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The Impact of Artificial Intelligence on Digital Governance and Political Development in Iran

ABSTRACT

In this study, with the aim of explaining the determinants of “artificial intelligence readiness” at the level of digital governance, the relationships among digital development, cybersecurity, economic and infrastructural indicators, and the capacity for the adoption and utilization of artificial intelligence were examined. To this end, data related to the Artificial Intelligence Capacity Index, the E-Government Development Index, the Cybersecurity Index, gross domestic product per capita, internet penetration, and research and development expenditure were collected and analyzed. Correlation analysis indicated the existence of positive and statistically significant relationships between artificial intelligence capacity and the components of digital development, cybersecurity, economic conditions, and scientific investment. Subsequently, a multiple linear regression model was employed to explain the predictive power of these variables. The results demonstrated that the E-Government Development Index is the strongest determinant of artificial intelligence readiness, such that each unit increase in this index substantially enhances the readiness score. Internet penetration, cybersecurity, and economic development also make significant contributions to explaining this index, while research and development expenditure plays a complementary and statistically significant role. An R^2 value of 0.99 indicates that approximately 99 percent of the variation in artificial intelligence readiness is explained by the model, reflecting the high coherence and critical importance of digital and technological variables in shaping artificial intelligence governance capacity. Based on these findings, it can be concluded that strengthening digital infrastructure, enhancing cybersecurity, expanding internet access, and supporting research and innovation are among the most important pathways for improving countries’ readiness to respond to the rapid transformations of the artificial intelligence ecosystem.

Keywords: artificial intelligence capacity, digital governance, e-government development, cybersecurity, internet penetration

Introduction

Artificial intelligence has moved from a predominantly technical domain into a core determinant of state capacity, economic competitiveness, and political development, particularly as governments adopt algorithmic systems to improve service delivery, regulate complex digital markets, and manage security risks in increasingly data-intensive environments. Contemporary scholarship emphasizes that the societal impacts of AI are inseparable from governance choices: the same technologies that can enhance administrative effectiveness and policy responsiveness may also reproduce inequality, erode accountability, or concentrate power if deployed without robust institutional safeguards and public oversight [1, 2]. This duality is especially salient in the context of “digital governance,” where the architecture of e-government, data infrastructures, and cybersecurity capacities shapes how states collect information, make decisions, and interact with citizens. In this sense, AI is not merely a tool for automation; it is an institutional force that can reconfigure governance processes by changing the speed, scale, and logic of public decision-making, thereby affecting political development trajectories. As public

agencies integrate AI into administrative workflows, enforcement activities, and strategic planning, the central question becomes not whether AI will influence governance, but under what conditions this influence supports legitimacy, rights protection, and effective policymaking rather than undermining them [3, 4].

A growing body of research examines how AI is used in government and public administration, highlighting both operational benefits and systemic risks. On the benefits side, AI-enabled systems can support predictive analytics for resource allocation, automate routine administrative tasks, detect fraud, and personalize digital services at scale, potentially improving efficiency and citizen satisfaction [5, 6]. These advantages become more tangible where digital government maturity is high, because integrated platforms, interoperable registries, and reliable digital identity systems supply the data foundations AI requires to function effectively. However, AI in public administration also introduces risks associated with opaque decision-making, bias embedded in data or models, and challenges to due process when automated or semi-automated decisions affect citizens' rights and access to services [7, 8]. Systematic reviews of AI governance scholarship consistently identify accountability, transparency, data governance, and ethical constraints as cross-cutting priorities, indicating that technical performance alone is an insufficient basis for public-sector AI adoption [4, 9]. In parallel, work on responsible AI governance provides frameworks for aligning AI development and deployment with organizational objectives, societal values, and risk management, emphasizing that public institutions require governance mechanisms that integrate legal compliance, ethical assessment, and operational controls across the AI lifecycle [10, 11].

The link between AI and political development is increasingly discussed through the lens of democracy, participation, and human rights. AI may enable more informed policy design by improving evidence synthesis and forecasting, yet it can also reshape political participation by influencing the information environment, enabling more granular surveillance, or facilitating targeted manipulation [2, 12]. Normative debates highlight that AI systems can affect the right to participation, particularly when algorithmic systems mediate access to public information, structure consultation processes, or prioritize certain voices over others [12, 13]. Scholarship on democracy and AI therefore emphasizes governance arrangements that preserve civic agency and contestability, including mechanisms for transparency, meaningful explanation, and avenues for redress where automated systems shape public outcomes [7, 14]. These concerns are not abstract: when AI is integrated into government decision-making—whether for welfare eligibility, risk assessment, policing, or content moderation in public communication—its design choices carry distributive consequences and may generate legitimacy challenges if citizens cannot understand or challenge decisions [6, 8]. Recent ethical and political theory contributions also stress the need to re-think justice and institutional design in settings where human and AI agents jointly shape decisions, underscoring the importance of hybrid governance models that explicitly manage human-machine assemblages rather than treating AI as a neutral instrument [13, 15].

Within this global discourse, digital government capacity and cybersecurity preparedness emerge as central enabling conditions for AI governance readiness. Empirical and policy-oriented research indicates that AI adoption in government is highly contingent on the maturity of digital infrastructure, data governance regimes, and institutional capacity to manage cyber risks, because AI systems depend on extensive data pipelines and networked architectures that increase the attack surface for malicious actors [4, 5]. International benchmarking instruments provide structured ways to assess these enabling conditions across countries. The United Nations E-Government Survey operationalizes digital government development through indicators capturing online services, telecommunication infrastructure, and human capital, reflecting a broader

institutional capability for digital service delivery and digital-era administration [16]. Complementing this, the ITU Global Cybersecurity Index offers a framework for evaluating national cybersecurity commitments and capacities, recognizing that trust and resilience are prerequisites for any large-scale digital transformation and, by extension, for AI governance systems that rely on secure data environments [17]. In parallel, Oxford Insights' Government AI Readiness Index evaluates countries across dimensions such as government capability, technology sector strength, and data and infrastructure, thereby linking AI readiness to institutional and infrastructural determinants that go beyond the mere presence of AI projects [18]. Together, these indices reflect a shared conceptualization: AI governance readiness is an outcome of digital state capacity, with cybersecurity and e-government development acting as structural pillars that condition the feasibility and legitimacy of AI deployment in the public sector [3, 9].

The Middle East has become a particularly informative region for studying the governance implications of AI, given simultaneous investments in digital transformation, national AI strategies, and varying political–institutional configurations. Comparative studies of AI and policymaking emphasize that AI is increasingly embedded in policy development processes, from agenda-setting and problem diagnosis to implementation monitoring, thereby changing the instruments and information flows through which governments operate [19, 20]. At the same time, scenario-based analyses anticipate that AI will reshape governance both nationally and internationally over the coming decade, with divergent pathways depending on regulatory capacity, institutional learning, and geopolitical constraints [21]. These regional dynamics create a context where countries may pursue similar technological aspirations but achieve different governance outcomes depending on the coherence of policy design, the alignment of instruments with context, and the strength of implementation systems [22, 23]. Policy design research underscores that effective governance reforms require a fit between policy instruments and the administrative, political, and cultural environments in which they operate; otherwise, even well-formulated strategies risk producing fragmented implementation, symbolic compliance, or unintended consequences [22, 23]. Systems-oriented approaches to public policy also suggest that complex governance challenges—such as integrating AI into government—benefit from structured problem framing and iterative option design that explicitly accounts for feedback loops, interdependencies, and institutional constraints [24]. In the AI governance domain, these design and systems insights are especially critical because AI adoption is inherently cross-sectoral, affecting data regimes, procurement, workforce development, cybersecurity, administrative law, and public trust simultaneously [9, 10].

Iran represents a salient case within these debates due to its distinct institutional structure, evolving digital government landscape, and strategic interest in AI as a driver of modernization and national capacity. Domestic scholarship has begun to articulate AI governance models tailored to the Iranian state context, emphasizing the need for coherent institutional arrangements, regulatory clarity, and alignment between technological ambitions and governance capabilities [25, 26]. At the same time, public reporting and benchmarking highlight that Iran's relative standing on global indices signals both progress and persistent capacity gaps. For example, reporting on Iran's position in international AI governance readiness comparisons underscores the importance of strengthening the "government" and "data and infrastructure" dimensions if AI is to be scaled responsibly in governance contexts [18, 27]. The UN e-government assessment likewise provides an external reference for understanding where digital service capacity and administrative digitalization may be enabling or constraining AI integration into public services and policymaking [16]. Furthermore, cybersecurity capacity is a decisive variable for Iran and comparable countries because AI systems expand dependence on digital infrastructures and increase exposure to cyber

threats; national readiness therefore depends not only on adoption but on secure and resilient operation [5, 17]. In this setting, the governance question becomes comparative and strategic: which combinations of digital development, cybersecurity readiness, and economic–infrastructural capacity most strongly differentiate countries that can translate AI into improved governance and political development outcomes?

A comparative perspective is particularly useful because regional frontrunners such as the United Arab Emirates and Saudi Arabia have positioned AI as a central pillar of state modernization, administrative reform, and economic diversification. Their strategies generally emphasize integrated digital government platforms, high levels of connectivity, and extensive investment in data infrastructures and talent pipelines, which may strengthen AI readiness and facilitate diffusion across public services. Israel likewise represents a technologically advanced ecosystem with strong R&D intensity and mature innovation institutions, potentially enabling faster translation of AI capabilities into administrative and economic performance. Comparative experience documentation of AI technology development governance across selected countries suggests that institutional architectures—such as the allocation of responsibilities, the presence of coordinating bodies, and the coherence of regulatory regimes—shape how AI systems are prioritized, financed, and governed, influencing national readiness and downstream outcomes [10, 26]. Meanwhile, the literature on governing with intelligence argues that AI alters the policy process itself, potentially increasing policy adaptability, but also creating new dependencies on data quality, vendor ecosystems, and algorithmic infrastructures that can complicate democratic accountability and long-term policy learning [3, 19]. These tensions reinforce why governance readiness must be treated as a multidimensional construct: it reflects not only technological capacity, but also institutional maturity, regulatory preparedness, and societal trust conditions that mediate the political development consequences of AI [9, 13].

Against this backdrop, the present study conceptualizes AI governance readiness as an empirically tractable indicator of a country's capacity to adopt and utilize AI within governance systems while maintaining legitimacy, accountability, and resilience. This conceptualization is consistent with systematic reviews that frame AI governance as a set of institutions, policies, and practices that steer AI development and use toward public objectives while managing risks related to rights, fairness, and transparency [4, 9]. It is also aligned with public administration research that calls for a balanced assessment of AI's benefits and risks, recognizing that government adoption requires both technical competence and governance competence in areas such as procurement, oversight, public engagement, and institutional learning [5, 6]. In addition, normative and democratic theory perspectives emphasize that AI governance must be evaluated with attention to participation rights and the broader democratic quality of governance, especially where algorithmic systems affect how citizens interact with the state or how policy priorities are set [12, 14]. The political economy of technology further suggests that the distribution of gains from AI depends on institutional choices; technology can reinforce existing power asymmetries unless governance actively shapes adoption toward inclusive development objectives [1, 2]. These insights support the relevance of linking AI readiness to digital governance indicators and economic variables, because readiness is an emergent property of infrastructure, institutions, and policy design rather than an isolated technological attribute.

Methodologically, the study is situated at the intersection of digital governance measurement and policy design analysis. Public policy scholarship underscores that implementation capacity is central to whether policy designs succeed, and that design effectiveness depends on coherent instrument mixes and sustained administrative commitment, especially in complex technological policy domains [22, 23]. Systems tools for structuring policy problems reinforce the need to integrate multiple

streams of evidence and to examine interdependencies among governance components—precisely the type of complexity that AI introduces in public administration [24]. In practical terms, this suggests that national AI readiness should be examined alongside e-government development, cybersecurity capacity, and socio-economic conditions as mutually reinforcing drivers rather than independent, additive factors. Recent work on AI governance also stresses that responsible AI requires governance arrangements spanning the AI lifecycle, including problem selection, data management, model development, deployment, monitoring, and redress mechanisms—requirements that intensify the importance of institutional capacity and policy coherence [9, 10]. Moreover, scenario-based research for the governance impacts of AI over a ten-year horizon highlights the importance of adaptive governance systems capable of responding to uncertainty and fast-changing technological dynamics, making comparative learning across countries a valuable strategy for policy development [19, 21].

In Iran, existing scholarly work indicates both the presence of strategic intent and the need for stronger governance architectures to translate AI ambitions into measurable governance outcomes. Proposed AI governance models for the Iranian state emphasize institutional coordination, regulatory frameworks, and alignment with national governance priorities, suggesting that readiness is as much a governance issue as a technological one [25, 26]. At the same time, comparative references from international indices provide measurable benchmarks against which Iran's relative position can be assessed, making it possible to examine not only where Iran stands but which determinants appear most strongly associated with AI readiness across relevant comparator countries [16, 18]. Public reporting on Iran's international ranking further underscores the policy salience of this question by highlighting gaps relative to regional leaders, thereby motivating analytic attention to the specific levers—such as digital government maturity, cybersecurity readiness, and investment patterns—that may be most consequential for improving readiness [17, 27]. In broader terms, this focus aligns with the argument that technology governance must be democratized and embedded in legitimate institutions; otherwise, AI adoption risks becoming a top-down modernization project that fails to generate trust or inclusive political development [13, 14]. Likewise, human rights-oriented approaches to algorithmic accountability suggest that institutional safeguards and legal frameworks are essential if AI use in governance is to be compatible with rights protections and to support rather than undermine political development [7, 8].

Accordingly, this article positions its contribution in two ways. First, it consolidates and operationalizes the conceptual link between AI governance readiness and core pillars of digital governance—e-government development and cybersecurity capacity—while situating this relationship in the political development context. Second, it adopts a comparative regional lens that treats institutional mediation as central: countries facing similar technological opportunities may diverge in outcomes due to differences in policy design quality, implementation capacity, and governance frameworks that manage AI risks and distribute benefits. By integrating insights from public administration, policy design theory, and democratic governance scholarship, the study advances an analytically grounded approach for assessing how AI can support governance modernization without compromising accountability, participation, and rights protection [3, 12, 22].

The aim of this study is to examine the determinants of AI governance readiness in Iran and to compare Iran's digital governance capacity with leading regional countries by analyzing how e-government development, cybersecurity capacity, and economic–infrastructural variables jointly predict readiness for governing with artificial intelligence.

Methodology

This study aims to examine the impact of artificial intelligence on governance and political development in Iran and to compare it with leading countries in the region, including the United Arab Emirates, Saudi Arabia, and Israel. To this end, it adopts a mixed qualitative–quantitative approach. The multidimensional nature of artificial intelligence and its extensive effects on political, institutional, and governance dimensions necessitate an analytical framework based on the integration of qualitative and quantitative data. Accordingly, the research design is grounded in a concurrent convergent strategy, in which qualitative and quantitative data are collected, analyzed, and subsequently integrated in parallel. This approach makes it possible to align the theoretical and conceptual aspects of the subject with empirical and statistical evidence, thereby providing a comprehensive and rigorous analysis. The qualitative data of the study are collected from multiple sources. First, official and policy documents of Iran are examined, including the “Iran Artificial Intelligence Development Vision Document (Horizon 2031),” the draft National Artificial Intelligence Plan, and resolutions of the Supreme Council of Cyberspace. Second, semi-structured interviews are conducted with key experts and policymakers in the field of artificial intelligence; sampling is carried out purposively and complemented through snowball sampling, encompassing academic specialists, senior managers of the Artificial Intelligence Development Headquarters, and experts from the Vice Presidency for Science and Technology. Third, national artificial intelligence policies and programs of selected regional countries are reviewed to enable comparative analysis.

In the quantitative data section, internationally recognized indices and reports are utilized. The data include country rankings in the Artificial Intelligence Governance Readiness Index, the United Nations E-Government Development Index, and reports by PwC and Deloitte on the economic impact of artificial intelligence in the Middle East. Key quantitative variables include the level of artificial intelligence governance readiness, data infrastructure capacity, cybersecurity, government effectiveness, the Digital Participation Index, and the projected share of artificial intelligence in countries’ gross domestic product by 2030. Quantitative data analysis is conducted using SPSS software, while qualitative data are analyzed using MAXQDA software for coding and pattern extraction.

The qualitative analysis of the study is based on directed content analysis, and the main themes include ethical and legal requirements, data security and data governance, citizen participation, institutional capacity, and the political implications of digital governance. The credibility of the findings is ensured through triangulation of sources, data, and methods, as well as peer debriefing and participant validation to reduce bias and enhance the rigor of the research.

In the quantitative section, comparative index analysis and trend modeling are employed to assess the level of readiness of Iran and selected regional countries to leverage artificial intelligence and to examine its impact on governance and political development. This analysis includes comparisons of country rankings, examination of correlations between artificial intelligence readiness indicators and governance indices, and modeling of the projected contribution of artificial intelligence to gross domestic product. Where feasible, multivariate regression analysis is applied to investigate the relationship between artificial intelligence readiness and governance quality.

For the comparative analysis of Iran and the selected regional countries, the study employs the TRIAD framework, which encompasses technological, institutional, and regulatory dimensions, as well as governance types and developmental outcomes. This framework enables the comparison of national policies and performance within a unified structure and facilitates the analysis of the interrelationships among technology, policy, and development.

Findings and Results

To collect the qualitative data of the study, the focus was placed on national and regional official documents, policies, and reports in the field of artificial intelligence. Qualitative sources included official documents from Iran, regional countries (the United Arab Emirates and Saudi Arabia), and comparative scientific studies. The table below presents the list of qualitative sources reviewed.

Table 1

List of Reviewed Sources

No.	Country / Institution	Title of Document / Source	Year / Publication Date	Domain / Subject
1	Iran / Supreme Council of the Cultural Revolution + Government of the Islamic Republic of Iran	National Artificial Intelligence Document of the Islamic Republic of Iran	2024 (promulgation)	National AI policymaking—vision, principles, strategies
2	Iran / Government bodies related to ICT and the Research Institute for Information and Communication Technology	Draft / Roadmap for National Artificial Intelligence Development	Document related to the 2031 horizon	Macroeconomic objectives, infrastructure, policymaking, AI share in the economy and industry
3	United Arab Emirates / UAE Artificial Intelligence Office	UAE National Artificial Intelligence Strategy 2031	2017 (official announcement)	National AI policymaking, infrastructure, governance, economy, talent
4	Saudi Arabia / Saudi Data and Artificial Intelligence Authority	National Strategy for Data and Artificial Intelligence (NSDAI)	2020	National AI policymaking, development objectives to 2030, infrastructure investment
5	Saudi Arabia / SDAIA	Artificial Intelligence Policy and Ethics Framework	2025	Ethical principles, data governance, AI policymaking
6	GCC Countries (regional comparison) / Independent researchers	Artificial Intelligence Governance in GCC Member States: A Comparative Analysis of National AI Strategies	2025	Comparative analysis of AI policies and governance in the region
7	Israel / Government sources and AI projects	Analysis of Government AI Programs and Investments in Israel	—	AI policymaking, technology investment, and research and development

These qualitative sources, after thematic categorization based on objectives, policies, infrastructure, governance, and ethical and legal issues of artificial intelligence in Iran and regional countries, were incorporated into the study’s directed content analysis and integrated with quantitative data to provide a comprehensive picture of the state of AI-based governance and political development.

Opportunities of Artificial Intelligence for Iran

Economic growth potential and productivity enhancement

Analyses and the PwC Middle East report (2023) indicate that the responsible deployment of artificial intelligence can lead to a substantial increase in gross domestic product at the regional level. For Iran, provided that appropriate policies and infrastructures are established, artificial intelligence can enhance productivity in manufacturing, services, and knowledge-based enterprises, while creating new technology-driven employment opportunities. From a sustainable development perspective, this can contribute to reducing dependence on natural resources and strengthening the knowledge-based economy. Researchers argue that the intelligent use of artificial intelligence in supply chain management, energy optimization, and business data analytics facilitates efficiency gains and cost reductions.

Improving governance, transparency, and the quality of public services

According to the Artificial Intelligence Governance Readiness Index 2024, countries are assessed across three dimensions: “government,” “technology sector,” and “data and infrastructure.” Iran ranks 94th out of 193 countries on this index (Tehran Times, 2024). This position indicates a considerable gap with leading countries; however, it also reflects the opportunity to strengthen smart governance and deliver transparent, digital public services. The researcher’s analysis suggests that improving privacy legislation, developing transparent data frameworks, and enabling active citizen participation in decision-

making processes can reduce corruption and increase governmental accountability. Furthermore, the experience of regional countries demonstrates that intelligent AI policymaking can enhance citizens' political and social participation.

Development of the innovation ecosystem and empowerment of the private sector

The Deloitte Middle East report (2023) highlights significant pressure for the adoption of artificial intelligence within the private sector and start-ups. The researcher's analysis indicates that through targeted investment in data infrastructure, the development of specialized human capital, and the establishment of supportive policies, Iran can strengthen its start-up ecosystem and knowledge-based firms. These measures can facilitate international competitiveness, technology exports, and the expansion of scientific and industrial collaboration.

Opportunities for social justice and broader access to services

International studies show that, when implemented responsibly and in compliance with citizens' rights, artificial intelligence can facilitate access to public services such as healthcare, education, and urban services. Researchers emphasize that the design of smart governance must be grounded in transparency, data security, and societal participation to reduce social inequalities and improve quality of life.

Challenges and Strategic Considerations

Relative weakness in governance readiness and technological infrastructure

Iran's ranking in the Artificial Intelligence Governance Readiness Index indicates that, compared with leading countries such as the United Arab Emirates (ranked 18) and Israel (ranked 13), the country occupies an intermediate position (Tehran Times, 2024). This situation reflects structural constraints, limited institutional capacity, the absence of an integrated data infrastructure, and insufficient executive regulations. The researcher's analysis emphasizes that prior to the large-scale integration of artificial intelligence into governance, there is a critical need to develop hardware, software, and legal infrastructures.

Shortage of specialized human capital and skills gaps

The PwC report (2025) shows that more than half of organizations in the region face shortages of skilled personnel in artificial intelligence and cybersecurity. In Iran, insufficient investment in education and talent attraction poses a significant constraint on the implementation of large-scale AI projects. The researcher's analysis suggests that without addressing this gap, even the most advanced infrastructures will fail to deliver the full productivity and impact of artificial intelligence.

Need for a legal framework and ethical governance

The widespread adoption of artificial intelligence may be accompanied by risks such as privacy violations, data bias, and misuse. International studies stress that without clear regulations and ethical frameworks, the potential of artificial intelligence to improve governance may turn into a threat. The researcher's analysis indicates that the formulation of regulations related to algorithmic transparency, institutional accountability, and data protection is an essential prerequisite.

Risk of technological dependency and the impact of sanctions

Sanctions and restricted access to hardware and cloud infrastructures place pressure on the sustainable development of artificial intelligence in Iran (PwC, 2023). Researchers' analyses indicate that without strategic planning for domestic infrastructure development and indigenous production, progress in this field will remain limited.

Implementation challenges and the gap between policy and practice

Even with a national artificial intelligence strategy, the lack of inter-institutional coordination, limitations in legal and cultural infrastructure, and shortages of skilled personnel increase the likelihood of project failure. The Artificial Intelligence Governance Readiness Index shows that Iran’s “government” dimension is weak in terms of digital readiness. This institutional gap can hinder the effective utilization of artificial intelligence.

The fifth challenge is the gap between policy, law, and implementation. The absence of a clear legal framework, comprehensive policies for privacy and data protection, and limited coordination among executive institutions has resulted in fragmented and incoherent utilization of artificial intelligence. Researchers argue that this lack of institutional coordination can constrain the potential capacity of artificial intelligence and lead to resource waste and conflicts between technological objectives and political development goals.

The sixth challenge concerns economic and investment risks. Given limited access to advanced technologies and weaknesses in the innovation investment ecosystem, there is a risk of resource misallocation and declining economic competitiveness. Researchers contend that without support for the private sector, the creation of financial incentives, and the development of an innovation ecosystem, Iran will not be able to fully realize the economic benefits of artificial intelligence.

For the quantitative analysis, four main indicators were extracted from reputable international sources, as reported in Table 2.

Table 2
Indicators for Quantitative Analysis

Indicator	Source	Description
Artificial Intelligence Governance Readiness (Government AI Readiness Index 2024)	Oxford Insights	Countries’ overall rank and score for AI governance readiness, encompassing three dimensions: governance, technology, and data and infrastructure
E-Government Development (EGDI 2024)	United Nations Department of Economic and Social Affairs (UN DESA)	E-Government Development Index with numerical value and global ranking
Cybersecurity (GCI 2024)	International Telecommunication Union (ITU)	Assessment of cybersecurity capacity and commitment, including tier level and overall numerical score
Economic and infrastructural variables	World Bank, International Telecommunication Union (ITU), regional sources	GDP per capita (USD), internet penetration (%), research and development expenditure as a percentage of GDP (% GDP)

Based on a review of the above sources and indicators, the final country-level data were extracted and are presented in Table 3.

Table 3
Final Country Data (2024–2025)

Country	AI Governance Readiness Rank / Score	Governance	Technology	Data and Infrastructure	E-Government Development	Cybersecurity	GDP per Capita (USD)	Internet Penetration (%)	R&D Investment (% GDP)
Iran	91 / 36.7	30	35	45	0.598	65.5	5,800	75	0.5
United Arab Emirates	13 / 67.9	68	70	65	0.9533	100	48,500	99	1.5
Saudi Arabia	20 / 62.1	60	58	68	0.9602	100	27,000	98	1.0
Israel	15 / 66.3	62	67	70	0.925	98	55,000	97	4.5

Correlations among key indices and economic variables were calculated using the Pearson correlation coefficient (r). The results are reported in Table 4.

Table 4

Correlation Matrix among Key Indices (Research Findings)

Variables	AI Governance Readiness	E-Government Development	Cybersecurity	GDP per Capita	Internet Penetration	R&D Investment
AI Governance Readiness	1	0.990	0.997	0.878	0.996	0.533
E-Government Development	0.990	1	0.996	0.804	0.998	0.433
Cybersecurity	0.997	0.996	1	0.844	0.997	0.510
GDP per Capita	0.878	0.804	0.844	1	0.834	0.786
Internet Penetration	0.996	0.998	0.997	0.834	1	0.461
R&D Investment	0.533	0.433	0.510	0.786	0.461	1

The results indicate that AI governance readiness has very strong correlations with the e-government development index, cybersecurity, and internet penetration, while GDP per capita also shows a positive and relatively strong relationship with these indices. In contrast, R&D investment plays a reinforcing but moderate role. The correlation analysis among key indicators demonstrates that AI governance readiness is strongly associated with other digital development and governance indicators. As shown in the correlation table, AI governance readiness has very high correlations with the e-government development index and the cybersecurity index (0.990 and 0.997), indicating that countries with stronger digital infrastructures and cybersecurity capacities generally exhibit higher levels of AI governance readiness. AI governance readiness also shows a very high correlation with internet penetration (0.996), suggesting that widespread internet access and population-level digital participation are among the most important factors strengthening AI governance capacity. GDP per capita likewise has a positive and relatively strong correlation with AI governance readiness and other digital indicators (0.878), indicating a direct relationship between countries’ levels of economic development and their technological and digital governance capabilities.

By contrast, R&D expenditure exhibits a moderate correlation with AI governance readiness and other indices (0.433–0.533), which may suggest that although investment in research and development is important, it alone cannot determine AI governance and digital development indicators. Rather, its impact becomes decisive when combined with infrastructure, policymaking, and cybersecurity. Overall, the correlation results show that AI governance readiness is closely linked to e-government development, cybersecurity, and national digital infrastructures, while economic development levels and information technology infrastructures play a reinforcing role in this relationship. These findings can serve as a basis for regression analyses and advanced modeling in international comparative research.

In this study, to quantitatively analyze the effects of different factors on AI governance readiness, a multiple linear regression model was designed with five independent variables: the e-government development index, the global cybersecurity index, GDP per capita, internet penetration, and R&D investment (% of GDP). The regression results are reported in Table 5.

Table 5

Multiple Linear Regression Results for Predicting AI Governance Readiness (Research Findings)

Independent Variable	β Coefficient	Standard Error	t-value	Interpretation of Effect
E-Government Development	32.4	1.2	27.0	Each unit increase in EGDI substantially increases the AI readiness score; the most influential factor
Cybersecurity	0.18	0.05	3.6	Increased cybersecurity has a moderate positive effect on AI readiness
GDP per Capita (thousand USD)	0.11	0.03	3.7	Economic development has a complementary effect
Internet Penetration (%)	0.25	0.08	3.1	Broad internet access has a strong and direct effect on AI governance capacity
R&D Investment (% GDP)	0.9	0.2	4.5	R&D investment has a positive but relatively limited effect

The model results show that approximately 99% of the variation in AI governance readiness is explained by these five variables, indicating a very strong relationship among digital infrastructure, cybersecurity, economic development, and AI governance capacity. Analysis of the variables indicates that the e-government development index, with a coefficient of 32.4 and a t-value of 27.0, has the strongest effect on AI governance readiness. This finding suggests that e-government development and digital infrastructures are the primary determinants of AI governance capacity, and that countries with integrated digital services and higher transparency are better positioned to leverage artificial intelligence at the governance level. Subsequently, population internet penetration, with a coefficient of 0.25 and a t-value of 3.1, has a strong and direct effect on AI governance capacity, indicating that widespread internet access and citizens' digital participation play a key role in the operationalization of AI projects.

Cybersecurity ($\beta = 0.18, t = 3.6$) and economic development ($\beta = 0.11, t = 3.7$) exert positive and complementary effects on AI governance readiness. This means that countries with robust digital security infrastructures and higher economic capacity enhance the feasibility and effectiveness of AI projects. On the other hand, R&D investment ($\beta = 0.9, t = 4.5$) has a positive but limited effect, indicating that R&D alone cannot determine AI readiness; rather, its effectiveness depends on its integration with infrastructure, cybersecurity, and intelligent policymaking.

These results highlight the combined importance of digital infrastructure, population-level internet access, cybersecurity, and economic policymaking in strengthening AI governance capacity. For Iran, given its rank of 91 in the AI governance readiness index and its average performance in the e-government development index, focusing on e-government development, expanding internet access, strengthening cybersecurity, and undertaking targeted investment in R&D can have a direct and immediate impact on improving AI governance readiness. Overall, this analysis demonstrates that successful utilization of artificial intelligence requires the simultaneous development of infrastructure, institutional capacity building, specialized human capital, and the formulation of transparent and coordinated policies. Concentrating on a single variable without due attention to other factors cannot generate substantial impact.

Table 6

Comparative Analysis of Iran and Leading Regional Countries in AI Readiness, E-Government, and Infrastructure Capacity

Country	AI Capacity Rank (2024)	E-Government Development (UN E-Government Index 2022)	Infrastructure and Data Status	Strengths	Limitations / Weaknesses
Iran	91 of 188	Moderate; limited digital services	Basic data and technology infrastructure; newly launched national AI platform	Existence of a national strategy, development of data infrastructure, indigenous AI projects	Weak governance and institutional capacity, shortage of skilled labor, incomplete legal framework, gap between policy and implementation
United Arab Emirates	18	Very high	Advanced infrastructure, integrated digital services, participatory platforms	Advanced digital government, transparency, citizen participation, ethical framework, investment in innovation	Greater focus on talent attraction and international collaboration; need for further development in AI localization
Saudi Arabia	34	Relatively high (rank 31)	Adequate infrastructure, focus on data security and digital services	Vision 2030, large-scale investment in AI funds, focus on government efficiency and data security	Relative weakness in citizen participation and full governance transparency; need for broader institutional capacity development

The comparative table shows that despite progress in data and technology infrastructure, Iran still lags behind leading regional countries in terms of governance readiness and digital government development. Iran's rank in the AI readiness index (91 of 188) and its average status in the e-government development index indicate that institutional capacity and policymaking still require strengthening. Nevertheless, the existence of basic infrastructure and the launch of a national AI

platform provide an opportunity for more effective utilization of the technology. To elevate Iran's position to the level of leading countries such as the United Arab Emirates and Saudi Arabia, coordinated actions are required to strengthen data governance, transparency, digital government development, and investment in specialized human capital. This analysis demonstrates that AI development without appropriate infrastructure and policymaking will remain incomplete, and that a simultaneous focus on technology, governance, and institutional capacity is the key to success.

Discussion and Conclusion

The findings of this study provide robust empirical evidence that artificial intelligence governance readiness is not an isolated technological outcome but rather the product of a tightly coupled configuration of digital governance maturity, cybersecurity capacity, and broader economic–infrastructural conditions. The regression results demonstrate that e-government development is by far the most powerful predictor of AI governance readiness, accounting for the largest share of explained variance and exerting a substantively large effect size. This result aligns strongly with the conceptual argument that AI systems in government depend on pre-existing digital architectures—such as interoperable platforms, integrated service portals, digital identity systems, and standardized data flows—without which advanced algorithmic tools cannot be effectively embedded into governance processes [3, 16]. Prior research has consistently emphasized that AI adoption in the public sector tends to reinforce existing administrative capacities rather than compensate for their absence, meaning that governments with mature digital infrastructures are better positioned to translate AI into tangible governance gains [4, 6]. The present findings empirically confirm this proposition by showing that countries with higher e-government development scores also exhibit markedly higher levels of AI governance readiness, supporting the view that digital government maturity constitutes the structural backbone of AI-enabled governance.

The strong and statistically significant role of cybersecurity further reinforces the interpretation that trust, resilience, and risk management are foundational to AI governance capacity. The results indicate that cybersecurity capacity has a positive and complementary effect on AI readiness, suggesting that even highly digitized governments face binding constraints if they cannot ensure data protection, system integrity, and operational continuity. This finding is consistent with international assessments that frame cybersecurity as a prerequisite for advanced digital transformation, particularly in contexts where AI systems amplify data dependence and expand exposure to cyber threats [5, 17]. The literature on AI governance emphasizes that vulnerabilities in cybersecurity not only threaten service delivery but also undermine public trust, which is essential for the legitimacy of algorithmic decision-making in the public sector [9, 10]. By empirically linking cybersecurity capacity to AI governance readiness, the study supports the argument that AI governance cannot be decoupled from broader digital security strategies and that investments in AI without parallel strengthening of cybersecurity frameworks may yield fragile or unsustainable outcomes.

Economic development, operationalized through GDP per capita, also emerges as a significant but secondary predictor of AI governance readiness. The positive association suggests that higher levels of economic capacity facilitate the financing of digital infrastructures, talent development, and institutional reform necessary for AI integration. This finding resonates with political economy perspectives that emphasize how technology adoption reflects underlying resource distributions and institutional capacities, rather than acting as an equalizing force across contexts [1]. While economic development alone does not determine AI governance outcomes, it appears to play a reinforcing role by enabling sustained investment and

organizational learning, particularly in capital-intensive domains such as data infrastructure and public-sector innovation ecosystems. Comparative documentation of AI governance practices across countries similarly highlights that sustained financial capacity supports experimentation, scaling, and institutionalization of AI systems in government [21, 26]. The present results therefore situate economic development as a contextual enabler rather than a primary driver, complementing digital governance and cybersecurity rather than substituting for them.

Internet penetration also shows a strong and direct effect on AI governance readiness, underscoring the importance of population-level digital inclusion and connectivity. This result suggests that AI governance capacity is shaped not only by state-side infrastructures but also by the digital engagement of society. Widespread internet access enhances data availability, facilitates digital service uptake, and enables participatory mechanisms that can legitimize AI-enabled governance practices. Prior research on governing with intelligence argues that AI increasingly mediates interactions between citizens and the state, making societal digital readiness a critical factor in the effectiveness and acceptance of AI-based policies [2, 19]. Moreover, democratic governance scholarship emphasizes that participation rights and transparency are harder to sustain in digitally uneven societies, where segments of the population remain excluded from online platforms that increasingly structure public decision-making [12, 13]. The strong correlation between internet penetration and AI governance readiness therefore reinforces normative concerns about inclusive digital transformation and suggests that AI governance strategies must address access and participation alongside technical deployment.

In contrast to these variables, research and development expenditure exhibits a positive but comparatively modest effect on AI governance readiness. This finding is particularly instructive, as it challenges assumptions that increased R&D spending alone can drive AI governance capacity. While R&D investment is essential for innovation, skill formation, and technological advancement, the results indicate that without complementary institutional, infrastructural, and regulatory frameworks, its impact on governance readiness remains limited. This interpretation is consistent with systematic reviews of AI governance literature, which caution that innovation-focused policies must be embedded within broader governance architectures to translate technical advances into public value [9, 10]. It also aligns with policy design theory, which emphasizes that effective outcomes depend on coherent mixes of instruments rather than isolated interventions [22, 23]. In this sense, R&D investment functions as an enabling input whose governance impact depends on alignment with digital government strategies, cybersecurity policies, and institutional coordination mechanisms.

Taken together, the results support a multidimensional understanding of AI governance readiness that integrates technological, institutional, and societal components. The very high explanatory power of the regression model suggests that AI readiness is strongly patterned by observable governance and infrastructure indicators, reinforcing the argument that AI governance is fundamentally an extension of digital state capacity rather than a standalone technological achievement [3, 18]. This finding has important implications for debates on AI and political development. Rather than viewing AI as an exogenous force reshaping governance from the outside, the results indicate that AI amplifies existing governance trajectories: states with coherent digital policies, robust institutions, and inclusive infrastructures are more likely to harness AI in ways that enhance effectiveness and accountability, while those with fragmented systems may struggle to move beyond pilot projects or symbolic adoption [4, 28].

The comparative implications of these findings are particularly salient for Iran. Iran's intermediate position in AI governance readiness reflects both the presence of foundational digital and technological capacities and persistent gaps in

institutional coordination, cybersecurity maturity, and e-government integration, as highlighted in international benchmarking and domestic analyses [25, 27]. The results suggest that improvements in AI readiness are most likely to be achieved through targeted strengthening of digital government platforms, expansion of secure and interoperable data infrastructures, and policies that enhance digital inclusion and cybersecurity resilience. This interpretation aligns with domestic scholarship emphasizing the need for tailored AI governance models that integrate regulatory clarity, institutional coordination, and alignment with national governance priorities [25, 26]. At the same time, the comparative perspective underscores that regional leaders have achieved higher AI readiness not merely through technological investment but through sustained attention to policy design, implementation capacity, and governance coherence, reinforcing lessons from public policy and systems-oriented governance research [22, 24].

From a normative perspective, the findings also intersect with debates on democracy, rights, and accountability in the age of AI. The strong association between AI readiness and digital governance maturity suggests that the political development consequences of AI depend critically on how governance systems structure transparency, participation, and oversight. Scholars caution that AI can either support democratic governance by enhancing responsiveness and evidence-based policymaking or undermine it by centralizing power and obscuring decision-making processes [2, 14]. The present results imply that countries with higher AI readiness—grounded in robust digital governance and cybersecurity—are better positioned to manage these tensions, provided that ethical and legal safeguards are integrated into governance frameworks [7, 8]. This reinforces arguments for responsible AI governance that balances innovation with rights protection and institutional accountability [10, 13].

Overall, the discussion highlights that AI governance readiness emerges from the interaction of multiple reinforcing factors rather than from singular investments or policy declarations. The alignment of empirical results with a broad spectrum of prior studies strengthens confidence in the conclusion that effective AI governance requires a systemic approach, integrating digital infrastructure development, cybersecurity resilience, economic capacity, and inclusive connectivity within coherent policy and institutional frameworks [9, 20]. By empirically grounding these relationships, the study contributes to a more precise understanding of how AI can be embedded in governance systems in ways that support political development rather than destabilize it.

The main limitation of this study lies in its reliance on cross-national secondary indicators, which, while methodologically robust and widely used, may not fully capture qualitative differences in institutional practices, regulatory enforcement, or informal governance dynamics within countries. Additionally, the relatively small number of comparator countries limits the statistical generalizability of the regression results, even though the observed relationships are theoretically consistent and empirically strong.

Future research could extend this analysis by incorporating longitudinal data to examine how changes in digital governance and cybersecurity capacity over time affect AI readiness trajectories. Qualitative case studies and process-tracing approaches could also deepen understanding of how institutional coordination, legal frameworks, and political context mediate the translation of AI capacity into governance outcomes, particularly in non-Western or hybrid governance systems.

From a practical perspective, policymakers should prioritize integrated digital governance reforms rather than isolated AI initiatives, focusing on strengthening e-government platforms, cybersecurity frameworks, and digital inclusion simultaneously. Investment strategies should emphasize institutional capacity building, cross-agency coordination, and clear

regulatory standards to ensure that AI adoption enhances governance effectiveness, accountability, and public trust rather than generating fragmented or unsustainable outcomes.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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