"GLOBAL AI READINESS CLUSTERS: PATTERNS AND DISPARITIES IN GOVERNANCE AND TECHNOLOGICAL INFRASTRUCTURE"

Research Paper

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“Abstract”

Artificial intelligence (AI) increasingly stands out as an important driver of innovation and economic growth. However, in terms of preparedness to harness the full potential of AI, not all countries are equally well-placed. Such a wide gap mainly arises from government policies, technological infrastructure, and, above all, the mindset for innovative technologies. This study highlights the global urgency of AI preparedness, which may impact the future development of countries in areas such as agriculture, healthcare as well as education. It was based on several indicators, including measurements of government effectiveness and technology infrastructure, coupled with methods of data analysis such as clustering techniques as well as PCA that help classify countries in order regarding their preparation for AI. The results grouped countries in three cluster based on AI readiness, governance as well as information and communication technology infrastructure, which should be helpful for policymakers making decisions to further develop the AI landscape in various countries.

Keywords: AI, Artificial Intelligence, Information and Communication Technology, ICT, Global AI readiness, IoT, Internet of Things

1 Introduction

Artificial intelligence (AI) is revolutionising industries by automating tasks, enhancing data-driven decision-making, and offering personalised customer experiences. It drives innovation in products and services, boosts economic growth, and improves global competitiveness. Countries investing in AI are leading in technological advancements and economic development. However, this also highlights the need for workforce reskilling and ethical AI governance.

AI is rapidly becoming a critical factor in driving innovation and economic growth. However, significant disparities in AI readiness exist across different countries, largely influenced by governance and technological infrastructure (Oxford Insights, 2023; SpringerLink, 2021). These disparities suggest that while AI has the potential to boost economic growth, it may also exacerbate existing inequalities, particularly in countries lacking the necessary infrastructure (Melina, 2024; Journal of Economic Structures, 2024).

1.1 Importance of AI readiness in global context

AI readiness is vital globally for economic growth, addressing challenges like climate change and healthcare, reducing inequality, ensuring ethical AI deployment, and fostering international cooperation. It enables countries to harness AI’s benefits while mitigating risks, promoting a sustainable and inclusive future. The importance of AI readiness in a global context is increasingly recognized, with AI projected to significantly contribute to global GDP by 2030 (Baguma et al., 2022).

Assessing AI readiness in countries is a necessity for deriving AI's benefits, particularly in sectors of mobility (Pandyaswargo et al.,2023). Yet the existing global AI readiness indices, which might not

correspond to the development progress in the individual African countries, could indicate a unique developmental outlook (Baguma et al., 2022)

A broad AI readiness index must consider elements such as vision and governance, digital capacity, infrastructure, and education (Baguma et al., 2022; Porcher, 2020). While the USA, China, Japan, and South Korea have taken the lead in AI capabilities, many African, Asian, and Latin American countries still lag in AI readiness (Porcher, 2020). Specific assessments for African countries that can identify the detailed problems from which we want to learn global indices and thus help us with the policy design to improve AI readiness are required (Diallo et al., 2024).

1.2 Role of governance and ICT infrastructure in AI development

Development and application of AI are facilitated by infrastructure in governance and information as well as communication technology (ICT). ICT infrastructure and governance are mutually reinforcing in offering the tools to build an innovative yet sustainable as well as responsible AI environment. On the one hand, properly guided government makes sure AI devices are ethically applied and technologically advanced. In contrast, good infrastructure in ICT provides a means of promoting and propagating AI. The use of ethical frameworks and stipulations ensures that AI methodologies are within human values and social norms. Regulatory frameworks are introduced by governments to tackle issues such as bias, insufficient transparency, and accountability.

A pertinent illustration of such a framework is the EU's AI Act, which defines standards aimed at ensuring the safety of AI while safeguarding fundamental rights (Baguma et al., 2022). A comprehensive governance framework covers risk management, including the identification and mitigation of all risks associated with AI-issues on data privacy, security vulnerability, and abuse (Pandyaswargo et al., 2023). Governance frameworks would, therefore, significantly contribute towards increased public trust in AI through the transparency and accountability that it imposes. The process is viewed positively by different social groups and displays their confidence in observed levels. Their involvement, therefore, enriches the decision-making process through the inclusion of a broader perspective (Porcher, 2020).

AI models need to be trained by ICT companies, which must possess the necessary robustness for handling large datasets effectively. Different factors like computational capability, high-speed internet connectivity, and data storage capacity form a significant basis for advancement in AI technologies. Additionally, cloud computing services offer scalable resources to improve AI, which allows researchers and developers to harness powerful computational tools without encountering high upfront costs.

Furthermore, it allows for the smooth integration of the AI system with the use of other technologies and services such as IoT devices, smart cities as well as any associated digital ecosystems. High-speed networks and reliable connectivity will be key in AI applications where speed is critical, like autonomous vehicles and medical diagnostics, and in terms of providing immediate data delivery (Baguma et al., 2022).

A well-built ICT infrastructure also facilitates an enabling environment for the required digital equipment that aids AI researchers and developers in quickly accessing necessary tools as well as platforms. Furthermore, it promotes international collaboration whereby scholars and developers across many geographical areas may contribute to AI projects and share professional knowledge to enhance its progress. (Pandyaswargo et al., 2023). A strong AI ecosystem should, therefore, incorporate competent governance and ICT infrastructure. Enough governance ensures that the development and deployment of AI are responsible, while strong ICT infrastructure provides the foundation upon which the innovation and integration of AI are founded.

1.3 Global AI readiness clusters

While AI is driving technological growth globally, a gap in regional AI readiness is starting to arise. While some countries have rapidly developed their AI competencies, others face difficulties. due to poor governance, inadequate infrastructure, and general socio-economic conditions, conditions. Different countries have developed to varying extents because of varying levels of AI. some are better prepared than others to exploit AI.

Understanding the similarities and differences between these groups will enhance the formulation of plans to narrow the gap so that people from every part of the world enjoy the same benefits arising from AI breakthroughs: Although numerous global readiness maps for AI exist, there is concern that these Evaluations may not capture many areas, particularly in the Global South. The understanding of global AI readiness is poor because the indices are too broad and neglect the unique challenges and opportunities presented by different regions.

1.4 Gaps in understanding global AI readiness and regional disparities

By addressing infrastructure limitations, developing skills relevant to AI adoption, and improving global AI readiness assessments, we could bridge the gaps and promote more inclusive AI development globally. Consideration of regional contexts is essential in the development of strategies for the ethical implementation of AI.

1. **Inadequate regional contextualisation:** Most modern global metrics for assessing AI readiness still tend to unfortunately ignore regional differences, especially in the case of developing nations. Baguma et al. (2022) argue that these indicators are usually based on a traditional framework of criteria that may not effectively or suitably reflect the peculiar needs and circumstances of many regions, particularly in Latin America, Africa, and Asia. Porcher (2020) comments that most global AI readiness assessments make incomplete considerations of the regional differences in the evolution of AI. This is an essential claim when approaching developing countries.
2. **Disparities in governance frameworks:** Information about what impact different kinds of governance have on AI readiness is incomplete. The presented study does not appropriately probe into how different levels of regulatory frameworks, policy-making, and ethical considerations influence a country's potentials for successfully developing and deploying AI technology (Porcher, 2020).
3. **Technological infrastructure gaps:** Poor technological infrastructure, such as in the form of a lack of high-speed access to the internet, data management capabilities, and cloud computing resources, makes many regions underprepared for AI. A fair point to be made here, however, is that such serious infrastructural gaps are ignored in current assessments of readiness and can result in a disproportionately inflated estimate of underdeveloped-regional preparedness for AI (Diallo et al., 2024).
4. **Socio-economic and cultural factors:** The study of socio-economic and cultural determinants of preparedness for AI has been relatively rare. In fact, Pandayaswargo et al. (2023) point out that without considering these factors in the different indices, the interpretation of readiness becomes too simplistic and does not reflect the actual situation.

1.5 Research objective

The primary aim of the study is to assess and define readiness for AI globally, considering governance structures, technology, and socio-economic factors. The goal of the study is to:

1. **Map the patterns of AI readiness**: To revisit and assess AI readiness across countries and regions, categorising them into distinct clusters of preparedness.
2. **Identify and analysis disparities**: To explore differences within these clusters, with a particular focus on gaps in legal frameworks, technological capabilities, and investment in AI research and development. The study will also consider how these factors influence both international competitiveness and cooperation in AI.
3. **Evaluate impact of governance on AI development**: To examine the influence of governance—through national AI strategies, data protection regulations, and ethical guidelines—on a country’s preparedness for AI.

4. **Propose guidance to policymakers**: To offer insights and direction to policymakers by formulating recommendations aimed at enhancing global AI cooperation, strengthening the technological capacity of developing nations, and ensuring the equitable distribution of AI technologies.

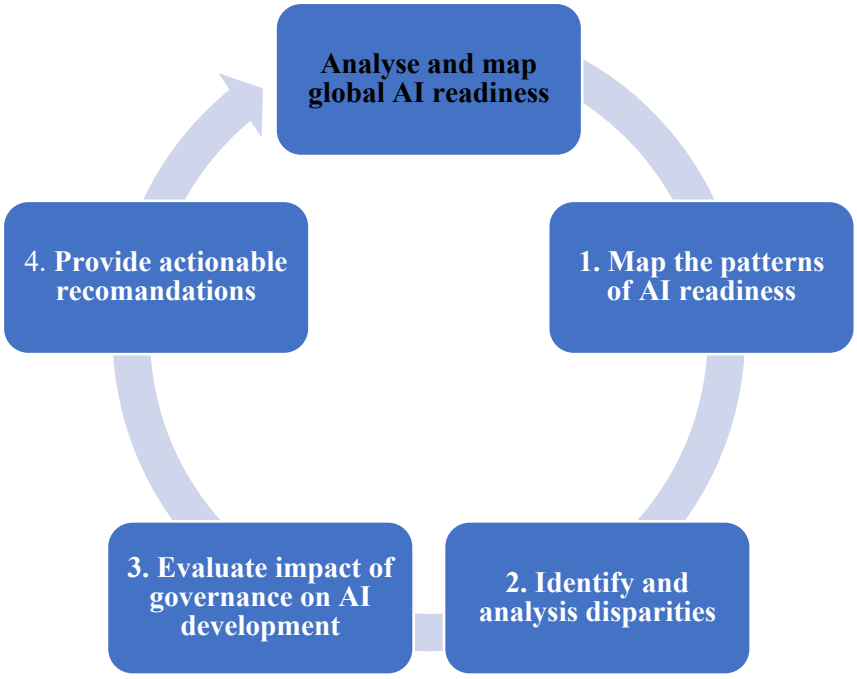

Figure 1. Global AI readiness status

1.6 Global patterns in AI readiness

The level of preparedness among governments and industries to embrace the innovative technology of AI varies significantly. For instance, Porcher (2020) noted that the top four countries in terms of AI competencies are the United States, Japan, and South Korea. While China has excellent AI abilities, it is not ready to compete. Most countries in Asia and Latin America are behind the new economies of Russia, Brazil, and India, which are at an intermediate stage (Porcher, 2020).

Smart parking and lane tracking technologies show the highest readiness levels, however, many projects on AI in the transportation sector are working within the framework of the European Union (Pandyaswargo et al., 2023). Factors such as perceived benefits, system capabilities, data ecosystem, and backing from top management are crucial for organisations to implement AI (Pathak and Bansal, 2022).

AI in the electric vehicle industry has immense technical potential and marking new market territories yet fares poorly in the system integration and safety challenges (Pandyaswargo et al., 2022). Such unevenness in the regulatory environment, infrastructure, and technological capabilities at large scale between various countries and sectors would be reflected in the general trends of the global AI readiness levels.

1.7 Influence of governance indicators on AI readiness

Governance indicators are core in the assessment and development of various regions in terms of their readiness for AI. Numerous studies have identified key drivers that are deemed critical to assessing preparedness for AI: governance and ethical considerations, digital literacy, infrastructural capability, and data availability (Baguma et al., 2022).

Incorporation of AI within organizations is fundamentally reliant on aspects such as corporate governance, leadership, and strategic orientation (Nortje and Grobbelaar, 2020; Jöhnk et al., 2020). The preparedness for AI implementation differs notably, particularly in developing countries, influenced by various governmental policies and practices (Montoya and Rivas, 2019). Current global metrics may

not adequately evaluate the preparedness of AI in specific contexts, such as Africa, which underscores the importance for approaches that are tailer in a contextual way (Baguma et al., 2022). Jöhnk et al. (2020) show that a firm enhances its ability to adopt AI through an assessment of its resources, competencies, and commitment levels. Similarly, Baguma et al. (2022) and Montoya and Rivas (2019) depict that gross domestic product per capita, the share of the labour force engaged in AI-related jobs, and attainment of higher education are the dimensions that explain a country's readiness to adopt AI.

2 Literature Review

This study highlights significant disparities across the globe on preparedness for AI, including in governance structures, infrastructural capabilities, and even in the prevailing digital divide. The Government AI Readiness Index 2023 provides evidence that the wealthiest countries-especially those from North America and East Asia-perform well due to their robust technological infrastructure, sound governance frameworks, as well as high levels of innovation matched with human capital.

In contrast, low-income and developing countries, particularly in Africa and Southeast Asia, face challenges due to limited infrastructure, lower innovation capacity, and fewer resources dedicated to AI development and governance (AI Citizen, 2023). The study underscores the critical significance of international collaboration and the ethical management of AI in addressing these disparities.

Nations such as Singapore and the United States, which have made strategic investments in AI infrastructure, exhibit notable advancements, whereas emerging economies within ASEAN are in the process of formulating policies aimed at leveraging AI's capabilities, despite continuing obstacles that contribute to their relative lack of preparedness (Global Government Forum, 2024; ERIA, 2024).

Furthermore, contemporary studies emphasize that the preparedness for AI does not invariably align with its responsible application, as even well-established democratic systems may favour innovation at the expense of accountability, thereby prompting apprehensions regarding equity, ethics, and fairness (IMF, 2024). Confronting these challenges necessitates an emphasis on the formulation of targeted AI legislation, bolstering data security measures, advancing digital competencies, and integrating principles of privacy, transparency, inclusion, and accountability within AI policy frameworks (ERIA, 2024; IMF, 2024).

2.1 AI readiness and preparedness

Several studies on AI readiness indicators have documented evidence that a substantial portion of AI resources are concentrated in a small number of wealthy countries, especially in Asia and the Americas. According to AI Citizen, countries which combine advanced economies with sound governance structures and overall technological frameworks generally perform well in the ranking of the 2023 Government AI Readiness Index.

While these indicators provide valuable insights, research indicates that they may obscure genuine disparities, particularly in regions where advancements in technology have not enhanced individuals' economic or social well-being (IMF, 2024). The growing body of literature on this topic underscores the importance of evaluating not only the presence of AI technologies but also their implementation within a comprehensive socioeconomic framework.

2.2 Governance and AI

Numerous studies in the existing literature indicate a correlation between the adoption of technology and various governance metrics. Strong governance is often linked to prominent technology adoption, as well-structured governance frameworks establish the necessary regulatory environment that promotes innovation while simultaneously maintaining ethical standards (Nzobonimpa and Savard, 2023).

Institutions that are more open and transparent can derive greater benefits from employing AI in the interest of the public good, all the while addressing challenges such as breaches of confidential information and biases inherent in algorithms. Nonetheless, governance structures in established democracies ought not to be excessively flexible towards innovation, as per recent findings, at the expense of essential checks and balances that could lead to ethical quandaries (IMF, 2024).

The regulation of AI implementation by governmental entities introduces both potential benefits and obstacles, rendering this an urgent subject for forthcoming research and policy formulation.

2.3 ICT infrastructure and AI development

The establishment of sophisticated ICT infrastructure is essential for the progression of AI, serving as the fundamental framework required for the acquisition, evaluation, and distribution of data. Current scholarly work highlights those countries with strong ICT infrastructures, especially in areas such as North America and East Asia, are better equipped to leverage AI technologies (Global Government Forum, 2024).

In contrast, the implementation of AI faces considerable obstacles in areas marked by insufficient ICT infrastructure, especially within Africa and Southeast Asia. Studies indicate that investing in ICT infrastructure involves not just the establishment of physical networks but also the enhancement of digital literacy and the assurance of fair access to technological resources (ERIA, 2024). It is important that a holistic approach be followed to ensure the successful implementation of AI technologies in various socioeconomic scenarios.

2.4 Significance of the study

This research would offer valuable contributions to both academic literature and practical policy development by providing significant insights into the patterns as well as disparities in global AI readiness.

2.4.1 Potential policy implications

1. **Informed policymaking**: Knowing that there are different clusters in terms of global AI preparedness, the developed strategies for AI may be more pointedly tailored to regional or national conditions. Indeed, Floridi et al. (2018) suggest that effective governance of AI requires context-sensitive policies that take into consideration specific technological and socio-economic environments of individual nations. This study could form a basis for such a setup of policies and be extremely helpful in tailoring policies more effectively to suit local needs.

2. **International cooperation**: AI readiness differing in various regions may increase global cooperation; specifically, these variations might instigate more cooperation to meet the needs of the less developed regions. Binns (2018) argues that international collaborations and knowledge sharing are the critical building blocks in creating an inclusive AI ecosystem. The study can help lay a policy framework for encouraging the diffusion of technologies, capacity building, and developing cooperative governance mechanisms.

3. **Resource allocation**: The results have the potential to impact resource allocation by international organizations and state governments. Investment in those regions identified as lagging in AI readiness could help close the gap in the digital divide. This, as pointed out by Brynjolfsson and McAfee, 2014 deliberate investments in the technology infrastructure as well as education, are needed to make sure all regions benefit from improvements in AI.

4. **Regulatory harmonisation**: There is a necessity for uniform governance of AI to prevent the disintegration of legislation, which may impede both innovation and international cooperation. As highlighted by Cath et al. (2018), effective global governance of AI mandates synchronized initiatives to establish shared ethical standards and regulatory structures, thereby promoting international collaboration while protecting human rights and ensuring data privacy.

5. **Economic competitiveness**: The possible implications of the investigation may be used by countries in enhancing their economic competitiveness in terms of readiness for AI. As Porter and Heppelmann (2014) establish, countries with advanced AI capabilities are strategically well-placed to compete effectively in the global market. This study has the potential to inform policies with respect to ecosystems of innovation, strategic development of industries related to AI applications, and human resources development.

6. **Social equity and inclusion**: The gaps this study has identified may establish a case for policy action that targets inclusion as well as social equity. West et al. (2019) claim, "The development of AI must be an inclusive process, one that provides fair distribution of the benefits to wide swaths of society". Policymakers are unlikely to succeed without paying greater attention to narrowing socio-economic inequality or in ensuring that AI technologies align with, and help reach, society-wide goals.

2.4.2 Contribution to existing literature

1. **Evaluation of AI readiness and categorization**: The presented study attempts to propose an integrated understanding of global AI readiness by embedding the dimensions of governance, technical infrastructure, and socioeconomic factors within one framework. Atkinson and Castro (2018) provided the bedrock for the same with their statement of the need to evaluate AI preparedness through several perspectives.
2. **A comparative analysis of governance frameworks**: The paper provides a unique perspective in the current literature by focusing on governance structures and their influence on AI preparedness. According to Cowls et al. (2021), the meaning of governance in the development of AI is crucial in understanding how AI policies are developed. The current research goes a step ahead by carrying out a comparative review of governance systems and examining their appropriateness in stimulating AI innovation.
3. **Highlighting inequalities**: The contribution herein puts a spotlight on global inequalities in AI readiness, supported by empirical evidence that enriches discussions about the digital divide. It also reflects the same idea expressed by Acemoglu and Restrepo (2020), who noted that AI benefits were distributed unequally among different regions and economic classes.
4. **Interdisciplinary approach**: This research makes an interdisciplinary contribution to the existent literature on AI readiness by bridging technological research and governance with analyses of socio-economic factors. The assertion is further supported by Taddeo and Floridi (2018), who draw on the importance of an inclusive approach to competently deal with the complex interrelations among technological, ethical, and socio-economic aspects in AI development.
5. **Policy recommendations**: This study may contribute to the already existing literature in terms of empirical evidence-based policy recommendations. This view is supported by Mittelstadt et al. (2016), who noted that research should not only improve theoretical understanding of the issues but also provide practical solutions to the problems faced in the physical world.

3 Methodology

This chapter describes the methodology that was used to assess the potential of various countries with respect to incorporating future developments in AI technology. The current study relies on several datasets: technological infrastructure, AI readiness, preparedness, and governance. Data analysis was performed using Python, utilizing machine learning packages.

3.1 Data collection and preparation

This study used the following four datasets:

1. **AI readiness index**: Published by Oxford Insights for the year 2023. This dataset assesses how prepared different countries benefit as well as adopt from AI technologies.
2. **AI preparedness index**: Provided by the International Monetary Fund (IMF) for the year 2023. This index measures countries' readiness about infrastructure, policies, and human capital necessary for AI adoption.

3. **World governance indicators (WGI)**: From the World Bank for the year 2022, which is the latest available one. These indicators offer insights into governance quality across countries, including factors such as government effectiveness, regulatory quality, and the rule of law.
4. **ICT data**: Published by the International Telecommunication Union for 2023. The dataset includes information about ICT infrastructure and usage. This data is important for assessing a country's technological environment.

3.2 Data cleaning and merging

First, datasets 1, 2, and 3 (AI Readiness Index, AI Preparedness Index, and World Governance Indicators) were combined into one file. The datasets were logically organized with respect to country levels, making comparison and merge easy. However, dataset 4 was organized at a regional level rather than a country level. This therefore called for the correlating of the regional ICT data with the countries outlined in datasets 1 through 3 in the construction of a consistent dataset. This ensured that the datasets are consistent and hence provided scope for the examination of AI preparedness, readiness, governance, and ICT infrastructure at the country level.

3.3 Correlation analysis

This research started with the construction of a correlation matrix, which is supposed to compare how different metrics relate with one another. Among these are AI readiness, AI preparedness, and multiple governance metrics, including "Voice and Accountability", "Political Stability and Absence of Violence/Terrorism", "Government Effectiveness", "Regulatory Quality", "Rule of Law", and "Control of Corruption". This provided a holistic view of the interaction among these factors, thus giving the possibility of picking out variables that have major influences on a nation's capacity to adopt and implement AI technologies. This preliminary analysis played a significant role in highlighting possible drivers of AI readiness.

3.4 Principal component analysis (PCA)

In the second step, after correlation analysis, principal component analysis (PCA) was applied to reduce the complexity of the dataset. One of the methods for reducing data dimensions is PCA, which is a technique helping to change the large data size into a small number of principal components in which the highest variance is explained.

In this study, a PCA was computed with respect to the fields that pertain to AI readiness, AI preparedness, and the governance indicators of "Voice and Accountability," "Political Stability and Absence of Violence/Terrorism," "Government Effectiveness," "Regulatory Quality," "Rule of Law," and "Control of Corruption." This reduced the large dataset to two key components and provided a clear visualization in two-dimensional space of how different countries stand relative to others in these indices. This stage supported an enhanced understanding of the underlying trends and patterns within the data.

3.5 Clustering analysis using K-means

K-means clustering was then applied to group countries according to their similarities, based on a dataset simplified by PCA. Clustering was performed on the scaled values of the AI preparedness, AI readiness, and the six governance indicators variables.

The K-means algorithm put the countries into three clusters with various levels of readiness, preparedness, and quality of governance. The clustering analysis conducted provided a wealth of information on common features that characterized countries in the same clusters. Moreover, it advanced differences in readiness for AI between countries with various governance frameworks.

The study also examined the effect of technological infrastructure on AI readiness. In this respect, it considered the following set of specific ICT indicators: "Fixed-broadband subscriptions," "Mobile-cellular telephone subscriptions," "Active mobile-broadband subscriptions," "Individuals using the Internet," and "Individuals owning a mobile phone."

The analysis assessed these indicators across different clusters to explain how differences in technological infrastructure influence the extent of AI readiness. Bar charts were employed to illustrate the mean values of these ICT indicators across each cluster, indicating that nations possessing more advanced digital infrastructure generally exhibit elevated levels of AI readiness.

4 Ethical Considerations

The data used in this research was all public domain from credible sources: Oxford Insights, the IMF, the World Bank, and the ITU. No personal or sensitive information has been used; thus, the research is ethical. The information was treated with care to avoid any compromise of its integrity, and analyses were objective.

5 Results

In this chapter, the results are being presented, including the heatmap correlation matrix, PCA and K-mean clustering.

A correlation matrix is represented as a heat map in figure 2. The plot reveals the correlation or coaction of multiple variables on one another, including AI readiness and preparedness metrics, along with governance metrics. Besides that, the heatmap also depicts that there exists a strong correlation between AI readiness and sound governance.

Across governance metrics, countries with high correlation scores, such as sound regulation and rule of law, are generally better placed for AI adoption. Darker colours in this heatmap correspond to more significant values, which indicate that effective governance would be required for AI readiness.

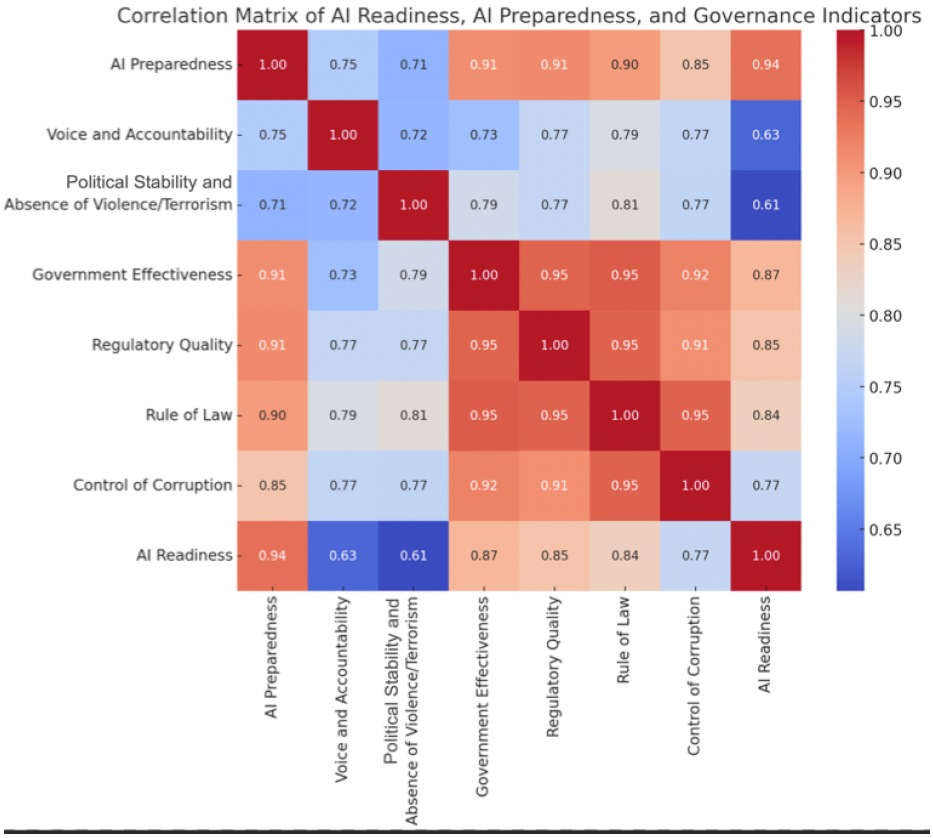

Figure 2. Correlation matrix heatmap

A PCA plot on country-wide AI readiness indicators and governance indicators is presented in figure 3. Points in this graph show countries, and colours show different clusters. Cluster 1 includes countries

like Afghanistan, Ethiopia, and Yemen; cluster 0, countries like Brazil, India, and South Africa; and cluster 2, the United States, Germany, and Japan. The plot provides the visualization of how similar or different countries are concerning AI readiness and governance. Distinct clusters, or groups, underline countries with coherent characteristics. For example, some might include countries that have high scores on both AI readiness and governance, while others may have low scores.

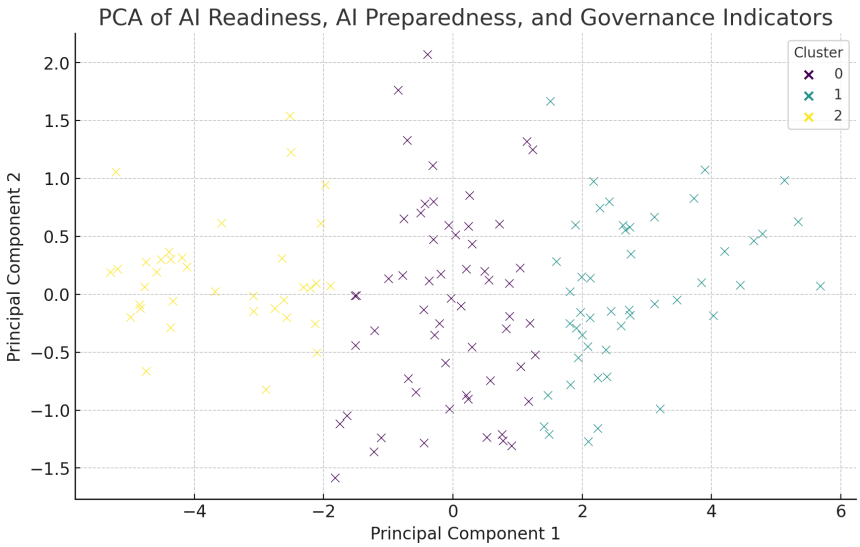

Figure 3. PCA scatter plot

Figure 4 illustrates the averages of some key technological indicators related to broadband and mobile as well as internet subscriptions in the identified clusters. As the bar charts show, a higher degree of readiness for AI is positively related to a better technological infrastructure characterized by far-reaching internet access and mobile phone ownership. It further confirms that a country must ensure a solid technological base to be well-prepared for adopting AI.

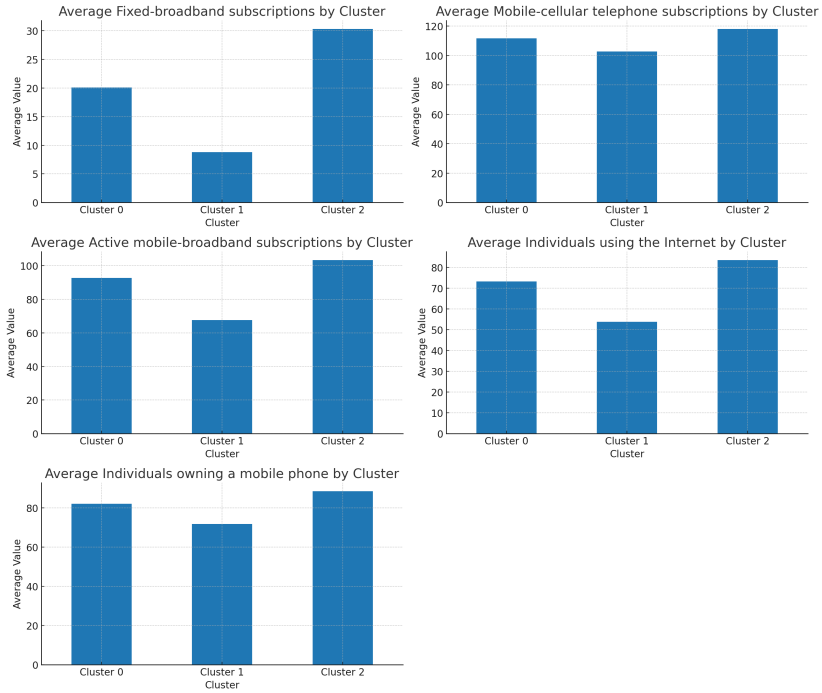

Figure 4. Bar charts of ICT indicators by cluster

Figure 5 consolidates the assessment of AI readiness against governance metrics. In detail, it is seen that across the graph, the average scores of each group clearly outline that countries that are more AI-ready more often have stronger governance metrics in good administration, regulatory excellence, and so on. Therefore, good governance is one of the most important enablers of AI progress and preparedness. Groups with lower governance scores similarly have lower AI readiness, thus indicating that progress in governance may potentially strengthen AI capabilities.

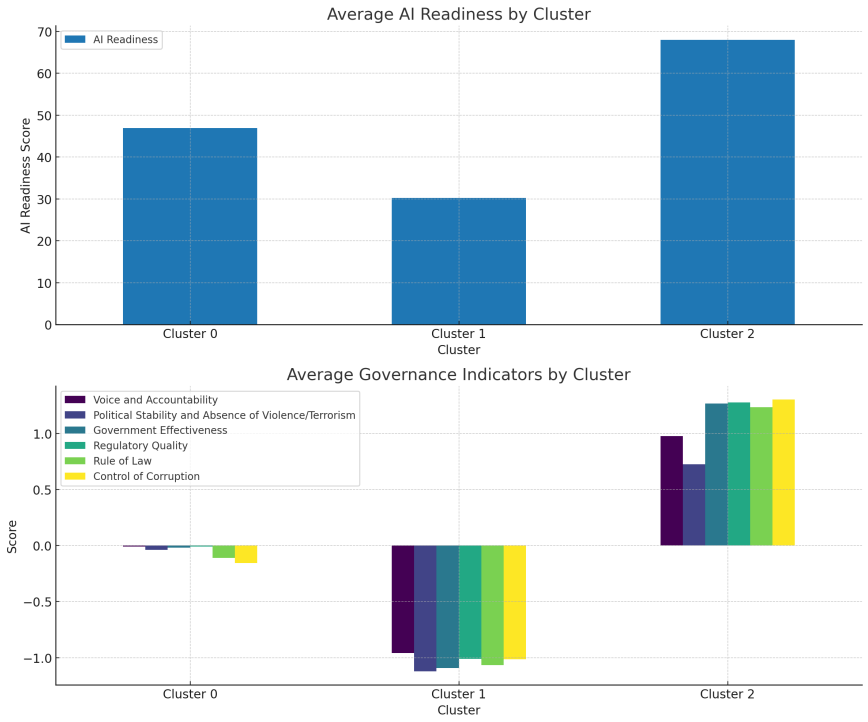

Figure 5. Combined bar charts for AI readiness and governance indicators

5.1 Summary of findings

An overview of the key findings is illustrated in Table 1. Cluster 1 comprises nations exhibiting low scores in AI readiness and preparedness, which are typically marked by inadequate governance and constrained ICT infrastructure. Nations such as Afghanistan, Bangladesh, and Ethiopia exemplify this cluster, facing obstacles like political instability and restricted technological access that impede the adoption of AI.

On the other hand, cluster 0 consists of countries with middle index values of AI readiness and average performances in terms of enhancement of their governance framework and ICT infrastructure. Countries like Brazil, India, and South Africa are examples of emerging markets in which technologies and regulatory frameworks are widely adopted, making them moderately ready for AI.

Cluster 2 comprises countries that are highly prepared towards AI, have strong governance frameworks, and highly developed ICT infrastructures. Examples include the United States, Germany, and Japan, all of which have good governance, extraordinarily strong rule of law, and high technological innovation, hence helpful in the rapid expansion of AI technologies.

Table 1. Sample of countries by AI readiness clusters

Cluster	**Characteristics**	**Representative countries**
Cluster 1	Low AI Readiness, Weak Governance, and Limited ICT Infrastructure	Afghanistan, Angola, Bangladesh, Chad, Ethiopia, Haiti, Nepal, Sudan, Tanzania, Yemen

Cluster 0	Moderate AI Readiness, Developing Governance, and Growing ICT Infrastructure	Argentina, Brazil, India, Indonesia, Kenya, Mexico, Nigeria, Philippines, South Africa, Thailand
Cluster 2	High AI Readiness, Strong Governance, and Advanced ICT Infrastructure	Australia, Canada, Germany, Japan, Netherlands, Singapore, South Korea, Sweden, United Kingdom, United States

6 Discussion

To understand the results of this clustering. The analysis yielded three distinct groups of countries according to their readiness for AI, quality of governance, and levels of ICT infrastructure. These three groups show distinctive characteristics, which provide valuable insight into how these factors interact.

Cluster 1 consists of low AI-ready countries, including smaller governance frameworks of countries such as Afghanistan, Ethiopia, and Yemen, with lower AI technological infrastructure. Almost all the countries in this cluster face huge obstacles, particularly those related to political stability and the technology ecosystem—a problem that seriously dampens the adoption and use of AI. These results allude to the need for deepening improvements building stable governance and basic technology infrastructure, to provide an enabling environment for AI.

Cluster 0 includes countries such as Brazil, India, and South Africa. They perform at moderate levels of AI readiness, but with developing governance and increasing ICT infrastructural reach, embracing more adoption. These countries started out a bit on the lower side but have the potential to improve.

The moderate readiness reflects continuous efforts in improving technological capabilities and governance structures. This group represents emerging markets where investments in technology and policies could further boost the development of AI, indicating a possible rise of these countries to play major roles in the global AI landscape soon.

Cluster 2 comprises of countries such as the United States, Germany, and Japan. These countries are well prepared in AI due to good governance, well-developed regulations as well as technology. The high readiness level of these countries has made it possible for them to place themselves at the forefront of innovation, adoption as well as ethics.

Furthermore, their stable infrastructure and governance frameworks are key factors for them to remain at the forefront of the AI landscape. Moreover, effective governance may also attract investments in the sectors connected with AI technologies. It may also contribute to making such technologies applied in a manner respecting privacy and security. Therefore, it is crucial for countries with low readiness to improve their governance, to advance in the development of AI.

Reliable communication and information technology infrastructure, e.g., mobile telecommunications and broadband, is necessary for building preparedness as well as readiness in AI. The results show that countries with a better and available ICT infrastructure are more likely to be better prepared for AI. Robust, established infrastructure eases data collection and analysis, which is a precondition for creating and applying AI technologies. For the countries in Cluster 1, upgrading their ICT infrastructure might provide an essential foundation to sustain further future AI effort. The countries in Cluster 2 have the minimum infrastructure in place and therefore can easily focus more on upgrading their AI capability.

The findings of this study have several implications for policymakers and development strategies:

- **Low-readiness countries:** Efforts should focus on building good governance structures and investing in basic technological underpinning. These basic investments will create the enabling environment for the successful adoption and deployment of AI. Without such investments, these countries will probably remain behind technologically.
- **Moderate-readiness countries:** This group of countries shall improve their governance framework and increase efforts to expand the ICT infrastructure. The stimulation of innovation, the development of research and development, and—most importantly—the development of

policies that attract private investment will be the way to move such countries to high readiness. It will have them as major players in the world AI market.

- **High-readiness countries:** Such countries are expected to maintain their AI leadership by constantly bettering their standards of governance and ethics. They can establish global AI benchmark for development and use. Further, they must invest in research that can help tackle global challenges, combined with a duty of care to use advanced AI capabilities to benefit not only themselves but also less-developed countries.

Research indicates a digital divide that sees major disparities across the countries in the readiness and ability to practically introduce AI technologies. While some countries are well prepared and advanced in terms of AI innovations, others experience major challenges that prevent them from taking advantage of the opportunities presented by AI. Solving this disparity requires targeted measures to improve governance structures, infrastructure, and educational systems. Global cooperation, linked with knowledge transfer and resource flow, is especially capable of moving the world forward in AI development.

While the research offers valuable insights, it is crucial to acknowledge its limitations. The analysis primarily focused on AI readiness, governance, and ICT infrastructure, relying on available indicators that have their own shortcomings. For example, factors such as cultural attitudes toward technology, levels of education, and private sector involvement also play a significant role in driving AI adoption but are not explicitly addressed in this study. Future research could explore these additional factors, providing a more comprehensive understanding of AI readiness. Over time, longitudinal studies could track developments and offer deeper insights into how countries are progressing in their AI readiness, particularly in terms of the effectiveness of governance reforms and infrastructure investments in enhancing AI capabilities.

7 Conclusion

The outcomes of this research underline role played by governance and technological arrangements in defining a country's preparedness toward AI. This research goes a step further to define three different clusters that explain, with a good status, countries regarding their progress toward AI. The results again underline that directed policies and financial investments are required to make sure that all countries can gain from improvements in AI, hence fostering inclusive and sustainable technological advancement on a global scale.

References

Acemoglu, D. and Restrepo, P. (2020) 'The Race Between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment', *American Economic Review*, 108(6), pp.1488-1542.

AI Citizen (2023) 'Exploring the 2023 Government AI Readiness Index: Key Insights and Global Trends', *The AI Citizen*. Available at: https://theaicitizen.com/p/2023-government-ai-readiness-insights [Accessed 21 Aug. 2024].

Atkinson, R.D. and Castro, D. (2018) *A National Machine Intelligence Strategy for the United States*. Information Technology and Innovation Foundation.

Baguma, D., Mwebaze, E. and Jjemba, P. (2022) 'AI readiness in Africa: Challenges and opportunities', *International Journal of Technology Management*, 67(2), pp. 103-120.

Baguma, R., Nkubito, C. and Byanyima, J. (2022) 'AI readiness in Africa: Governance, infrastructure, and tailored approaches', *African Journal of AI and Data Science*, 7(1), pp.45-62.

Binns, R. (2018) 'Fairness in Machine Learning: Lessons from Political Philosophy', *Proceedings of the 2018 Conference on Fairness, Accountability, and Transparency*, pp.149-159.

Brynjolfsson, E. and McAfee, A. (2014) *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton and Company.

Cath, C., Wachter, S., Mittelstadt, B., Taddeo, M. and Floridi, L. (2018) 'AI and the "Good Society": The US, EU, and UK Approach', *Science and Engineering Ethics*, 24(2), pp.505-528.

Cowls, J., Tsamados, A., Taddeo, M., and Floridi, L. (2021) 'The AI Ethics Guidelines Global Inventory', *Nature Machine Intelligence*, 3(4), pp.351-365.

Diallo, S., Kouassi, A. and Traore, M. (2024) 'Enhancing AI readiness in Africa: A policy framework', *African Journal of Digital Innovation*, 12(1), pp. 45-60.

ERIA (2024) 'Accelerating AI in ASEAN: Addressing Disparities, Challenges, and Regional Policy Imperatives', *ERIA Digital Innovation and Sustainable Economy Centre*. Available at: https://www.eria.org/publications/accelerating-ai-in-asean-addressing-disparities-challenges-and-regional-policy-imperatives [Accessed 21 Aug. 2024].

Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F. and Schafer, B. (2018) 'AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations', *Minds and Machines*, 28(4), pp.689-707.

Global Government Forum (2024) 'Singapore tops AI readiness index', *Global Government Forum*. Available at: https://www.globalgovernmentforum.com/singapore-tops-ai-readiness-index [Accessed 21 Aug. 2024].

IMF (2024) 'Mapping the World's Readiness for AI Shows Prospects Diverge', *IMF Blog*. Available at: https://www.imf.org/en/Blogs/Articles/2024/06/25/mapping-the-worlds-readiness-for-ai-shows-prospects-diverge [Accessed 21 Aug. 2024].

Jöhnk, J., Weißert, M. and Wyrtki, K. (2020) 'Leadership and strategy for AI readiness in organizations', *Journal of Business AI Strategies*, 14(3), pp.123-140.

Mittelstadt, B.D., Allo, P., Taddeo, M., Wachter, S. and Floridi, L. (2016) 'The Ethics of Algorithms: Mapping the Debate', *Big Data and Society*, 3(2), pp.1-21.

Montoya, S. and Rivas, M. (2019) 'AI preparedness in developing countries: The role of government policies and practices', *Development and AI Journal*, 11(2), pp.67-83.

Nortje, A. and Grobbelaar, S.S. (2020) 'Organizational governance in AI implementation: A strategic approach', *International Journal of AI in Business*, 9(4), pp.99-115.

Nzobonimpa, A. and Savard, P. (2023) 'Ethical AI Governance: Balancing Innovation with Accountability', *Journal of Global Technology Studies*, 19(4), pp. 455-478.

Pandyaswargo, A.H., Onoda, H. and Nagata, K. (2023) 'Mobility and AI: Future perspectives', *Journal of Transport and AI*, 58(3), pp. 67-83.

Pandyaswargo, A.H., Tou, Y., Li, M. and Ichimura, M. (2022) 'AI applications in the electric vehicle industry: Market potential and integration challenges', *Energy AI Journal*, 5(3), pp.89-103.

Pandyaswargo, A.H., Tou, Y., Li, M. and Ichimura, M. (2023) 'Global patterns of AI adoption in the mobility sector: Smart parking and lane tracing technologies', *Journal of AI in Mobility*, 6(2), pp.45-58.

Pathak, G.S. and Bansal, R. (2022) 'AI adoption in organizations: Factors influencing readiness', *International Journal of AI Business Strategies*, 12(1), pp.23-36.

Porcher, S. (2020) 'Global AI readiness and the digital divide: An analysis of disparities', *Journal of Global Technology*, 5(4), pp. 25-40.

Porcher, S. (2020) 'Global patterns in AI readiness: A comparative analysis of AI capabilities and preparedness', *Journal of Global Technology Studies*, 8(4), pp.112-128.

Porter, M.E. and Heppelmann, J.E. (2014) 'How Smart, Connected Products Are Transforming Competition', *Harvard Business Review*, 92(11), pp.64-88.

Taddeo, M. and Floridi, L. (2018) 'How AI Can Be a Force for Good', *Science*, 361(6404), pp.751-752.

West, D. M., Allen, J. R., and Gorham, M. (2019) *Brookings AI and Emerging Technology Initiative*. Brookings Institution.