

The state-led AI Model in the Gulf: A comparative analysis of investments, ecosystems, and challenges across the GCC countries

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Abstract

Artificial intelligence (AI) has emerged as a central pillar of economic transformation, public-sector modernization, and strategic competitiveness across the Gulf Cooperation Council (GCC). Motivated by the dual imperatives of economic diversification beyond hydrocarbons and the modernization of public services, GCC states have invested heavily in AI infrastructure, platforms, and applications. This viewpoint paper offers a comparative interpretive analysis of AI development trajectories in the six GCC countries — Kuwait, Oman, the United Arab Emirates (UAE), the Kingdom of Saudi Arabia (KSA), Qatar, and Bahrain. Drawing on official national strategies, sovereign wealth fund disclosures, multilateral reports, and industry analyses published between 2023 and 2026, the paper examines AI investments, emerging ecosystems and institutions, flagship national projects, strategic drivers, and structural challenges. We frame the analysis through national innovation systems framework and contrast the region with market-driven AI ecosystems. We argue that the GCC has developed a distinctive model of AI development characterized by strong state leadership, sovereign-led financing, and application-oriented deployment. At the same time, the analysis highlights shared regional constraints related to talent availability, data governance, ethical regulation, commercialization, infrastructure sustainability, and technological dependence, raising important questions about the long-term resilience of AI-driven growth in the GCC. As a viewpoint contribution, the paper advances a typology of three GCC country clusters and proposes a policy agenda for sustaining the model.

Keywords: Artificial intelligence; Gulf Cooperation Council; digital transformation; sovereign wealth funds; national AI strategies; national innovation systems; Middle East

Introduction

Artificial intelligence (AI) is increasingly reshaping economic structures, governance systems, labor markets, and the sources of national competitiveness. Beyond its technological dimension, AI has become a strategic asset capable of enhancing productivity, enabling new forms of public-service delivery, and redefining global value chains. For the Gulf Cooperation Council (GCC) countries — Kuwait, Oman, the UAE, Saudi Arabia, Qatar, and Bahrain — the relevance of AI is particularly pronounced. Confronted with structural challenges such as long-term hydrocarbon dependence, fiscal sustainability pressures, and labor-market transformation (with a large share of nationals employed in the public sector), GCC governments have positioned AI as a key instrument supporting economic diversification and state modernization (Semanticbrains, 2025).

The six countries have experienced substantial growth in population, internet usage, and GDP since 2007 (see Table 1). Population growth has been particularly pronounced in Saudi Arabia and the UAE, reflecting labor migration and demographic expansion associated with large-scale development projects. Internet adoption expanded dramatically across all countries, with penetration rates increasing from modest 2007 levels to near-

saturation by 2025, especially in the UAE and Qatar. Over the same period, aggregate GDP nearly tripled, led by Saudi Arabia and the UAE, which together account for the majority of GCC output. This parallel expansion of digital connectivity, demographic scale, and economic capacity underpins the GCC's strategic shift toward digital and knowledge-based development (Global Data & Statistics Hub, 2025; World Bank, 2026).

Table 1. GCC countries: area, population, internet users, internet penetration, and GDP (2007 vs. 2025)

Country	Area (sq km)	Population (million)		Internet users (million)		Internet penetration (%)		GDP (\$ Billion)	
		2007	2025	2007	2025	2007	2025	2007	2025
Bahrain	694	0.74	1.60	0.16	1.60	21.3	100.0	16.9	47.4
Kuwait	17,818	2.73	4.98	0.82	4.94	29.9	99.2	103.4	157.8
Oman	309,500	2.45	5.20	0.32	5.00	13.0	96.2	40.5	105.0
Qatar	11,521	0.82	2.80	0.29	2.80	35.2	100.0	65.8	240.2
Saudi Arabia	2,149,690	24.07	33.90	4.70	34.30	19.5	100.0	374.5	1,027.0
UAE	77,700	3.98	11.10	1.71	11.20	42.9	100.0	189.6	569.0
Total	2,566,923	34.80	59.58	7.99	59.84	—	—	790.7	2,146.4

Sources: Global Data & Statistics Hub (2025); World Bank (2026). Note: Penetration values for 2025 are approximations rounded from ITU/World Bank estimates.

Since the late 2010s, all GCC member states have articulated national digital or AI strategies aligned with broader long-term development visions, including Saudi Vision 2030 (Saudi Vision 2030, 2026), Oman Vision 2040 (Oman Vision 2040, 2026), Qatar National Vision 2030 (Qatar National Vision 2030, 2026), Kuwait Vision 2035 (Kuwait Vision 2035, 2026), the Abu Dhabi Economic Vision 2030 (UAE Vision 2030, n.d.), and the Bahrain Economic Vision 2030 (Bahrain Economic Vision 2030, 2026). These strategies reflect a shared political commitment to leveraging emerging technologies to transition toward knowledge-based economies and reduce structural dependence on hydrocarbons (United Arab Emirates Artificial Intelligence Office, 2022).

However, the institutional pathways adopted by GCC countries differ significantly from those of market-driven AI ecosystems such as the United States or East Asia. AI development in the GCC has predominantly taken a state-centric form, characterized by the central role of governments and sovereign wealth funds in financing, coordinating governance, and enabling large-scale AI deployment (Pasquali, 2026). Recent years have witnessed massive investments in hyperscale data centers, national AI platforms, smart-city initiatives, digital government services, and Arabic-language large language models.

While the GCC is widely recognized for its advanced infrastructure, prominent tourism destinations, and strategic role as a global aviation hub, the region remains relatively underexplored in the scholarly literature on AI policy and innovation. This viewpoint paper addresses this gap by advancing a comparative interpretation of AI ecosystems across the six GCC countries, structured around five dimensions: total AI investment, AI companies and institutional ecosystems, flagship AI projects, strategic drivers of adoption, and structural and policy challenges.

Research Questions

To address the gap identified above, this paper is guided by four research questions:

- RQ1:** What are the levels, sources, and structural characteristics of AI investment across the six GCC countries?

2. **RQ2:** How do AI institutional ecosystems and flagship projects differ across the GCC, and what country-level typologies can be identified?
3. **RQ3:** What are the principal strategic drivers shaping AI adoption in the region?
4. **RQ4:** What structural risks and policy challenges threaten the long-term sustainability of the GCC AI model, and what implications do they have for regional and national policy?

Paper Type and Contribution

This paper is framed as a viewpoint (perspective) contribution rather than a systematic literature review. As such, it advances an argued interpretation of the GCC AI landscape, drawing on a broad evidence base of policy documents, official strategies, sovereign-fund disclosures, multilateral reports, and current industry analyses. The viewpoint format is appropriate because the GCC AI landscape is moving faster than the peer-reviewed literature can document it, and because the analytical contribution lies in synthesizing dispersed evidence into a coherent comparative interpretation rather than in cataloging an established research field.

Within this format, the paper makes three contributions. *First*, it provides a structured comparative mapping of AI ecosystems across all six GCC states using a consistent five-dimension framework. *Second*, it adapts national innovation systems framework to a state-led, sovereign-fund-financed context, offering a conceptual lens through which the GCC model can be analyzed alongside — and contrasted with — market-driven ecosystems. *Third*, it advances a typology of three GCC country clusters (frontier leadership, infrastructure-and-governance, and externally-oriented sovereign investment) and identifies a set of regional and country-cluster policy priorities that follow from the analysis.

Literature Review

Academic scholarship on AI in the GCC remains fragmented across three largely separate streams: (a) work on state-led innovation and rentier-economy diversification, (b) studies of digital transformation and e-government in the Arab Gulf, and (c) the broader literature on national innovation systems and AI policy in non-Western contexts. This section synthesizes these strands and identifies the gaps this paper addresses.

State-Led Innovation and Rentier Economies

The political-economy literature on the Gulf has long emphasized the rentier-state character of GCC economies, in which hydrocarbon rents enable state-directed investment but can also distort labor markets and weaken private-sector innovation incentives (Hertog, 2010; Beblawi & Luciani, 1987). More recent work documents a deliberate shift toward what Hvidt (2013) and Krane (2019) describe as state-led modernization: large public investment programs, sovereign-wealth-fund deployment into advanced sectors, and the use of national visions (Saudi Vision 2030, UAE Vision 2030) as coordinating instruments. AI investment in the GCC fits squarely within this tradition but extends it by mobilizing sovereign capital not only domestically but also through cross-border infrastructure partnerships (Pasquali, 2026; Nolan, 2025).

Digital Transformation and E-Government in the Gulf

A second body of work examines digital government and ICT adoption in the Arab world. Studies of e-government implementation in the GCC have documented strong infrastructure investment but persistent challenges in citizen adoption, inter-agency data sharing, and human-capital development (Al-Shehry et al., 2006; Rouibah & Hamdy, 2009; Weerakkody et al., 2016). The UAE's smart-government and the Kingdom of Saudi Arabia's digital-transformation initiatives have been analyzed as showcases of top-down digital reform (Sallam et al., 2023), while Bahrain's regulatory sandboxes and Oman's incremental digital roadmap have received more limited academic attention. AI extends this digital-government agenda but introduces new governance demands — algorithmic accountability, data ethics, and explainability — that earlier e-government scholarship did not anticipate.

National Innovation Systems and AI Policy

The national innovation systems (NIS) framework, developed by Freeman (1987) and Lundvall (1992), conceptualizes innovation as the outcome of interaction between firms, universities, public research organizations, financing institutions, and regulatory bodies within a national context. Recent AI-policy scholarship has applied the NIS framework to comparative studies of AI strategies in the United States, China, the European Union, and emerging economies (Bessen, 2022; Cao, 2020). These studies highlight the strong role of demand-side conditions, public procurement, and skills systems in shaping AI trajectories. The NIS framework is particularly useful for the GCC because it foregrounds the interaction between state actors, sovereign capital, universities, and global technology partners — the four dominant features of the regional AI landscape.

Research Gap

Despite the growing volume of policy reports and consulting briefs on AI in the Gulf (Pasquali, 2026; Semanticbrains, 2025; World Economic Forum, 2025), peer-reviewed comparative academic studies covering all six GCC states remain scarce. Existing scholarship tends to focus on single-country case studies (most often the UAE or Saudi Arabia) and rarely engages the theoretical literature on NIS or compares the GCC explicitly against market-driven AI ecosystems. Moreover, the literature has not yet integrated the physical and geopolitical infrastructure risks (submarine cables, hyperscale-data-center exposure) that have become salient since the regional conflicts of 2024–2026. This paper addresses these gaps.

Approach and Analytical Framework

Research Approach

Consistent with its framing as a viewpoint paper, this study adopts an interpretive comparative approach grounded in documentary analysis (Bowen, 2009). The unit of analysis is the national AI ecosystem, and the goal is to identify both shared regional patterns and country-level divergence and to advance an interpretation of the GCC model and its sustainability. The approach is not intended as a systematic literature review in the PRISMA sense; rather, it follows the conventions of policy-oriented viewpoint scholarship, in which authors synthesize a broad evidence base to argue for a specific reading of an emerging phenomenon.

Evidence Base

The evidence base for the paper includes: (i) official government strategy documents and ministerial publications from each GCC state; (ii) sovereign wealth fund and AI-company disclosures; (iii) publications from multilateral institutions including the IMF, World Bank, World Economic Forum, and UNESCO; and (iv) industry and policy analyses published between January 2023 and April 2026.

Sources were identified through structured searches of Google Scholar, the websites of each country's national AI authority, sovereign wealth fund portals, and the document repositories of multilateral institutions. Search terms combined country names with the keywords "AI strategy," "artificial intelligence," "sovereign AI," "data center," "large language model," and "digital transformation." Sources were included if they (a) covered at least one GCC country, (b) were published between 2023 and 2026 or were foundational policy documents, and (c) were verifiable against an institutional or governmental authority. Where headline figures conflicted across sources (for example, announced investment amounts), priority was given to primary government sources, followed by multilateral institutions, with industry reports cross-checked where possible.

Analytical Framework

The five comparative dimensions analyzed in this paper — AI investment, ecosystems and institutions, flagship projects, strategic drivers, and challenges — were derived a priori from the national innovation systems framework and adapted to the GCC context. The mapping is shown in Table 2.

Table 2. Mapping of NIS framework to comparative dimensions

NIS Component	Comparative Dimension in this Study
Financing institutions & demand-side conditions	AI investment levels and sources (sovereign wealth funds, public budgets, private capital)
Actors & institutional configuration	AI ecosystem (government agencies, national AI authorities, sovereign AI firms, universities)
Innovation outputs	Flagship AI projects (LLMs, smart cities, data lakes, sovereign clouds)
Framework conditions	Strategic drivers (national visions, diversification, smart cities, regional competition)
System risks & vulnerabilities	Challenges (talent, data governance, ethics, sustainability, geopolitics)

Scope and Limitations

As a viewpoint paper, this study has three scope conditions that should be noted. First, the interpretation rests on available documentary analysis rather than primary fieldwork or interviews with policymakers; this limits insight into informal decision-making and implementation realities. Second, several headline investment figures originate from government press releases or industry reports; while triangulated where possible, these figures should be read as announced commitments rather than verified deployed capital. Third, the AI landscape in the GCC is evolving rapidly. Accordingly, this paper reflects the state of evidence available up to April 2026, and the interpretation advanced here should be understood as a structured assessment of the evidence at this point in time rather than as a definitive account. Further research—particularly studies involving decision-makers and policymakers across GCC countries—is necessary to validate, refine, and extend these findings.

Comparative Country Analyses

Kuwait: Sovereign-Driven AI Adoption and Public-Sector Digitization

AI Investment Levels

Kuwait's AI strategy is strongly shaped by sovereign investment logic. The Kuwait Investment Authority (KIA) has reportedly directed approximately US\$9 billion toward AI and digital services between 2019 and 2024, primarily through global technology funds and strategic partnerships; this figure derives from industry reporting rather than audited disclosures and should be read as estimated allocated capital rather than verified deployment (Pasquali, 2026). Complementing this external orientation, KIA joined as an anchor investor in a US\$30 billion global AI-infrastructure initiative alongside Microsoft, BlackRock, and MGX — a headline figure that reflects the vehicle's total announced target rather than Kuwait's individual contribution — signaling a strategic shift toward AI-enabled infrastructure and data-center assets (Nolan, 2025). Kuwait's investment posture is thus distinctive in that a substantial share of its AI capital deployment is directed at external assets rather than at building domestic infrastructure at the scale of the UAE or Saudi Arabia.

AI Ecosystem

Kuwait's AI ecosystem is characterized by a predominantly public-sector orientation. The main institutions coordinating AI activity are the Central Agency for Information Technology (CAIT, 2026) and the Communications and Information Technology Regulatory Authority (CITRA, 2026), while international technology firms — notably Microsoft and Google Cloud — provide core platforms. Private-sector and startup activity remains comparatively limited, and the country has not yet established a dedicated national AI authority equivalent to Saudi Arabia's SDAIA or the UAE's national AI office. Interpreted through the NIS framework, Kuwait pairs strong financing institutions (sovereign capital) with low actor density and weak university–industry linkage; this configuration helps explain why substantial capital has not yet translated into indigenous innovation outputs — most visibly, the absence of a sovereign large language model — and why the ecosystem's coordination capacity lags its financial capacity.

Flagship Projects

Flagship projects include an AI-powered Microsoft Azure cloud region, the Sahel e-government platform, the Kuwait e-government portal (e.gov, 2026), predictive-maintenance systems in the oil sector (Al-Subaiei et al., 2021), and biometric digital-identity infrastructure (Macdonald, 2023). The oil-sector predictive-maintenance program uses real-time sensor data and machine learning to monitor equipment condition and anticipate failures, with the stated aim of reducing unplanned downtime and maintenance costs across pumps, turbines, and other critical assets. The biometric digital-identity program, led by the Public Authority for Civil Information, integrates fingerprint data with the national Civil ID system; it supports the Kuwait Mobile ID application and secure digital signatures for e-government transactions.

Sultanate of Oman: Policy-Led AI Development under Vision 2040

AI Investment Levels

In contrast to Kuwait's externally oriented investment posture, Oman has adopted a more incremental and policy-driven approach. The government allocated OMR 15 million (approximately US\$39.1 million) to AI projects in 2025 — a budgeted allocation rather than an announced headline commitment — supplemented by sovereign investments reported to exceed US\$200 million in AI-enabled space, connectivity, and digital-infrastructure projects (AI in Oman, 2026). While these figures are modest by regional standards, they are coherent with a deliberate strategy of capacity building before scale.

AI Ecosystem

Oman's AI ecosystem is evolving as part of a broader national digital-transformation agenda aligned with Oman Vision 2040. Central to this ecosystem is the Ministry of Transport, Communications and Information Technology (MTCIT, 2026), which leads policy development, digital-infrastructure expansion, and AI governance. Strategic funding is supported by the Oman Investment Authority (OIA, 2026). The National AI Program 2024–2030 (AI in Oman, 2026) provides a structured roadmap for building national capabilities, research, and human capital. Private-sector participation is increasing, particularly in logistics, energy, and semiconductor design.

Flagship Projects

Flagship initiatives include the Mu'een/Maeen national language model, the National Open Data Portal, dedicated AI zones in Muscat, and AI satellite programs (Oxford Business Group, 2023). The Mu'een/Maeen initiative supports advanced analytics and Arabic-language AI development within Oman's public sector, providing a foundation for localized natural-language-processing systems tailored to administrative and societal needs. The National Open Data Portal provides centralized access to government datasets across sectors, enabling researchers and businesses to leverage data for AI applications (NCSI, 2023). The AI zones, with a planned investment of approximately OMR 100 million (approximately US\$ 260 million), aim to position Oman as a regional hub for AI development through dedicated infrastructure and incentives (Oxford Business Group, 2023).

United Arab Emirates: Global AI Hub and Frontier Ambitions

AI Investment Levels

The UAE has emerged as one of the world's leading investors in AI, committing substantial financial resources to both domestic and global AI initiatives. Industry estimates report cumulative UAE AI-related investment commitments of approximately US\$148 billion since 2024 (Semafor, 2025); this headline figure aggregates announced commitments across infrastructure, partnerships, and international investments and should be interpreted accordingly. Major partnerships include a US\$15+ billion investment by Microsoft to expand AI and cloud infrastructure in the country (Semafor, 2025). The UAE National AI Strategy 2031 positions AI as a core pillar of economic diversification, with the explicit ambition that AI contribute up to 20% of non-oil GDP by 2031.

Internationally, the UAE has committed to invest up to €30–50 billion (approximately US\$31–52 billion) in large-scale AI data centers in France, including a 1-gigawatt AI data-center campus designed to support hyperscale model training and sovereign cloud systems (Bloomberg, 2025). In parallel, private-sector investment is accelerating, with AI startups in the UAE raising over US\$125 million in funding in 2025 alone.

AI Ecosystem

The UAE's AI ecosystem is anchored by G42 (G42, 2026), an AI and cloud-computing group driving large-scale deployment across healthcare, energy, and government sectors. Its subsidiaries include Core42, focused on cloud infrastructure and sovereign AI systems, and Presight AI, specializing in big-data analytics and decision intelligence. Together these entities underpin national AI infrastructure projects including LLMs and hyperscale data centers (Semafor, 2025). In NIS terms, the UAE exhibits an unusually dense and tightly coordinated actor network — a national AI office setting framework conditions, a sovereign AI firm (G42) mobilising financing and deployment, a dedicated research university (MBZUAI), and a research council (ATRC) generating outputs — which closes the loop from financing to innovation output and helps account for the comparatively high ecosystem maturity reflected in indigenous models such as Falcon.

Mohamed bin Zayed University of Artificial Intelligence (MBZUAI, 2025) is widely described as the world's first graduate-level university dedicated entirely to AI, offering programs in machine learning, computer vision, and natural-language processing and collaborating with industry and government on applied research. The Dubai AI Campus (Dubai AI Campus, 2026; Government of Dubai, 2026) provides infrastructure, incubation support, and regulatory facilitation for AI startups. The Abu Dhabi Advanced Technology Research Council (ATRC, 2026) oversees the Technology Innovation Institute, which develops foundational AI models and robotics technologies (ATRC, 2025).

Flagship Projects

Falcon Large Language Models. The Falcon family, developed by the Technology Innovation Institute, includes Falcon 40B, Falcon 2, and Falcon H1 Arabic, and has shown competitive performance against leading open-source models while remaining freely available for research and commercial use (Technology Innovation Institute, 2026).

National AI Governance Frameworks. The UAE National Strategy for AI 2031 is supported by the AI Council, AI Ethics Principles, and national certification mechanisms emphasizing accountability and alignment with international standards (UAE Government Portal, 2026).

Nationwide Access to ChatGPT. Under the Stargate UAE initiative, the UAE has been reported as the first country to enable nationwide access to ChatGPT through a partnership with OpenAI, with the stated aim of mainstreaming AI literacy across education, government, and daily life (OpenAI, 2025).

AI in Policing, Border Control, and Healthcare. AI is extensively deployed across UAE law enforcement, smart borders, and healthcare, supporting surveillance, biometric identification, diagnostics, and resource management (Oxford Institute of Technology and Justice, 2025).

Kingdom of Saudi Arabia: Sovereign-Scale AI under Vision 2030

AI Investment Levels

Saudi Arabia has announced a target of SAR 75 billion (approximately US\$20 billion) in AI investment by 2030 — a stated ambition rather than capital already deployed — positioning AI as a central pillar of economic diversification under Vision 2030 (Saudi Vision 2030, 2026). Against this target, AI-related firms had reportedly secured approximately US\$9.1 billion in disclosed funding by 2025, and government spending on emerging technologies was reported to have risen by more than 56% in 2024. Investments span AI infrastructure, cloud computing, advanced data centers, generative AI, smart-city technologies, and sectoral applications in healthcare, energy, finance, and public services.

AI Ecosystem

The Saudi Data and Artificial Intelligence Authority (SDAIA), established in 2019, serves as the primary national entity responsible for coordinating AI policy, governance, data regulation, and implementation across government sectors (SDAIA, 2024). The ecosystem is further strengthened by sovereign-backed initiatives led by the Public Investment Fund (PIF), including investments in advanced computing infrastructure, cloud technologies, and AI innovation companies such as HUMAIN (Saudi Vision 2030, 2026). Human-capital development has been prioritized through national training initiatives, research partnerships, and university programs.

HUMAIN, the sovereign AI company launched by PIF in 2025, leads Saudi Arabia's advanced AI infrastructure and model-development activities. It focuses on hyperscale AI data centers, Arabic large language models (including ALLAM), and sovereign AI systems tailored to regional and government needs, in partnership with NVIDIA, AMD, Qualcomm, and AWS. Its projects support healthcare, energy, finance, manufacturing, and smart cities, and align with Vision 2030.

Flagship Projects

Sovereign AI Infrastructure and Data Centers. Saudi Arabia is investing heavily in hyperscale AI data centers and sovereign computing infrastructure, including GPU-powered AI factories, cloud infrastructure, edge computing, and high-performance computing facilities developed with international partners (Semanticbrains, 2025).

National Data Lake. This large-scale platform integrates data from more than 430 government systems to support data-driven decision-making and digital transformation, enabling advanced analytics and secure data sharing across government entities (National Data Lake, 2026).

NEOM Smart City. NEOM is a flagship megaproject integrating AI, robotics, IoT, and predictive analytics into urban infrastructure and governance. Developments such as The Line, Oxagon, and Trojena are intended to operate using AI-enabled systems for transportation, sustainability, security, and public services, and are positioned as a prospective global testbed for next-generation urban AI applications (Semanticbrains, 2025).

Tawakkalna Platform. Originally a pandemic-response application, Tawakkalna has evolved under SDAIA into a national AI-enabled super-application providing more than 100 digital government services, including identity verification, healthcare access, and mobility services (Semanticbrains, 2025).

Estishraf AI Platform. An AI-driven predictive analytics and decision-support platform developed under SDAIA, Estishraf uses machine learning and big-data analytics to model future scenarios, assess policy outcomes, and support national planning across ministries (Semanticbrains, 2025).

Qatar: AI Infrastructure and Smart-State Strategy

AI Investment Levels

Qatar's AI trajectory emphasizes infrastructure and smart-state deployment. The country has announced commitments exceeding US\$20 billion to AI infrastructure through a joint venture between Brookfield and the Qatar Investment Authority (QAI), alongside a US\$2.4 billion National AI Initiative; these represent announced partnership and programme values rather than confirmed disbursements (Qatar Investment Authority, 2025). Qatar is also reported to be building a startup ecosystem valued at approximately US\$5 billion, supported by government initiatives, venture capital firms, incubators, and innovation hubs (Qatar Magazine, 2025).

AI Ecosystem

Qatar's AI ecosystem is rapidly expanding through government investment, research institutions, accelerators, and partnerships with global technology firms. The Qatar Science & Technology Park (QSTP, 2026) supports startups through incubation, research facilities, funding, and industry connections. The Qatar FinTech Hub (2026) develops AI-driven financial-technology startups through mentorship, accelerator programs, and investor access. The Qatar Research, Development, and Innovation Council (QRDI, 2026) drives national research strategy, innovation funding, and collaboration between government, academia, and industry. The ecosystem benefits from strong digital infrastructure and ongoing investment in cloud computing and cybersecurity.

Flagship Projects

Lusail Smart City. Lusail integrates AI, IoT systems, and digital infrastructure to enhance urban living, transport, energy management, and public safety (Lusail Real Estate Development Company, 2026).

National Digital Agenda 2030. This strategic framework guides Qatar's digital transformation through AI, cloud computing, and smart government services, supporting Qatar National Vision 2030 (U.S. Department of Commerce, 2024).

Integrated Compute Centers. Advanced digital-infrastructure facilities support high-performance computing and AI workloads, combining cloud services, AI processing, and secure data storage to enable government and enterprise digital transformation (DC Pulse, 2024).

Bahrain: Regulation-First AI and Fintech Innovation

AI Investment Levels

Compared to other GCC countries, Bahrain has invested less in AI in absolute terms, but its investment is rising and is paired with a distinctive regulation-first approach emphasizing ethical governance and fintech-driven innovation. Through Tamkeen (the Labour Fund), Bahrain committed approximately US\$100 million to AI growth in 2026 — a comparatively modest but explicitly earmarked allocation — leveraging its regulatory sandbox and AWS cloud presence to attract experimentation and SME participation (World Economic Forum, 2025). Tamkeen is a semi-government organization supporting private-sector growth, entrepreneurship, and workforce development through funding, training, wage support, and business-development initiatives. Bahraini investors and funds have also participated in large international AI deals, indicating exposure to the sector beyond domestic spending alone.

AI Ecosystem

National AI Policy (2025). Bahrain launched its National AI Policy in 2025 to establish a comprehensive framework for the responsible and ethical use of AI across government and industry, incorporating GCC ethical AI guidelines (Information & eGovernment Authority, 2025a).

Fintech and Regulatory Sandbox. The Central Bank of Bahrain's Regulatory Sandbox enables startups and fintech firms to test innovative banking, blockchain, and digital-payment solutions in a controlled regulatory environment (Central Bank of Bahrain, 2021), reinforcing Bahrain's position as a regional fintech hub.

UNESCO AI Readiness Assessment. Bahrain participated in UNESCO's AI Readiness Assessment Methodology, with results highlighting progress and identifying further opportunities in governance, research, and workforce development (Information & eGovernment Authority, 2025b).

Flagship Projects

AI-Ready Sovereign HyperCloud. Through a partnership between Beyon Solutions, Oracle, and the Information & eGovernment Authority, Bahrain developed its first AI-ready Sovereign HyperCloud to provide secure, locally hosted AI and cloud services (Beyon, 2025).

AI-Based Plant Disease Crisis Management System. Bahrain Polytechnic and the Ministry of Municipalities Affairs & Agriculture completed an AI-powered system integrating machine learning and robotics for agricultural monitoring and automated pesticide spraying (Cloud Innovation Center Bahrain Polytechnic, 2023).

Bahrain AI Academy. Launched through a collaboration between Tamkeen, Bahrain Polytechnic, and Microsoft, the AI Academy trains students and educators in AI technologies (Bahrain Government, 2025).

Comparative Analysis

Drawing the six country analyses together, Table 3 summarizes the comparative position of each GCC state across the five dimensions of the NIS analytical framework. The table operationalizes RQ1–RQ2 by showing both the magnitude of investment and the institutional character of each ecosystem.

Table 3. Comparative summary of AI ecosystems across the six GCC countries

Dimension	Kuwait	Oman	UAE	Saudi Arabia	Qatar	Bahrain
Announced AI investment (recent)	~US\$9B (KIA, 2019–24) + US\$30B global JV anchor	~US\$39M (2025 budget) + US\$200M+ infra	~US\$148B (cumulative since 2024)	~US\$20B target by 2030; US\$9.1B firm funding	US\$20B+ infra JV; US\$2.4B National AI Initiative	~US\$100M (2026 Tamkeen commitment)
Primary financing source	Sovereign wealth (KIA)	Government budget + OIA	State + G42 + sovereign + private	PIF + state budget	QIA + state	Tamkeen + sovereign-backed funds
Core national AI authority	CAIT, CITRA	MTCIT, National AI Program	AI Office, AI Council, ATRC	SDAIA	QRDI, QSTP	iGA, National AI Policy
Flagship sovereign LLM / AI firm	None to date	Mu'een/Maeen	Falcon (TII); G42	ALLAM; HUMAIN	Arabic AI initiatives (QRDI/QSTP)	None to date
Strategic posture	External / sovereign-investor	Incremental / capacity-building	Frontier / global hub	Frontier / sovereign-scale	Infrastructure / smart-state	Regulation-first / fintech
Most exposed	Talent; limited	Scale; private-sector depth	Energy, geopolitics,	Commercialization; talent localization	Talent; market size	Scale; private

Dimension	Kuwait	Oman	UAE	Saudi Arabia	Qatar	Bahrain
risk	domestic ecosystem		vendor concentration			capital depth

Three country clusters emerge. The frontier-leadership cluster (UAE and Saudi Arabia) deploys sovereign capital at hyperscale, builds indigenous LLM capabilities (Falcon, ALLAM), and seeks global hub status. The infrastructure-and-governance cluster (Qatar, Bahrain, Oman) emphasizes smart-state deployment, regulatory frameworks, and incremental capacity building rather than frontier model development. Kuwait occupies a distinctive position: it deploys substantial sovereign capital but predominantly externally, while domestic AI activity remains concentrated in public-sector digitization.

Across all six GCC countries, AI development follows a predominantly state-led paradigm; however, the institutional configuration of each ecosystem varies in ways that the National Innovation Systems (NIS) framework helps to illuminate. In the first cluster—the frontier cluster—a dense network of actors, including national AI authorities, sovereign AI firms, research universities, and global technology partners, interacts within a highly integrated policy architecture. In the second cluster—the infrastructure-and-governance cluster—the ecosystem is institutionally thinner, with greater emphasis placed on enabling framework conditions such as regulation, regulatory sandboxes, and AI ethics frameworks, rather than on the generation of innovation outputs. In the third cluster, represented by Kuwait, the relationship between sovereign investment capacity and the development of a robust domestic AI ecosystem remains comparatively underdeveloped. Read across the three clusters, the NIS lens suggests that differences in ecosystem maturity and innovation output track not the volume of financing but the density and coordination of actors: where financing institutions are linked to national authorities, sovereign firms, and research universities within an integrated architecture (the frontier cluster), capital more readily converts into indigenous outputs and commercialization capacity; where those linkages are thinner (the infrastructure-and-governance cluster) or largely externally oriented (Kuwait), comparable or even substantial financing yields fewer domestic innovation outputs and weaker commercialization.

Drivers of AI Adoption in the GCC

Government Vision and National AI Strategies

Governments across the GCC have positioned AI as a central pillar of economic-diversification and digital-transformation strategies. National initiatives such as Saudi Vision 2030, the UAE National AI Strategy 2031, and Qatar's National Digital Agenda emphasize AI adoption in public services, industry, healthcare, and education. These strategies provide long-term policy direction, regulatory support, and public investment that accelerate ecosystem development.

Economic Diversification Beyond Oil

GCC countries are investing in AI to reduce dependence on hydrocarbon revenues and build knowledge-based economies. AI technologies are being integrated into finance, logistics, manufacturing, tourism, and energy to improve productivity and global competitiveness. This agenda has encouraged governments and sovereign wealth funds to allocate significant capital toward AI startups, digital infrastructure, and innovation hubs.

Smart Cities and Digital Infrastructure

Large-scale smart-city projects — NEOM, Lusail City, and Masdar City — drive demand for AI-enabled technologies in urban planning, mobility, security, and sustainability. GCC governments are also investing

heavily in cloud computing, data centers, 5G networks, and sovereign AI infrastructure. These projects create environments in which AI applications can be deployed at scale across public and private sectors.

Sovereign Wealth Fund Investments

Sovereign wealth funds in the GCC are among the world's largest investors in advanced technologies. Saudi Arabia's PIF, Abu Dhabi's Mubadala, the Kuwait Investment Authority, and the Qatar Investment Authority actively invest in global AI firms, research partnerships, and infrastructure. Their financial capacity enables GCC countries to acquire talent expertise, attract international firms, and build domestic ecosystems at a pace that few other emerging regions can match.

Young Digital Population and Talent Development

The GCC has a young, highly connected population with strong digital-adoption rates and growing demand for AI-related skills. Governments and universities are introducing AI-focused education programs, coding academies, and digital-upskilling initiatives. Partnerships with global technology companies further support talent development.

Regional Competition and Global Positioning

GCC countries view AI as a strategic tool for regional leadership in technology. Competition to attract multinational technology firms, establish AI research centers, and host international innovation events accelerates policy reforms, infrastructure investment, and cross-border collaborations, and knowledge transfer.

Research Universities and AI Talent Development

The GCC has expanded its higher-education and research ecosystem through institutions such as King Abdullah University of Science and Technology (KAUST), Hamad Bin Khalifa University, Abdullah Al-Salem University, and MBZUAI. These universities offer specialized AI programs and research centers in machine learning, robotics, and data science, and collaborate with international technology firms and academic institutions. The expansion of AI-focused academic programs is gradually building a sustainable pipeline of researchers, engineers, and technology professionals.

Challenges and Risks of AI in the GCC countries

The breadth of activity documented above should not obscure the paper's central claim: the durability of the state-led model depends on a common set of structural conditions rather than on the scale of investment alone. Despite substantial progress, GCC countries face structural, economic, technological, and governance-related challenges that may constrain the long-term impact and sustainability of AI initiatives. These risks are largely common across the region, although their severity differs by national capacity, market size, and institutional maturity.

Talent Shortages and Human-Capital Constraints

A critical risk affecting AI development in the GCC is the persistent shortage of highly skilled AI professionals, particularly in machine-learning research, LLM development, explainable AI, and AI ethics. Although the UAE and Saudi Arabia have invested heavily in AI education, most GCC states remain dependent on expatriate expertise. This dependence exposes national strategies to risks related to talent mobility, wage inflation, and global competition for scarce AI skills, and creates structural tension with workforce-localization policies.

Data Availability, Quality, and Sovereignty

AI systems require large volumes of high-quality, representative data. Across the GCC, challenges include fragmented data silos, limited historical datasets, and inconsistent data-governance standards across public institutions. Heightened concerns about data sovereignty have produced restrictive data-localization policies.

Weak data quality can reduce model accuracy, introduce bias, and undermine trust in AI-enabled decision-making, while excessively restrictive regulation may slow innovation and increase dependence on foreign models trained on non-local data.

Governance, Ethics, and Regulation

Most GCC countries have published AI strategies and ethical principles, but regulatory frameworks remain at varying stages of maturity, particularly regarding algorithmic transparency, accountability, and explainability. The rapid deployment of AI in public services raises concerns about automated decision-making, fairness, and contestability. Insufficient governance mechanisms may erode public trust, increase legal liability for government entities, and limit AI adoption in sensitive sectors such as justice, healthcare, and public safety. Regulatory divergence across GCC states also complicates cross-border AI collaboration.

Economic Sustainability and Commercialization

AI development in the GCC has been predominantly state-funded and infrastructure-heavy, with limited private-sector-led commercialization relative to investment scale. AI initiatives are often concentrated in government services rather than export-oriented or revenue-generating applications. This model risks turning AI into a long-term fiscal burden if productivity gains and private-sector spillovers fail to materialize. Weak commercialization may result in underdeveloped startup ecosystems, limited SME participation, and low returns on sovereign investments, particularly in smaller GCC economies.

Energy and Environmental Constraints

AI infrastructure — particularly hyperscale data centers and high-performance computing — requires significant energy and water for operation and cooling. While GCC countries benefit from abundant energy resources, the rapid expansion of AI infrastructure is increasing pressure on environmental systems and existing infrastructure. Rising demand may challenge national sustainability goals and global net-zero commitments while increasing operational costs. As international focus shifts toward environmentally responsible "green AI," GCC nations may face growing pressure to align with these emerging standards.

Limited Private-Sector Participation

Despite significant public investment, limited private-sector participation challenges the long-term sustainability of GCC AI ecosystems. Continued reliance on state-led financing, sovereign wealth funds, and government initiatives creates potential vulnerabilities related to funding concentration and market dependency. Insufficient participation from startups, venture capital firms, and private technology companies may constrain innovation, commercialization, and the development of competitive AI industries.

Limited Domestic Data-Center Capacity

Despite significant investment in hyperscale facilities, local capacity remains insufficient to fully meet the growing future demand for cloud computing, model training, and data-intensive digital services. This gap sustains continued reliance on foreign data centers, increasing exposure to latency constraints, regulatory dependencies, and cross-border data governance risks. Expanding domestic capacity is therefore critical to strengthening digital sovereignty and enabling AI-driven economic transformation.

Geopolitical and Technology Dependence

Advanced AI hardware, cloud platforms, and foundational models used across the GCC are largely sourced from a small number of global technology providers (Microsoft, Google, AWS, NVIDIA). This concentration creates vulnerabilities related to geopolitical tensions, export controls, vendor lock-in, and potential supply-chain disruptions. The increasing strategic importance of AI infrastructure also exposes it to a wider range of physical, cyber, and hybrid threats than traditional digital systems faced. Sustained dependence on external technology providers may undermine strategic autonomy, slow national AI initiatives during periods of geopolitical stress, and constrain the ability of GCC countries to develop and scale sovereign AI capabilities independently.

Internet Connectivity and AI Resilience

As GCC countries accelerate AI investments, the resilience of international internet connectivity has emerged as a strategic vulnerability, given their proximity to the Strait of Hormuz and the Bab el-Mandeb Strait. The rapid expansion of AI ecosystems in the UAE and Saudi Arabia — sovereign AI initiatives, large-scale cloud infrastructure, smart-city programs, AI-driven financial and industrial platforms — relies heavily on uninterrupted international data flows. Industry estimates indicate that the great majority of global internet traffic transits submarine cable systems, many of which traverse these geopolitical chokepoints.

These maritime corridors function as critical "digital arteries" linking Europe, Asia, Africa, and the GCC. The Red Sea corridor alone is estimated to carry approximately 17–20% of global internet traffic through cable systems including SEA-ME-WE 4–6, AAE-1, IMEWE, EIG, SEACOM, and Tata TGN, in addition to regional networks such as FALCON and GCX. The Strait of Hormuz similarly underpins Gulf digital connectivity through dense cable networks linking Kuwait, Bahrain, Qatar, the UAE, Iraq, and Oman.

Geopolitical instability in or near these maritime corridors raises the risk of disruption to this infrastructure. Security tensions may restrict access for cable-maintenance vessels and increase the likelihood of accidental damage or collateral impacts from military activity. In addition to physical threats, submarine cable systems face cybersecurity risks including Border Gateway Protocol (BGP) hijacking and malicious traffic rerouting. Potential disruptions range from latency increases and temporary service degradation to broader regional outages affecting cloud computing, AI applications, and critical digital platforms. Strengthening network redundancy, diversifying cable routes, and enhancing regional digital resilience constitute essential prerequisites for sustaining long-term AI development in the Gulf.

Conclusion, implications and Future Research

Research contributions

This viewpoint paper has argued that the GCC represents a distinctive model of AI development characterized by centralized governance, sovereign financing, and a strong application-oriented focus. The evidence reviewed here suggests that the long-term sustainability of this model depends less on capital availability than on the ability of GCC states to cultivate local talent, strengthen AI governance frameworks, harmonize regional regulations, ensure environmental and infrastructural sustainability, and foster genuine private-sector innovation. The comparative analysis advanced a typology of three country clusters — frontier leadership, infrastructure-and-governance, and externally-oriented sovereign investment — each with distinctive strengths and vulnerabilities. Across the region, the GCC AI agenda faces interconnected risks spanning human capital, data governance, ethics, environmental sustainability, commercialization, and geopolitical exposure of digital infrastructure. These risks are not abstract: they shape whether large announced investments translate into durable productivity gains and institutional resilience.

Addressing these challenges through coordinated policy design, regulatory alignment, talent development, and deeper private-sector engagement will determine whether AI evolves from a technological upgrade into a sustained driver of long-term economic transformation in the region.

Policy Implications

The comparative analysis points to differentiated policy priorities for each country cluster:

- For Frontier-leadership cluster (UAE, Saudi Arabia) priorities include accelerating talent-localization programs, building genuine commercialization pipelines beyond government applications, diversifying foreign-technology dependence, and addressing energy and water sustainability of hyperscale infrastructure.

- For the Infrastructure-and-governance cluster (Qatar, Bahrain, Oman) priorities include deepening private-sector and venture capital participation, harmonizing regulatory frameworks with regional partners, and using regulatory-sandbox advantages to attract scalable AI firms.
- For externally-oriented sovereign investment cluster (Kuwait) priorities include translating sovereign investment capacity into domestic ecosystem development, establishing a dedicated national AI authority, and building research university capacity in AI similar to that of Saudi Arabia, Qatar, and the UAE.

Three regional-level priorities cut across all six countries: (i) coordinated investment in submarine-cable redundancy and digital-infrastructure resilience, (ii) harmonization of AI ethics and data-governance frameworks to enable cross-border collaboration, and (iii) shared talent-development initiatives that pool demand across the region.

Future research directions

Future research should extend the analysis advanced here in three directions. First, empirical fieldwork — including interviews with policymakers, surveys of citizens' AI trust, and case studies of specific flagship projects — would complement the documentary basis of the present viewpoint. Second, longitudinal measurement of productivity impacts and private-sector spillovers from sovereign AI investment would test the economic-sustainability claims of the GCC model. Third, comparative work linking the GCC to other state-led AI ecosystems (such as China and Singapore) would clarify which features of the GCC model are regionally specific and which are characteristic of state-led AI development more broadly.

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