cloud literacy as persistent inhibitors (Low, Chen and Wu, 2011; Alzahrani and Alamri, 2021). However, Syria's compounded constraints ranging from sanctions to institutional collapse magnify these challenges, echoing barriers faced in similar conflict-affected nations like Iraq, Libya, and Yemen (Farouk and AlHargan, 2020). Unlike more stable developing countries, Syrian enterprises must also contend with restricted access to global cloud vendors and the absence of a functioning ICT policy framework. This

duality underscores Syria's alignment with broader adoption trends, yet highlights its need for more customized, crisis sensitive cloud strategies.

4. Conclusions and Future Research Directions

This study has explored cloud computing adoption in Syria through the lens of the Technology–Organization–Environment (TOE) framework, offering a comprehensive analysis of the factors shaping technology uptake in a frozen-conflict setting. The findings reveal that while cloud computing holds significant promise for advancing Syria's digital recovery, and supporting economic revitalization, its diffusion is hindered by the convergence of technological deficiencies, organizational shortcomings, and environmental instability. Specifically, unreliable internet access, pervasive cybersecurity risks, and limited technological infrastructure constrain adoption on the technical front. On the organizational level, Syrian enterprises struggle with inadequate IT skills, digital illiteracy, and financial constraints, which collectively undermine implementation capacity. Environmentally, the absence of a coherent ICT policy, inconsistent regulations, and ongoing political and economic volatility further dampen the momentum for widespread cloud adoption.

Despite these barriers, encouraging signals such as the engagement of international donors, growing interest from educational institutions and startups, and a pressing national need for scalable, low-cost infrastructure suggest that cloud technologies could become a transformative tool for rebuilding essential sectors. To support this transition, strategic policy interventions and multi-stakeholder collaboration are essential.

One of the most profound structural constraints identified in this study is the impact of international sanctions, which cut across all three TOE dimensions and fundamentally shapes Syria's digital trajectory. From a technological standpoint, sanctions restrict access to leading cloud providers such as AWS, Google Cloud, and Microsoft Azure, limiting Syrian enterprises' ability to leverage robust, scalable platforms. On the organizational level, sanctions hinder cross-border financial transactions, making it nearly impossible for businesses to pay for international cloud services, access licensing tools, or participate in global digital ecosystems. Environmentally, sanctions generate extreme uncertainty and business risk, deterring foreign investment and discouraging technology transfer. As such, sanctions are not merely one of several environmental factors they form a systemic barrier that permeates the entire cloud adoption landscape. Recognizing their structural impact is critical for designing realistic and conflict-sensitive cloud strategies in sanctioned and geopolitically isolated states.

Looking forward, future research should incorporate empirical fieldwork, including semi-structured interviews or case studies with Syrian enterprises, to capture firsthand perspectives on cloud readiness, perceived risks, and implementation strategies. These qualitative insights would complement the current review and help develop context sensitive adoption models. Additionally, quantitative studies such as surveys assessing technology acceptance, TOE factor weighting, or statistical modeling of adoption predictors could further validate the framework and measure adoption maturity across sectors. Comparative analyses with other fragile or conflict-affected economies (e.g., Iraq, Libya, Yemen) would also provide valuable benchmarking and foster regional knowledge sharing. Lastly, deeper investigation into the role of cloud vendors, donor agencies, and multilateral institutions in supporting secure, ethical, and scalable access is warranted, particularly under conditions of political isolation and sanctions. These directions offer fertile ground for advancing both academic discourse and practical digital transformation strategies in Syria and similarly challenged contexts.

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