

DOI: https://doi.org/10.48009/3_iis_2026_104

The Institutional Foundations of Artificial Intelligence Readiness: A Cross-National Exploratory Analysis of 193 Countries

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Abstract

Purpose: This study identifies the structural factors most closely associated with national AI readiness and develops a comparative framework explaining how governance, institutional capacity, and foundational conditions shape countries' ability to adopt and regulate artificial intelligence.

Methodology: A cross-national dataset covering 193 countries was constructed using publicly available indicators capturing governance quality, institutional capacity, digital infrastructure, education level, healthcare access, and economic openness. Descriptive statistics, correlation analysis, and exploratory regression models were employed to identify the foundations of AI readiness.

Results/Findings: Countries with stronger governance, particularly regulatory quality and government effectiveness, and more capable institutions score substantially higher in AI readiness. Digital infrastructure contributes secondary effects, while education level, healthcare access, and economic openness show weak or inconsistent relationships. The results indicate that institutional strength outweighs purely technical or socio-economic factors in shaping AI preparedness.

Research implications/limitations: The analysis relies on cross-sectional indicators that are partially time-misaligned, limiting causal inference and masking subnational variation. Missing data in select social indicators constrained comparative depth. Future studies should employ longitudinal designs, causal identification, and subnational analyses to better capture dynamic institutional effects.

Practical implications: The findings offer conceptual and policy guidance to governments and development agencies seeking to lay the foundations for equitable and sustainable technological progress.

Originality/value: This study provides a comprehensive structural framework that examines the primacy of governance and institutional capacity over technical infrastructure in explaining global disparities in AI readiness.

Keywords: Artificial Intelligence, Governance Quality, Institutional Capacity, Digital Infrastructure; Comparative Governance, Innovation Policy

Introduction

Artificial Intelligence (AI) has rapidly become one of the defining technologies of the twenty-first century. Governments around the world are increasingly integrating AI into public services, regulatory systems, national security, industrial development, and economic planning (OECD, 2025a). Yet the capacity of countries to participate in this transformation is strikingly uneven. Most low- and middle-income

economies continue to face substantial barriers to AI adoption, despite international efforts to support digital development (World Bank, 2025). While the global policy discourse often emphasizes technical capacity, expanding internet access, building data centers, or training specialists, the deeper structural determinants of AI readiness remain less clearly understood.

Recent work in development studies, digital governance, and institutional economics has highlighted a growing consensus: the ability of states to adopt and regulate advanced technologies depends on more than connectivity and skills. It depends fundamentally on the quality of governance, the strength of public institutions, and the broader political-economic conditions that shape policy implementation (Lin and Yaakop, 2024; Thakur, 2025; Xavier, 2026). These insights call for a more systemic approach to understanding why some countries advance rapidly in AI, while others remain unable to harness its benefits.

This study responds to this gap by developing a comprehensive cross-national analysis of the structural factors associated with AI readiness. Using data from 193 countries, the study examines six dimensions: digital infrastructure, governance quality, education level, healthcare access, economic openness, and institutional capacity. These thematic areas reflect widely recognized prerequisites for technological development and allow for a comparative assessment of countries at different stages of development.

The aim of the research is twofold. First, it seeks to identify which structural factors are most strongly associated with national AI readiness. Second, it offers a conceptual model that explains how these factors interact to shape a country's ability to deploy and govern AI technologies. In doing so, the paper contributes to ongoing debates about digital leapfrogging, state capacity, and institutional development.

Background and Literature Review

Structural Determinants of AI Readiness

The rapid global diffusion of Artificial Intelligence (AI) has intensified scholarly interest in understanding why countries exhibit markedly different levels of preparedness for AI adoption. Existing research converges on the idea that national AI readiness is influenced not only by technological assets but also by broader development structures, institutional capacity, and governance arrangements (OECD, 2025; World Bank, 2025). Digital infrastructure provides the material foundation for AI adoption. Internet penetration, broadband availability, and network capacity are essential for data generation, connectivity, and digital participation, serving as key prerequisites for AI adoption across the public and private sectors (World Bank, 2025). The World Bank concludes that broadband plays a critical role in economic growth and should be central to national development and competitiveness strategies. Similarly, the ITU observes that the pandemic accelerated broadband adoption, digital services, government digitalization, and e-commerce growth (Qiang et al., 2009; ITU, 2022; ITU, 2023).

Digital Infrastructure

In development contexts, there is early optimism regarding digital leapfrogging, the idea that low-income countries could bypass earlier stages of development through digital technologies, which was reinforced by the rapid spread of the Internet and mobile connectivity (Heeks, 2018). Though leapfrogging succeeded in areas such as mobile banking in Kenya, telemedicine in India, and remote learning platforms in Asia, more recent research shows that infrastructure alone cannot catalyze transformative digital transitions without supportive institutions, and there are widely held false technology-deterministic expectations that ICT will have a specific development effect (Avgerou, 2010). Infrastructure improvements create potential, but realizing this potential depends on regulatory quality, administrative competence, and social trust. Evidence from Estonia, Finland, Singapore, and Latvia demonstrates that infrastructure is only one component of a broader digital governance system. These countries built high-capacity digital public infrastructure, eID

systems, interoperable registries, and secure data-exchange layers, but their success depended on long-standing traditions of bureaucratic professionalism and strong legal and regulatory systems. In Estonia's case, this institutional embedding is reflected in the state's decision to formalize digital identity infrastructure (e-Governance Academy, 2016). Conversely, several middle-income economies with substantial connectivity, Brazil and South Africa, exhibit lower-than-expected AI readiness due to political fragmentation, inconsistent regulation, or weak institutional coordination (Filgueiras & Junquillo, 2023; Diallo et al., 2025). Overall, the literature identifies that digital infrastructure is a necessary but insufficient determinant of AI readiness: its effectiveness depends on institutional and governance environments that enable strategic, safe, and scalable deployment.

Governance Quality

As a structural determinant of national technological capability, governance quality is repeatedly highlighted. The World Governance Indicators (WGI) consist of six composite indicators of broad dimensions of governance, including Political Stability and Absence of Violence/Terrorism, Government Effectiveness, and Regulatory Quality, and are widely used to evaluate state capacity to regulate innovation, coordinate public programs, manage uncertainty, and enforce rules (Kaufmann, et al., 2010). Strong governance systems facilitate the adoption of complex technologies by shaping investment incentives, ensuring regulatory predictability, and fostering trust among citizens and firms. AI-specific research highlights the critical role of governance in establishing ethical frameworks, data protection standards, algorithmic oversight, and public-sector readiness. These measures underscore UNESCO's emphasis on the essential role of capable regulatory systems in safe and accountable AI development, particularly in emerging economies where institutional safeguards are underdeveloped. It also provides ethical guidance to AI actors and authorities, including the public and private sectors, by providing a basis for ethical impact assessments of AI systems throughout their life cycles (UNESCO, 2021). Similarly, OECD's AI Policy Observatory documents how countries with coherent digital strategies, robust public administration, and transparent governance practices achieve higher AI readiness levels. Establishing robust governance frameworks could help ensure AI systems are deployed in a cohesive, efficient, and accountable way, aligned with strategic priorities and public values (OECD, 2020). The literature converges on a central insight: governance structures determine not only whether AI technologies can be adopted but also how effectively they can be institutionalized. Governance is therefore not simply one variable among others but a central mechanism for shaping digital transformation.

Education Level

Human capital theory argues that education expands productivity, innovation potential, and absorptive capacity, thereby facilitating the adoption of advanced technologies. Education can increase the human capital in the labor force, thereby boosting labor productivity and, in turn, transitional growth toward a higher equilibrium level of output. Education can also increase the economy's innovative capacity, and new knowledge about technologies, products, and processes promotes growth (Hanushek & Woessmann, 2010). Indicators such as tertiary enrollment, literacy rates, and government expenditure on education proxy a society's ability to generate AI-relevant skills. Countries like Finland and Canada illustrate the importance of education in supporting long-term digital capability: both have high tertiary enrollment rates and established STEM education pipelines, which contribute to their capacity to adopt and regulate AI at scale. However, empirical research shows that education alone does not guarantee high AI readiness. Middle-income economies with strong education systems but weak institutions, Argentina, Russia, and Tunisia, consistently underperform relative to their human capital levels. CT4D scholarship emphasizes that the effectiveness of education in promoting technological adoption depends on whether institutions can harness, retain, and integrate human capital into national digital strategies. ICT involves a complex array of physical resources such as computers and connectivity, digital resources such as content and language, human resources such as literacy and education, and social resources such as community and institutions

(Warschauer, 2004). Educated workforces are therefore necessary for AI development, but without governance systems that channel skills toward innovation and public administration, their contribution remains limited. Human capital plays an important but conditional role: it supports AI readiness only within institutional contexts that facilitate skill utilization, innovation, and administrative coordination.

Healthcare Access

Healthcare access is widely used in comparative development research as an indicator of structural well-being and state capacity. Improvements in life expectancy, basic health service delivery, and reductions in disease burden often accompany broader public-sector development and administrative strengthening. Social determinants are relevant to both communicable and non-communicable diseases. Health status, therefore, should be of concern to policymakers across all sectors, not solely those involved in health policy (Marmot, 2005). In principle, healthier populations are more productive, more adaptable, and better able to participate in digital economies. Countries such as Cuba demonstrate strong health outcomes but limited AI readiness due to institutional constraints, while countries with modest healthcare systems but high governance capacity, Qatar, Estonia, perform well in AI adoption. North America remains the dominant region in the global AI in healthcare market, while Asia-Pacific is the fastest-growing region for AI in healthcare, however their diffusion correlates more strongly with digital governance capacity than with healthcare indicators alone (Healthcare150, 2025). As a result, healthcare access may be understood as an indicator of broader social stability, rather than a direct determinant of AI readiness.

Economic Openness

Economic openness is frequently discussed as an enabling factor for technological diffusion. Countries engaged in international trade and foreign direct investment (FDI) tend to have greater exposure to advanced technologies, managerial expertise, and digital innovation networks. Open economies benefit from technology spillovers through multinational firms, cross-border data flows, and integration into global value chains. For example, the development of artificial intelligence has significantly improved the manufacturing industry's position in the global value chain (Liu et al., 2024). However, empirical research reveals that openness alone does not guarantee AI readiness. While countries such as Singapore, the United Arab Emirates, and Ireland leverage openness to bolster their AI ecosystems, many middle-income economies remain unable to capitalize fully on global integration due to domestic governance constraints. Trade openness may accelerate digital modernization only when supported by effective regulatory frameworks, strong institutions, and investment-friendly environments. As tax rate differences narrow globally, countries gain a greater advantage from strengthening infrastructure, regulatory quality, and institutional environments (UNCTAD, 2022). Without these, openness may increase dependency on foreign technologies without improving local absorptive capacity. The literature, therefore, conceptualizes economic openness as a conditional factor: it can enable AI development when paired with strong governance and institutional capacity, but it may not independently determine AI readiness.

Institutional Capacity

Institutional capacity represents the deepest structural determinant of national technological readiness. Rooted in institutional economics and political economy, this concept encompasses rule-of-law conditions, administrative coherence, predictability of public policy, corruption control, and the ability of the state to enforce regulations. Scholars emphasize that strong institutions are necessary for long-term investment, effective regulation, and the adoption of innovation, as extractive economic institutions fail to provide the incentives needed for people to save, invest, and innovate (Acemoglu & Robinson, 2012). In the context of AI, institutional capacity shapes the implementation of national AI strategies, privacy and data governance frameworks, algorithmic accountability mechanisms, cybersecurity requirements, digital public infrastructure governance, and AI-enabled system procurement processes. Cross-country evidence shows that countries with robust institutions, Finland, Denmark, Estonia, Singapore, consistently outperform

others in digital government maturity and AI readiness. Their institutional frameworks enable large-scale data integration, regulatory innovation sandboxes, interoperable public systems, and trustworthy AI deployment. Conversely, countries with weak rule-of-law systems lack the administrative stability and legal infrastructure required for AI-related reforms (OECD, 2024; OECD, 2025b). Institutional capacity thus serves as a foundational layer that shapes the effectiveness of governance, digital infrastructure, human capital, and economic openness. This aligns with structural development theory, which argues that inclusive, capable institutions foster innovation, while extractive ones hinder technological progress. Inclusive institutions promote growth through secure property rights, fair competition, and investment in skills and innovation, whereas extractive institutions concentrate wealth and discourage productive economic activity (Acemoglu & Robinson, 2012).

Interdependencies and the Hierarchical Model of AI Readiness

A consistent theme in the literature is that the determinants of AI readiness do not function independently but interact through layered causal mechanisms. Digital systems are effective only when supported by capable institutions. Likewise, human capital strengthens innovation capacity only in institutional environments that can channel skills into productive use, as institutional quality shapes the transformation of absorptive capacity into innovation (Barasa et al., 2017; Vivoda, 2025). Economic openness leads to technology spillovers only when government systems protect intellectual property, coordinate industrial strategies, and enforce contracts. Research using institutional measures such as governance quality, economic freedom, intellectual property rights, and ease of doing business across developed and transition economies found that strong institutions consistently have a positive effect on productivity (Krammer, 2015). These interdependencies reflect broader development theories emphasizing the mutually reinforcing nature of political, social, and economic structures in shaping development outcomes. This body of research shows that institutional capacity and governance quality tend to exert stronger and more stable effects on technological development than technical or socio-economic factors. While digital infrastructure, education level, healthcare access, and economic openness contribute meaningfully to national innovation systems, their influence is often shaped, positively or negatively, by the broader institutional environment (Acemoglu & Robinson, 2012).

The literature also reveals distinct regional patterns. Northern European countries, Finland, Denmark, Estonia, and Sweden, consistently achieve high AI readiness due to strong governance, digital bureaucracy, and long-standing investments in education and public-sector modernization. East Asian economies, Singapore, South Korea, Japan, combine infrastructural strength with coordinated state-led digital strategies. North America and Western Europe benefit from established innovative ecosystems, stable regulatory environments, and high institutional capacity. In contrast, Latin American and Southeast Asian countries show mixed performance: relatively strong digital ecosystems and educational attainment coexist alongside governance fragility and political volatility, which limit AI adoption. Sub-Saharan Africa exhibits pronounced heterogeneity, with emerging digital hubs (Kenya, Rwanda) alongside fragile states with systemic institutional weaknesses. The Middle East presents dual trajectories: high-capacity, resource-rich states (UAE, Qatar) contrast sharply with conflict-affected nations (Yemen, Syria). These regional differences emphasize that AI readiness reflects broader political-economic histories rather than isolated policy decisions (Oxford Insights, 2023; Oxford Insights, 2025).

A key debate in development studies concerns whether low-income countries can “leapfrog” traditional development barriers using AI and digital technologies. Mobile phones have enabled many developing countries, even those with relatively poor infrastructure, to leapfrog in certain sectors. For example, Kenya, recognized for its leadership in mobile money services, now uses a locally developed mobile Short Message Service (SMS) application that enables residents to verify doctors or clinics (Lunalo, 2025). Research shows that effective AI adoption depends on coherent regulation, anticipatory governance, and coordinated public-sector strategy, underscoring that institutional coordination for AI goes far beyond what was typical for

earlier technologies (Drago et al., 2025). AI deployment demands an integrated data infrastructure, regulatory oversight frameworks, strong cybersecurity protocols, coherent public-sector strategies, rule-of-law conditions, and technical expertise across ministries. These requirements are not easily leapfrogged. Institutional capacity cannot be rapidly manufactured; it is cumulative. This literature challenges the notion that AI development can bypass structural deficiencies and underscores the need for reforms that strengthen governance and institutional quality.

In summary, AI readiness is shaped by a constellation of structural factors, but institutional capacity and governance quality consistently emerge as the strongest determinants. Digital infrastructure, education, and economic openness contribute to important enabling conditions, yet their impact is conditioned by governance context. Healthcare access, while important for broader development outcomes, is only indirectly or marginally relevant to AI readiness. This synthesis underscores the need for empirical work that captures the hierarchical structure of these determinants. By examining multiple dimensions simultaneously, digital, institutional, human capital, social, and economic, the present study contributes to the literature by providing a comprehensive structural assessment of AI readiness across 193 countries. Furthermore, the study advances theoretical development by articulating a layered model in which institutional capacity and governance effectiveness may impact the relationship between infrastructural and socio-economic factors and national AI readiness.

Methodology and Research Questions

Research Design

This study employs a cross-national quantitative design to examine the structural determinants of national AI readiness. The analysis integrates data from 193 countries, using a set of harmonized indicators that represent six thematic dimensions: digital infrastructure, governance quality, education level, healthcare access, economic openness, and institutional capacity. The purpose of the research design is to identify which structural factors are most strongly associated with cross-country variation in AI readiness and clarify how they relate to one another within a broader institutional framework. The dataset integrates multiple indicators into six structural thematic dimensions, retaining only variables with consistent cross-country coverage and clearly defined measurement frameworks.

Data Sources and Variable Construction

All indicators were selected from internationally standardized datasets to ensure conceptual consistency and cross-country comparability. The following data sources were used for the independent variables: World Bank Open Data for indicators related to education, healthcare access, economic openness, and institutional capacity (World Bank, 2023); the ITU ICT Statistics Database for Internet Use (% of individuals using the Internet) and broadband subscriptions (ITU, 2023); UNDP Human Development Data for health and education indicators used in constructing thematic measures (UNDP, 2022); World Governance Indicators (Kaufmann, et al., 2010); and the OECD AI Policy Observatory for governance and AI policy context indicators where available (OECD, 2020). The dependent variable, the AI readiness score, is taken from the Government AI Readiness Index published by Oxford Insights (Oxford Insights, 2023). These sources were selected for their methodological transparency, global coverage, and frequent use in development and digital governance research.

Governance Quality is drawn from the World Governance Indicators and includes regulatory quality: percentile rank, political stability: percentile rank, and government effectiveness: percentile rank, capturing state capacity for policy design and enforcement. Education Level comprises government education expenditure and tertiary enrolment rates, representing national human capital relevant to AI development.

Healthcare Access, based on life expectancy and maternal mortality (UNDP and World Bank data), is included for completeness as a proxy for social stability, though limited data and weak association with AI readiness restrict its role to a descriptive function. Economic Openness is measured through trade and FDI as shares of GDP, indicating exposure to global markets and the diffusion of technology. Institutional Capacity includes WGI indicators for rule of law, regulatory quality, and control of corruption, capturing deeper structural conditions for effective technology adoption. All variables are standardized to a 0-1 scale where necessary to ensure comparability across dimensions.

Data Cleaning and Preparation

The dataset required several preparation steps to ensure consistency across indicators and comparability across countries. All data were extracted in their original numeric form and merged into a unified structure, with each row representing an observation for one country. Variables were inspected for format discrepancies, non-numeric characters, and duplicated header rows. To account for variation in data availability, each indicator was standardized using the most recent values reported by international statistical sources, typically from 2023. Several variables, such as Internet Use (% of individuals using the internet), Fixed Broadband subscriptions per 100 inhabitants, Regulatory Quality, Government Expenditure on Education (% of government expenditure), Gross Tertiary Enrollment Ratio, Trade (% of GDP), and Foreign Direct Investment inflows (% of GDP), were available only for later years. These indicators were incorporated using their latest available annual estimates to maintain temporal relevance and minimize inconsistencies across countries.

Missing values were addressed using a structured procedure. When country-level data were unavailable for individual indicators, sample means were used as approximations to preserve cross-country comparability and maintain full global coverage. This imputation strategy was applied selectively, only to variables with moderate missingness; indicators with extensive missing data were retained for descriptive analysis but interpreted cautiously in quantitative comparisons. After data harmonization, all variables were examined for scale consistency, and continuous indicators were normalized where appropriate to facilitate comparison across thematic dimensions. Outlier detection was conducted using distributional checks, though no values were removed to maintain the integrity of the global dataset. This cleaning procedure produced a coherent dataset that aligns the AI readiness score with six structural dimensions of development for 193 countries, enabling the correlation analysis and exploratory statistical modeling presented in subsequent sections.

Analytical Strategy

The empirical strategy focuses on examining how the six structural dimensions relate to national AI readiness. To do this, the analysis was carried out in four stages: First, descriptive statistics and distributional checks were conducted. Mean values, ranges, and frequency distributions were examined to understand the overall structure of the data and to identify potential anomalies. Second, correlation analysis was used to assess bivariate relationships. Pairwise Pearson correlations were calculated to measure the strength and direction of the association between each independent variable and the AI Readiness Score. This method is appropriate for continuous, cross-country data and provides a straightforward measure of linear association. Third, exploratory regression models were estimated. Due to missingness and reliance on complete-case subsets, these regressions are exploratory and should not be interpreted as definitive causal evidence. The models suggest that governance and institutional variables may exert a strong influence, but the estimates must be interpreted with caution, given data limitations. Fourth, cross-national pattern identification was conducted using visual inspection of scatterplots. These visualizations were used to analyse patterns and to highlight notable country clusters, such as outperformers (Estonia, Singapore), underperformers (Brazil, South Africa), and structurally constrained states (Somalia, Yemen). The analytical strategy aligns with best practices in global development research, where indicator harmonization and comparative structural analysis are standard methods for identifying macro-level patterns.

Results and Discussion of Findings

This section presents the empirical findings of the study. The results draw on descriptive statistics, correlation analysis, and visualization-based pattern identification across the full dataset of 193 countries. Consistent with the theoretical framework, the findings reveal a clear hierarchy of determinants, with governance quality and institutional capacity emerging as the strongest dimensions associated with AI readiness, followed by digital infrastructure, while education level, healthcare access, and economic openness exhibit weaker or inconsistent relationships.

Quantitative Relationships Between Structural Factors and AI Readiness

Pearson correlation coefficients were calculated between each structural dimension and the AI Readiness Score. The results and conceptual model are shown in Figure 1. Governance shows the strongest association ($r \approx 0.83$:Regulatory Quality;0.82:Government Effectiveness;0.42:Political Stability), followed closely by Institutional Capacity ($r \approx 0.82$:WGI Regulatory Quality;0.77:WGI Rule of Law;0.70:WGI Control of Corruption) and Digital Infrastructure ($r \approx 0.77$:Internet Use %;0.75:Broadband per 100). Education Level exhibits only a weak relationship ($r \approx -0.12$:Government Expenditure on Education \$ of Government Expenditure ;0.74:Gross Tertiary Enrollment Ratio), while Economic Openness shows a mild association ($r \approx 0.24$:Trade % of GDP Exports + Imports as a Share of GDP;-0.04:Foreign Direct Investment Inflows % of GDP). Healthcare Access: due to extensive missing data, this dimension was analysed descriptively rather than statistically. Preliminary correlations suggest a weak association ($r \approx 0.57$:Maternal Mortality Ratio Modeled Estimate, per 100,000 Live Births);0.76:Life Expectancy at Birth Years).

The underlying indicators exhibit limited cross-national variation and substantial missingness, requiring the use of mean values. This reduces the effective variance in the data and inflates correlation coefficients, making them a weak indicator of substantive association. These values indicate that governance quality and institutional capacity indicators exhibit the strongest linear relationships with the national AI Readiness Score. Digital infrastructure is also strongly correlated. Education and economic openness show only mild associations, and healthcare access appears largely unrelated to AI readiness across countries. These patterns align with the theoretical model, suggesting that institutional and governance foundations condition the effectiveness of technical and human capital investments. Scatterplots examining the relationships between AI readiness and key independent variables further illuminate the data's structural patterns as shown in Figure 2. The scatterplot of governance quality versus AI readiness shows a near-linear, upward trend, with high-governance countries consistently clustered at the upper end of the readiness distribution. The slope of the visual relationship is steep, reflecting the dataset's strongest correlation.

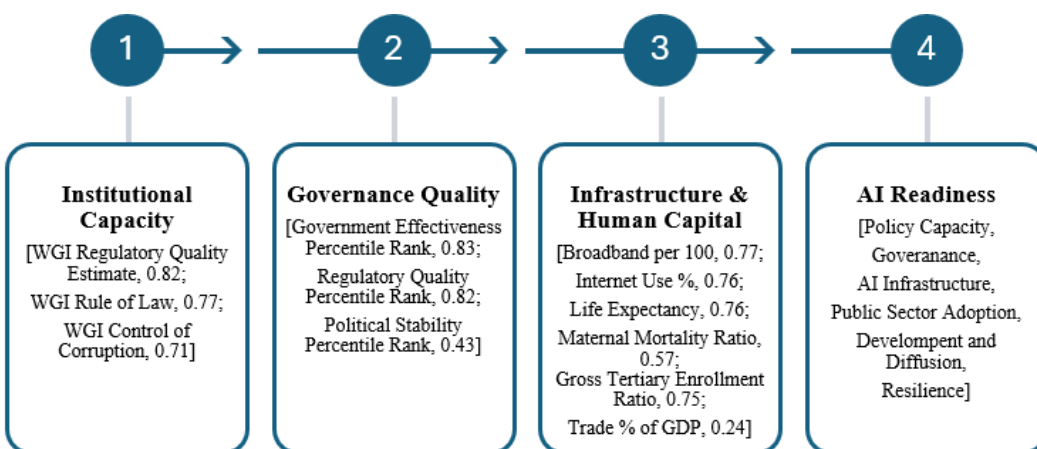


Figure 1. Conceptual Model Framework and Key Dimension Correlations

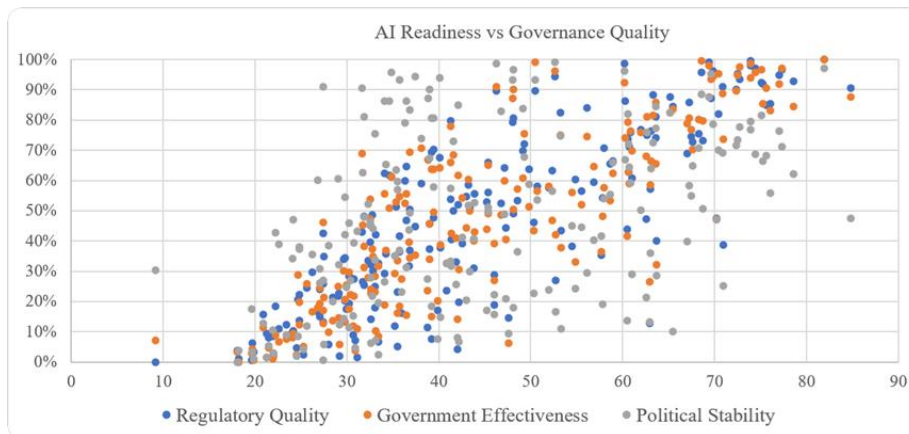


Figure 2

Several aspects stand out: High-performing governance systems (Denmark, Finland, Singapore, Estonia) cluster in the upper-right quadrant, indicating simultaneously high governance scores and high AI readiness. Mid-governance countries (Brazil, Mexico, South Africa) fall below the fitted regression line, suggesting that moderately strong governance is not sufficient to yield high AI readiness outcomes. Fragile states (Somalia, South Sudan, Yemen) are concentrated in the lower-left quadrant, with limited dispersion, reflecting consistently low values on both governance quality and readiness. This pattern confirms that AI readiness reflects institutional development trajectories rather than infrastructural or economic achievements alone.

The Figure 3 and Figure 4 scatterplots depict a strong positive association between digital infrastructure and AI readiness, but show greater dispersion: Countries with high infrastructure but weaker governance, Brazil, Malaysia, and Thailand, underperform relative to their connectivity levels. Countries with moderate infrastructure but strong institutions, such as Estonia, Latvia, and Lithuania, outperform expectations. Infrastructure leaders such as Singapore continue to score highly, reinforcing the idea that infrastructure amplifies existing governance advantages. The dispersion indicates that infrastructure is necessary but not sufficient for high AI readiness; its impact is heavily conditioned by governance.

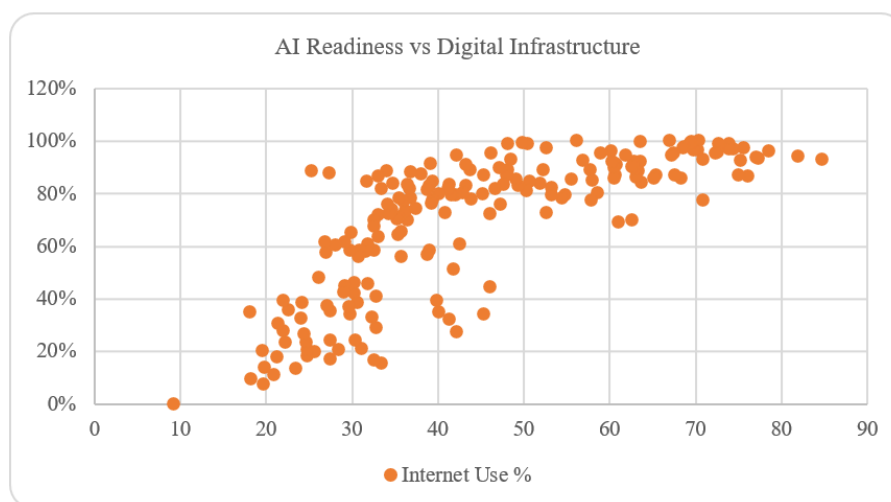


Figure 3

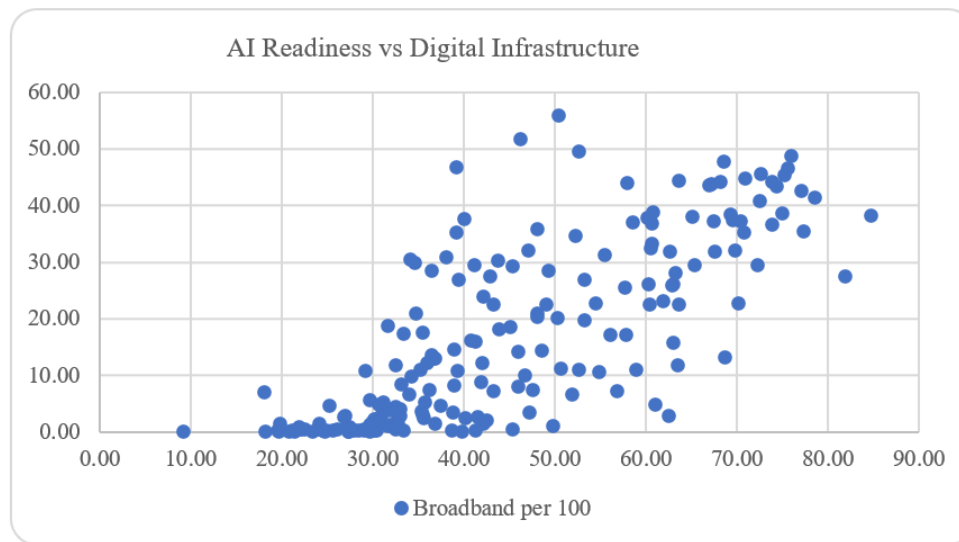


Figure 4

Global Cross-National Patterns

A systematic analysis of cross-country variation reveals several meaningful clusters that deepen understanding of the structural factors underlying AI readiness. Countries such as Estonia, Finland, Denmark, and Singapore significantly outperform expectations given their population size and economic scale. Their success reflects long-term investments in public administration, coherent digital governance strategies, interoperable public data infrastructure, and high regulatory quality combined with low levels of corruption. These cases provide evidence for the primacy of institutional and governance factors. In contrast, countries such as Brazil, Malaysia, Thailand, Argentina, and South Africa have strong connectivity, competitive education systems, and moderate to high levels of economic openness, yet they achieve only mid-range AI readiness scores. This gap is explained by regulatory fragmentation, inconsistent administrative coordination, political volatility, and deficits in institutional trust. These examples support the finding that infrastructure alone cannot compensate for governance constraints. A further cluster consists of countries such as Somalia, South Sudan, Yemen, Afghanistan, and Syria, which score at the bottom in both institutional capacity and AI readiness. These contexts are marked by limited rule of law, low administrative capability, conflict and instability, and the absence of fundamental data governance frameworks. Their position illustrates that AI systems cannot be implemented where essential institutional structures are lacking.

Another set of countries, including Uruguay, Costa Rica, Georgia, and Rwanda, outperform regional peers due to targeted administrative reforms, investments in digital public services, anti-corruption initiatives, and stable policy environments. These cases demonstrate that institutional strengthening can yield tangible improvements even in middle-income settings. China appears as a structural outlier. It combines high AI readiness and high institutional capacity with lower scores on political freedoms, supported by strong regulatory enforcement and a coordinated state strategy. This pattern shows that the institutional capacity required for AI does not necessarily correspond with democratic governance models. Instead, China demonstrates a state-centric developmental approach grounded in centralized governance and large-scale digital mobilization.

Taken together, these results establish a clear ordering of structural determinants. Institutional capacity and governance quality emerge as the strongest and most consistent dimensions associated with AI readiness.

Digital infrastructure also exerts a significant influence, though its effects are mitigated by governance. Education and economic openness show mild, indirect, or inconsistent impacts, while healthcare access appears largely irrelevant in cross-national comparisons. This ordering validates the theoretical model, which proposes that AI readiness depends fundamentally on state capacity and governance, with infrastructure and human capital serving as secondary enablers.

Implications for Research/Practice

The findings of this study demonstrate that national AI readiness is shaped primarily by structural conditions rooted in institutions and governance, rather than by technical capacity alone. This pattern is consistent across 193 countries and aligns with broader development theory, which emphasizes that complex technologies require stable administrative systems, predictable regulatory environments, and coherent public-sector coordination. Countries with strong rule-of-law foundations, low corruption, and effective bureaucratic systems, such as Estonia, Denmark, Singapore, and Finland, consistently achieve the highest AI readiness scores, even when their economic size or population scale is modest. Their trajectories illustrate that institutional depth, not economic weight, is the decisive factor enabling AI adoption.

The results also clarify why many middle-income countries underperform despite significant improvements in connectivity, market openness, or education. Cases such as Brazil, Malaysia, and South Africa reveal that digital infrastructure and human capital cannot compensate for governance fragmentation, weak regulatory enforcement, or political instability. These findings challenge the assumption that technical upgrades or increased internet penetration alone can accelerate AI readiness. Instead, they point to a structure in which institutional capacity and governance effectiveness condition the impact of all other determinants.

Moreover, the study contributes to ongoing debates about digital leapfrogging. While earlier generations of ICTs allowed some countries to bypass traditional development stages, AI adoption requires more complex institutional coordination than mobile banking or broadband expansion. The absence of leapfrogging effects in low-governance environments suggests that structural reforms, not technical shortcuts, are essential for emerging economies seeking to benefit from AI. This insight carries significant implications for development agencies and international donors, which often prioritize infrastructure financing over governance support.

Taken together, the findings underscore that AI readiness is best understood as an institutional capability embedded within the broader political economy of the state. Investments in infrastructure, education, or global integration become effective only when countries possess the institutional integrity, regulatory coherence, and administrative competence required to manage the risks and opportunities of AI. This perspective calls for a reorientation of national strategies and international development efforts toward strengthening governance systems as the core foundation for equitable and sustainable AI adoption.

Policy Recommendations

The results of this study indicate that governance quality and institutional capacity are perhaps the strongest determinants of AI readiness, suggesting that national and international policy efforts should prioritize reforms that strengthen the state's structural foundations. Governments should invest in clear, predictable, and accountable regulatory frameworks, particularly in domains such as data protection, algorithmic oversight, cybersecurity, and procurement transparency. Enhancing rule-of-law mechanisms reduces uncertainty for private-sector innovation and increases the state's ability to manage AI-related risks.

Countries seeking to advance AI readiness must also reinforce administrative competencies across ministries. Priority areas include digital public infrastructure governance, inter-agency data interoperability, civil service training in data management, and the establishment of independent oversight bodies responsible for AI ethics and safety. Strengthening these administrative capacities ensures that technological investments can be effectively implemented, coordinated, and regulated. National AI strategies must be rooted in realistic assessments of state capability. Rather than developing broad declaratory strategies, governments should focus on areas where institutional and administrative strengths already exist, such as digital identity systems, tax platforms, health registries, or the automation of public services. Aligning strategy with actual capacity increases the likelihood of successful implementation and long-term sustainability.

Infrastructure upgrades, such as broadband expansion and cloud platforms, should be embedded in broader institutional development strategies. Technical expansion without administrative capability results in underutilization, a pattern observed in several middle-income contexts where infrastructure outpaces governance. Integrating infrastructural development with institutional reform is therefore essential for ensuring that investments translate into national AI readiness. Finally, development agencies and multilateral organizations should adjust their support frameworks. While funding often prioritizes infrastructure and connectivity, this study's findings suggest that meaningful progress in AI readiness requires substantial investment in governance reforms, institutional capacity-building, anti-corruption frameworks, and administrative modernization. Prioritizing these foundational reforms ensures that technological initiatives are durable, scalable, and benefit society.

Limitations, Contributions, and Conclusions

Limitations and Directions for Future Research

Despite the strength of the results, several limitations should be acknowledged. Cross-national datasets rarely align temporally, and several indicators used in this study rely on the most recent available year rather than a standardized time point. Although this practice is common in global comparative research, it may obscure short-term dynamics or mask year-to-year variation. Additionally, healthcare access and several social indicators exhibited substantial missingness. While these variables were retained for completeness, their limited availability prevented their analysis with the same rigor as other structural dimensions. Future studies should employ more robust methods for handling missing data, such as predictive modeling and multiple imputation, to better handle incomplete observations.

The correlational nature of the analysis also restricts causal inference. Although institutional capacity and governance quality appear strongly associated with AI readiness, these relationships cannot be causally established without longitudinal or quasi-experimental designs. Although the independent variables were conceptually distinguished from the AI readiness index, the potential for construct overlap is also acknowledged as a limitation of the study. Moreover, the reliance on national averages conceals significant regional and sectoral variation. Large and diverse states may contain subnational pockets of administrative strength or governance weakness that are not captured at the country level. Future studies would benefit from subnational analyses of AI readiness across provinces, cities, and administrative regions. Another limitation stems from the rapid pace of technological change. AI systems, data governance models, and digital public infrastructure evolve quickly, and existing global indices may not fully reflect emerging forms of readiness. Indicators relating to cybersecurity maturity, algorithmic oversight, and digital public infrastructure governance are particularly dynamic and warrant continuous updating.

Future research should therefore focus on developing longitudinal datasets that track institutional change and AI readiness over time, applying causal inference techniques to better identify underlying mechanisms, and incorporating granular administrative metrics that capture variation in bureaucratic capability, data systems, and regulatory enforcement. Sector-specific analyses, particularly in health, education, taxation, and justice, may reveal more precisely where institutional conditions most strongly shape AI adoption. Comparative case studies could further illuminate the pathways through which governance reforms translate into meaningful progress in AI readiness, offering deeper insight into how institutional foundations support technological transformation.

Contributions

This study contributes to the emerging field of AI readiness research by advancing a structural, institution-centered explanation of why countries differ so sharply in their ability to adopt and govern AI technologies. Existing literature frequently treats AI readiness as a technical issue linked to infrastructure, skills, or economic integration. The findings of this study challenge that assumption and show that national AI readiness is shaped most strongly by institutional capacity and governance quality. These features operate as foundational conditions that enable or constrain the effectiveness of other developmental factors.

The first contribution is conceptual. Rather than viewing AI readiness solely as the outcome of digital infrastructure or human capital, the study reframes it as a broader state capability rooted in institutional quality, legal frameworks, and administrative reliability. The empirical results demonstrate that governance effectiveness and regulatory quality consistently outperform infrastructure, education, or openness in their association with AI readiness, showing that the ability to manage complex technologies is linked to deeper political and administrative characteristics. A second contribution is clarifying how structural factors relate to AI readiness. While digital access, education, economic openness, and healthcare conditions matter, their influence appears less stable and often contingent on institutional strength. The findings help explain why countries with similar levels of connectivity or schooling diverge sharply in technological performance.

The study also revisits assumptions about digital leapfrogging. Earlier generations of ICTs enabled some rapid advancement in low-income settings, but the adoption of AI requires integrated data systems, regulatory capacity, and coordinated institutions. The results show that countries with weak institutional environments do not benefit from leapfrogging effects, even when infrastructure improves. Finally, the study links AI policy analysis with institutional economics by showing that national AI strategies, ethical frameworks, and digital reforms are effective only when backed by capable state institutions. This connection helps explain why similar policy documents produce very different outcomes across countries.

Conclusion

This study examined the structural determinants of national AI readiness using data from 193 countries and found that governance quality and institutional capacity are most closely associated with a country's ability to adopt, regulate, and benefit from AI technologies. Digital infrastructure and education also matter, but their influence is less stable and often contingent on the broader institutional environment. Economic openness and healthcare access show limited or inconsistent relationships when assessed independently.

These findings challenge the assumption that improvements in connectivity, training, or market integration alone can drive progress in AI readiness. Instead, they point to the central role of governance systems and institutional depth in enabling countries to build effective digital and AI ecosystems. Without these conditions, technical investments often fail to translate into meaningful technological capability. The study contributes to the literature by demonstrating the relative strength of institutional and governance characteristics compared with other developmental factors and by providing an exploratory analysis using a large, diverse global dataset. The analysis offers policy-relevant insights and underscores the need for

governments and development agencies to prioritize institutional strengthening as a central component of AI-related development strategies.

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