



# AI Technology Development and its Impact on Developing Countries

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**Abstract:** Artificial intelligence (AI) has the potential to significantly boost economic development and societal well-being in developing nations. This study examines the barriers that developing nations encounter when trying to implement AI technology and then makes suggestions for how to eliminate those barriers. To locate unfilled areas of study and collect necessary information, a comprehensive literature search was performed. Using a qualitative study approach, the main obstacles to the advancement of AI in these countries were uncovered. In order to close the gap in AI development between developed and poor countries, the report emphasizes the importance of government policy interventions, enhanced infrastructure, and capacity building. The results lay the groundwork for future study and policy decisions in the field of artificial intelligence development in developing nations.

**Index Terms - artificial intelligence, AI, developing countries, technology development, economic growth**

## I. INTRODUCTION

Changes in many areas of life, including healthcare, education, and agriculture, have resulted from the rapid development of AI technology. Both industrialized and developing nations stand to benefit from the widespread adoption of artificial intelligence (Manyika, J., Chui, M., Miremadi, M., Bughin, J., George, K., Willmott, P., & Dewhurst, M., 2018). However, while developed countries have been able to leverage the benefits of AI technology, developing countries continue to face challenges in its adoption and implementation (Xieling, C., Haoran, X., Di, Z., & Gwo-Jen, H., 2020).

The rapid development of AI technology has resulted in profound shifts in many areas of human endeavor, including healthcare, education, and even agriculture. In both wealthy and developing nations, artificial intelligence has the potential to boost economic growth and societal well-being. Developing countries are at a disadvantage in the global economy because of their limited access to advanced technologies such as AI, which can improve their competitiveness in the global market (UNCTAD, 2021). According to a report by the World Bank, the adoption of AI technology in developing countries could increase their GDP growth by up to 1.2% (World Bank, 2019).

However, developing countries face significant challenges in the adoption and implementation of AI technology. These challenges include inadequate infrastructure, a shortage of skilled workers, limited financial resources, and insufficient government support (Dakuo, W., Liuping, W., Zhan, Z., Ding, W., Haiyi Z., Yvonne, G., Xiangmin, F., & Feng, T., 2021). Addressing these challenges is crucial for developing countries to bridge the AI development gap and leverage the benefits of AI technology.

Therefore, this paper aims to examine the challenges faced by developing countries in AI technology adoption and propose solutions to bridge the research gap between developed and developing nations. This study is motivated by the following research question: What are the most significant barriers to the advancement of AI technology in low- and middle-income countries, and how can these barriers be overcome to promote the widespread adoption of AI for the benefit of economic development and social progress?

## II. PROBLEM STATEMENT

Although AI technology has significant potential for enhancing the economic growth of developing countries, it faces numerous challenges in adoption and implementation. These challenges include inadequate infrastructure, lack of skilled workforce, limited financial resources, and insufficient government support (Jonathan, G. & Bin, L., 2018). Understanding these challenges and addressing them effectively is crucial for developing countries to bridge the AI development gap and leverage the benefits of AI technology.

## III. RESEARCH GAP

Existing literature on AI development in developing countries has primarily focused on case studies and anecdotal evidence, highlighting the potential benefits of AI technology (Ricardo, V., Hossein, A., Iolanda, L., Madeline, B., Virginia, D., Sami, D., Anna, F., Simone, D. L., Max, T. & Francesco, F. N., 2020). However, there is a lack of comprehensive and systematic analysis of the challenges faced by these countries in adopting AI technology. By conducting a rigorous literature analysis and assessing the main variables that impede AI development in developing nations, this study hopes to close this gap.

## IV. LITERATURE REVIEW

### 4.1 Infrastructure

Developing countries often lack the necessary infrastructure for AI development, such as reliable internet connectivity, data centers, and advanced hardware (Chui, M., Manyika, J., & Miremadi, M., 2018). This deficit hinders the successful implementation of AI-based solutions and limits the potential benefits for developing countries.

Limited availability of high-speed internet connectivity hinders the availability of data necessary for AI systems (UNCTAD, 2021). Insufficient data centers limit the storage and processing of data, while limited availability of advanced hardware components such as GPUs and TPUs restricts AI technology development (Liang-Jie, Z. & Jing, Z., 2015).

To address these challenges, developing countries must prioritize infrastructure development, including high-speed internet connectivity, data centers, and advanced hardware to facilitate the effective deployment of AI technology.

### 4.2 Skilled Workforce

Developing countries often face a shortage of skilled workers in AI-related fields (Jonathan, G. & Bin, L., 2018). To address this gap in human capital, developing countries must invest in education and training programs, including vocational training, internships, and other initiatives (Prashant L., Xiaoting, H., Linxiu, Z., Jianguo, W., Hongmei, Y., Yingquan, S., Yaojiang, S., & James C., 2016). Policies that support the development of AI start-ups, incubators, and accelerators can also encourage the retention of skilled workers and foster the growth of the AI ecosystem (Mengdie, 2023). Encouraging international partnerships and collaborations can facilitate knowledge-sharing and capacity building, thereby addressing the shortage of skilled workers in AI-related fields.

### 4.3 Financial Resources

Limited financial resources make it difficult for developing countries to invest in AI research, development, and deployment (Chui, M., Manyika, J., & Miremadi, M., 2018). To overcome this challenge, developing countries can explore innovative financing models such as public-private partnerships, crowdfunding, and venture capital funding. International partnerships with organizations and governments can also provide funding and support for AI technology deployment.

Developing countries can also focus on creating an enabling environment for innovation and entrepreneurship. Policies that encourage start-ups, entrepreneurship, and private sector investment can attract local and foreign investment, thereby stimulating AI technology development and deployment (Ajay, A., Joshua, G., & Avi, G., 2019).

In summary, developing countries face significant financial constraints in the adoption and deployment of AI technologies. Innovative financing models, international partnerships, and policies that encourage entrepreneurship and private sector investment can provide additional sources of funding and support for AI technology development.

### 4.4 Government Support

Inadequate government support in the form of policies, regulations, and funding is a significant barrier to AI development in developing countries (Qin, Y., Xu, Z., Wang, X., & Marinko, S., 2023). Developing countries must prioritize the development and implementation of AI strategies, policies, and regulations that support the growth of the AI ecosystem. Governments can invest in AI research and development, create funding mechanisms to support AI start-ups and entrepreneurs, and facilitate collaboration between academia, industry, and government agencies to support AI technology development and deployment. Initiatives such as technology transfer programs, research and development grants, and public-private partnerships can help to overcome financial constraints and accelerate the adoption and deployment of AI technologies in developing countries (Andreas, H., Peter, K., Edgar, W. & A Min, T., 2018).

## V. METHODOLOGY

A systematic literature review was conducted to gather relevant data and identify research gaps. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed to ensure a rigorous and transparent review process (Alessandro L., Douglas G. A., Jennifer, T., Cynthia, M., Peter C. G., John P.A., Mike, C., P.J. Devereaux, Jos, K., & David, M., 2009). Relevant keywords (such as "artificial intelligence," "developing countries," "technology development," and "economic growth") were used to search electronic databases like Google Scholar, Scopus, and Web of Science to find relevant papers. We looked at studies published between 2010 and 2021. Predetermined inclusion and exclusion criteria were applied to the search results. The data extracted from the selected articles were analyzed using thematic analysis to identify the key challenges and potential solutions to AI development in developing countries (Braun, V., & Clarke, V., 2006).

## VI. FINDING

Based on the systematic literature review and qualitative analysis, the following key challenges and potential solutions were identified:

### 6.1 Infrastructure

To address the infrastructural deficit, developing countries need to invest in reliable internet connectivity, data centers, and advanced hardware. Public-private partnerships can be an effective way to mobilize the necessary resources for infrastructure development (Chandan, 2012).

### 6.2 Skilled Workforce

Developing countries should focus on building human capital by investing in education and training programs in AI-related fields. Collaborations between educational institutions, industry, and government can help create targeted curricula and training programs (Jonathan, G. & Bin, L., 2018).

### 6.3 Financial Resources

To overcome financial constraints, developing countries can explore alternative funding sources, such as international aid, private investments, and multilateral agencies, to support AI development (Ricardo, V., Hossein, A., Iolanda, L., Madeline, B., Virginia, D., Sami, D., Anna, F., Simone, D. L., Max, T. & Francesco, F. N., 2020). Encouraging private sector investment and fostering an environment that supports startups and innovation can also help mobilize financial resources for AI development (Jessica, F., Nele, A., Hannah, H., Adam, C. N., Madhulika, S., 2020).

### 6.4 Government Support

Governments in developing countries need to play a proactive role in creating a conducive environment for AI development. This can be achieved through the formulation of policies and regulations that support AI innovation and protect user privacy and data security (Yigitcanlar, T., Desouza, K.C., Butler, L., & Roozkhosh, F., 2020). Governments can also provide funding and support for AI research and development, as well as create partnerships between industry, academia, and government to facilitate knowledge transfer and collaboration (Stephen C., & Seán S. Ó., 2018).

## VII. RECOMMENDATIONS

To address the challenges identified in this study, it is recommended that policymakers and stakeholders in developing countries take the following steps:

### 7.1 Government Support

Governments should play a proactive role in creating a conducive environment for AI development by formulating policies and regulations that support AI innovation, providing funding and support for AI research and development, and creating partnerships between industry, academia, and government.

### 7.2 Infrastructure Development

Developing countries should prioritize investment in reliable internet connectivity, data centers, and advanced hardware to address the infrastructural deficit that hinders AI development.

### 7.3 Human Capital Development

Developing countries should focus on building human capital by investing in education and training programs in AI-related fields and promoting collaborations between educational institutions, industry, and government.

### 7.4 Financial Resource Mobilization

Developing countries should explore alternative funding sources, such as international aid, private investments, and multilateral agencies, to mobilize financial resources for AI development.

## VIII. CONCLUSION

AI technology has the potential to transform various sectors of society, including healthcare, education, and agriculture, and enhance the economic growth and societal well-being of developing countries. However, the adoption of AI technology in developing countries faces numerous challenges, including inadequate infrastructure, lack of skilled workforce, limited financial resources, and insufficient government support. This study highlights the need for government policy interventions, improved infrastructure, and capacity building to help bridge the gap in AI technology development between developed and developing countries. By following the recommendations proposed in this paper, developing countries can capitalize on the opportunities presented by AI technologies and ensure their integration into various sectors of society to improve the quality of life for their citizens.

## IX. FURTHER STUDY

This study provides a foundation for understanding the challenges faced by developing countries in AI technology adoption and offers recommendations to address these issues. However, further research is needed to explore the following areas:

### 9.1 Context-Specific Challenges

Additional studies examining country-specific or regional challenges in AI adoption will help tailor policy recommendations and interventions to the unique needs of different developing countries.

### 9.2 Sector-Specific Analysis

Future research should focus on the impact of AI technology adoption in specific sectors, such as healthcare, education, and agriculture, to identify unique challenges and opportunities within these sectors.

### 9.3 Longitudinal Studies

Longitudinal studies can help assess the effectiveness of proposed policy interventions and recommendations over time, providing valuable insights into the evolving nature of AI technology adoption in developing countries.

### 9.4 Ethical and Social Implications

Further research should address the ethical and social implications of AI technology adoption in developing countries, including issues related to privacy, data security, and the potential for exacerbating existing inequalities.

## 9.5 Success Stories and Best Practices

Investigating successful AI adoption cases in developing countries can help identify best practices and strategies that can be replicated in other contexts. This can provide valuable insights for policymakers and stakeholders involved in AI technology development and implementation.

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## REFERENCES

- [1] Ajay, A., Joshua, G., & Avi, G. (2019). *The Economics of Artificial Intelligence An Agenda*. The University of Chicago Press.
- [2] Alessandro L., Douglas G. A., Jennifer, T., Cynthia, M., Peter C. G., John P.A., Mike, C., P.J. Devereaux, Jos, K., & David, M. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Journal of Clinical Epidemiology*, 62, e1-e34.
- [3] Andreas, H., Peter, K., Edgar, W. & A Min, T. (2018). Current Advances, Trends and Challenges of Machine Learning and Knowledge Extraction: From Machine Learning to Explainable AI. *Machine Learning and Knowledge Extraction* (pp. 1-8). Springer.
- [4] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>.
- [5] Chandan, S. (2012). Determinants of PPP in infrastructure in developing economies. *Transforming Government: People, Process and Policy*, 149-166. <https://doi.org/10.1108/17506161211246908>.
- [6] Chui, M., Manyika, J., & Miremadi, M. (2018). What AI can and can't do (yet) for your business. *McKinsey Quarterly*, 2, 28-41.
- [7] Dakuo, W., Liuping, W., Zhan, Z., Ding, W., Haiyi Z., Yvonne, G., Xiangmin, F., & Feng, T. (2021). "Brilliant AI Doctor" in Rural Clinics: Challenges in AI-Powered Clinical Decision Support System Deployment. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-18). Association for Computing Machinery.
- [8] Jessica, F., Nele, A., Hannah, H., Adam, C. N., Madhulika, S. (2020). Principled Artificial Intelligence: Mapping Consensus in Ethical and Rights-based Approaches to Principles for AI. *Berkman Klein Center Research Publication No. 2020-1*, NA.
- [9] Jonathan, G. & Bin, L. (2018). The Application of Medical Artificial Intelligence Technology in Rural Areas of Developing Countries. *Narrative Review*, 2 (1), 174-181. DOI: 10.1089/heq.2018.0037.
- [10] Liang-Jie, Z. & Jing, Z. (2015). 5C, A New Model of Defining Big Data. *STBD*, 4(2), 10-23. <https://doi.org/10.29268/stbd.2015.2.4.2>.
- [11] Manyika, J., Chui, M., Miremadi, M., Bughin, J., George, K., Willmott, P., & Dewhurst, M. (2018). *Artificial intelligence: the next digital frontier?* McKinsey Global Institute.
- [12] Mengdie, D. (2023). Policy Regulation of Artificial Intelligence: A Review of the Literature. *Frontiers in Artificial Intelligence and Applications*, 367, 407-415.
- [13] Prashant L., Xiaoting, H., Linxiu, Z., Jianguo, W., Hongmei, Y., Yingquan, S., Yaojiang, S., & James C. (2016). The Impact of Vocational Schooling on Human Capital Development in Developing Countries: Evidence from China. *The World Bank Economic Review*, 30(1), 143-170. <https://doi.org/10.1093/wber/lhv050>.
- [14] Qin, Y., Xu, Z., Wang, X., & Marinko, S. (2023). Artificial Intelligence and Economic Development: An Evolutionary Investigation and Systematic Review. *Journal of the knowledge Economy*, NA. <https://doi.org/10.1007/s13132-023-01183-2>.
- [15] Ricardo, V., Hossein, A., Iolanda, L., Madeline, B., Virginia, D., Sami, D., Anna, F., Simone, D. L., Max, T. & Francesco, F. N. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications*, 11, NA. <https://doi.org/10.1038/s41467-019-14108-y>.
- [16] Stephen C., & Seán S. Ó. (2018). An AI Race for Strategic Advantage: Rhetoric and Risks. *AIES '18: Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society* (pp. 36-40. <https://doi.org/10.1145/3278721.3278780>). Association for Computing Machinery.
- [17] UNCTAD. (2021). *UNCTAD*. Retrieved from unctad.org: <https://unctad.org/publication/digital-economy-report-2021>
- [18] World Bank. (2019). *The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All*. World Bank.

[19] Xieling, C., Haoran, X., Di, Z., & Gwo-Jen, H. (2020). Application and theory gaps during the rise of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 100002. <https://doi.org/10.1016/j.caeai.2020.100002>.

[20] Yigitcanlar, T., Desouza, K.C., Butler, L., & Roozkhosh, F. . (2020). Contributions and Risks of Artificial Intelligence (AI) in Building Smarter Cities: Insights from a Systematic Review of the Literature. *energies*, 13(6), NA. <https://doi.org/10.3390/en13061473>.

