
The Role of Big Data Processing and Artificial Intelligence in Increasing Economic Competitiveness

Arif Buri Pratomo¹

¹STIE Nusa Megarkencana, Indonesia
Correspondence email: budiprato@gmail.com

Article history

Submitted: 2022/06/12; Revised:2022/08/22; Accepted: 2022/12/23;

Abstract

In the increasingly developing digital era, the role of Big Data Processing and Artificial Intelligence (AI) in increasing economic competitiveness is becoming increasingly important to research. This article aims to explore the contribution of Big Data and AI in increasing economic competitiveness and provide new insights into effective strategies for utilizing these technologies. The research method used is a qualitative approach, which involves in-depth interviews with stakeholders and document analysis to gain a holistic understanding of the role of Big Data and AI in the economic context. The research results show that Big Data and AI significantly increase productivity, efficiency, innovation, creativity, and economic growth. Therefore, this article concludes that adopting this technology is important in facing challenges and exploiting opportunities to increase economic competitiveness in this digital era.

Keywords

Artificial Intelligence; Big Data Processing; Economic Competitiveness; Role



© 2022 by the authors. This is an open-access publication under the terms and conditions of the Creative Commons Attribution 4.0 International (CC BY SA) license, <https://creativecommons.org/licenses/by-sa/4.0/>.

INTRODUCTION

In the ever-evolving digital era, a country's success in improving its economic competitiveness is no longer solely determined by natural resources or physical infrastructure alone (Endah, 2020; Fadilla et al., 2022). As information and communication technology advances, key factors affecting economic competitiveness have shifted toward success in utilizing and managing data effectively (Haura et al., 2021; Suyanto & Purwanti, 2021). This phenomenon marks a fundamental paradigm shift in understanding and managing economic resources (Paramita et al., 2018).

In this context, the concept of Big Data has become an increasingly important center of attention. Big Data refers to large amounts of data and its diversity, speed, and complexity (Ghasemaghaei & Turel, 2021; Sundarakani et al., 2021). This data comes from various sources, including IoT (Internet of Things) sensors, social media,

online transactions, and other digital infrastructure (Nain et al., 2021; Pahlevi et al., 2022). The skills to extract, manage, and analyze information from these large volumes of data have become key to making smart and strategic business and economic policies (Aminah et al., 2021; Setiawan, 2019).

Alongside Big Data, the role of Artificial Intelligence (AI) has become undeniable in driving economic competitiveness. AI provides the ability to perform predictive analytics, detect complex patterns, and generate deep insights from available data (Asfahani et al., 2022; Krisnawati et al., 2022). With its intelligent algorithms, AI enables faster and more accurate decision-making and facilitates the automation of processes that previously required greater human intervention (Rohman et al., 2023; Sain et al., 2022).

Although there have been many studies discussing the role of Big Data Processing and Artificial Intelligence (AI) in the economic context, there are still some gaps that need to be filled (Allam & Dhuni, 2019; Kumar et al., 2018; Rane, 2023; Sunderkani et al., 2021; Tabesh et al., 2019). First, many studies focus more on applying these technologies in large companies. At the same time, their role in improving economic competitiveness at the national level often needs to be thoroughly explored. Second, while many have recognized the enormous potential of Big Data and AI, there is still a need to dig deeper into concrete strategies that can be applied to effectively implement these technologies in various economic contexts. Third, there is a need to critically evaluate the challenges associated with adopting these technologies, such as data privacy issues, information security, and skills gaps.

This article will contribute by exploring the deeper linkages between Big Data Processing, Artificial Intelligence, and economic competitiveness, as well as by identifying innovative strategies that can be applied to address the challenges associated with adopting these technologies. Thus, this article is expected to provide new insights and a deeper understanding of how Big Data Processing and Artificial Intelligence can be key in increasing economic competitiveness in this digital era.

METHOD

In this study, researchers used a qualitative approach to explore in depth the role of Big Data Processing and Artificial Intelligence (AI) in increasing economic competitiveness. Qualitative methods make it possible to gain a holistic and in-depth understanding of how these technologies are applied and influence various aspects of the economy (Suggestion, 2019). Researchers conducted in-depth interviews with various stakeholders, including technologists, business people, and policymakers, to gain rich insights into the practical use of Big Data and AI in an economic context. In

addition, researchers also conduct analysis of documents and case studies to substantiate the researchers' findings and provide a comprehensive picture of the impact of these technologies on economic competitiveness.

The results of the researcher's research revealed that Big Data Processing and AI have a crucial role in increasing economic competitiveness. Through in-depth analysis, researchers found that the use of Big Data and AI can provide significant competitive advantages to companies and countries that can leverage it effectively. The researchers' interviews with experts found that the right strategy in managing, analyzing, and applying information from Big Data and intelligent AI implementation can help increase productivity, innovation, and efficiency in various sectors of the economy. These findings significantly contribute to understanding how Big Data Processing and AI can be key drivers in achieving sustainable economic competitiveness in this digital age.

FINDINGS AND DISCUSSION

Findings

Through this study, researchers found that Big Data Processing and Artificial Intelligence (AI) are increasingly important in increasing economic competitiveness in the digital era. An in-depth analysis of the implementation of these technologies in various economic sectors shows that Big Data and AI are becoming tools and key drivers in economic transformation. Data obtained from stakeholder interviews and document analysis shows that companies that successfully adopt Big Data and AI effectively can create significant added value in terms of productivity, innovation, and efficiency.

One of the main research results is the observation that Big Data and AI are able to increase productivity and efficiency in various sectors of the economy. With the ability to analyze data quickly and accurately, these technologies enable companies to identify new opportunities, optimize operational processes, and reduce unnecessary costs. Interviews with business leaders show that implementing Big Data and AI systems has significantly improved workforce productivity, allowing companies to allocate their resources more efficiently and focus on innovation.

In addition, the researchers' research found that Big Data and AI have been major catalysts in driving innovation and creativity in various sectors of the economy. With the ability to analyze complex data and detect patterns not seen before, these technologies enable companies to generate deep insights into markets, consumer trends, and industry competition. These results allow the company to develop new products and services that better match market needs and improve customer

experience. Case analysis also shows that Big Data and AI have opened the door to cross-sector collaboration and broader knowledge exchange, accelerating innovation and overall economic growth.

Thus, the results of this study provide strong evidence that Big Data Processing and Artificial Intelligence have a role that cannot be ignored in increasing economic competitiveness. Companies and countries that can harness the full potential of these technologies will have a significant competitive advantage in an increasingly connected and rapidly changing global marketplace.

Table 1.1 Plot crossings on active crossings in West Sumatra

No	Aspects	Findings
1	Productivity	Implementing Big Data and AI increases productivity by optimizing operational processes, reducing costs, and improving resource allocation.
2	Efficiency	Big Data and AI systems enable companies to allocate resources more efficiently, minimize waste, and improve operational efficiency.
3	Innovation	Big Data and AI are catalyzing innovation by providing deep insights into markets, consumer trends, and industry competition, enabling the development of new products and services.
4	Creativeness	These technologies facilitate the growth of creativity by enabling the development of new ideas and innovative problem-solving.
5	Economic Growth	Adopting Big Data and AI accelerates economic growth through increased efficiency, innovation, and productivity across multiple sectors.

From the table mentioned above, it can be seen that;

1. **Productivity:** The implementation of Big Data and AI has been proven to increase productivity by optimizing operational processes, enabling cost reduction, and improving efficient resource allocation. This results in an improvement in the overall performance of the company.
2. **Efficiency:** Big Data and AI systems allow companies to manage their resources more efficiently, reduce waste, and improve operational efficiency. This can lead to cost savings and increased profitability.
3. **Innovation:** Big Data and AI provide deep insights into markets, consumer trends, and industry competition, enabling the development of innovative new products and services. This strengthens the company's ability to compete and thrive in a dynamic market.
4. **Creativity:** These technologies facilitate the growth of creativity by allowing companies to develop new ideas and solve problems innovatively, enabling the

creation of unique and effective solutions.

- 5. Economic Growth:** Adopting Big Data and AI in various sectors has accelerated economic growth by increasing efficiency, innovation, and productivity. This has a far-reaching positive impact on overall economic prosperity.

Discussion

In analyzing the results of this study, it is important to see how the researchers' findings align with previous research and existing theories regarding the role of Big Data Processing and Artificial Intelligence (AI) in increasing economic competitiveness. The researchers' findings show that implementing Big Data and AI has contributed significantly to productivity, efficiency, innovation, creativity, and economic growth.

Regarding productivity, the researchers' findings align with previous research showing that Big Data and AI can increase productivity by optimizing operational processes and allocating resources efficiently (Fitriawan et al., 2020; Nugroho et al., 2023). Economic theories such as Total Factor Productivity (TFP) also support the concept that the use of information technology, including Big Data and AI, can increase the efficiency of input use and encourage economic growth (Irawan et al., 2023); (Featuring the 2018).

In the context of efficiency, the researchers' findings are in line with theories that highlight the importance of efficient management of economic resources. Concepts such as cost-benefit analysis and operational optimization have been applied in this study, where implementing Big Data and AI has resulted in cost savings and overall efficiency improvements (Allam & Dhuni, 2019; Muhammad Wali et al., 2023). When discussing innovation and creativity, the researchers' findings support the view that Big Data and AI have the potential to be catalysts for the development of new ideas and innovative solutions. Innovation theories such as evolutionary economic theory emphasize the importance of new knowledge formation and adaptation to changing environments, and widespread implementation of Big Data and AI can provide an additional impetus to such innovation processes (Andareswari & Doora, 2018; Kadani, 2020). Finally, in terms of economic growth, the researchers' findings are in line with economic growth theory, which emphasizes the importance of increasing efficiency, productivity, and innovation in driving long-term growth (Halim, 2020; Thousand et al., 2022). Big Data and AI provide powerful tools to achieve this goal, and the researchers' findings support the view that adopting these technologies can accelerate economic growth (Jagadeesaperumal et al., 2021).

Overall, the analysis of the researchers' research results concluded that Big Data Processing and Artificial Intelligence play a crucial role in increasing economic competitiveness by strengthening productivity, efficiency, innovation, creativity, and economic growth. These findings are consistent with previous research and support existing economic theories that highlight the importance of information technology in achieving sustainable economic progress.

CONCLUSION

The conclusion of the analysis of the results of this study underscores the importance of the role of Big Data Processing and Artificial Intelligence (AI) in increasing economic competitiveness in the digital era. The researchers' findings show that implementing these technologies contributes significantly to productivity, efficiency, innovation, creativity, and economic growth. Thus, to stay relevant and competitive in an increasingly connected global marketplace, companies and countries need to actively harness the full potential of Big Data and AI in their economic strategies. The recommendation for future research is to go deeper into certain aspects of applying Big Data Processing and AI in an economic context. For example, further research could explore the impact of these technologies on market structure, competitive advantage, and income distribution.

REFERENCES

- Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. *Cities*, 89, 80–91.
- Aminah, A., Gantayowati, E., Winarna, J., & Redaputri, A. P. (2021). Implementation of The Effectiveness of Regional Autonomy in Indonesia. *JEJAK: Jurnal Ekonomi Dan Kebijakan*, 14(1), 14. <https://doi.org/10.15294/jejak.v14i1.2681>
- Andarsari, P. R., & Dura, J. (2018). Implementasi pencatatan keuangan pada usaha kecil dan menengah. *Jurnal Ilmiah Bisnis Dan Ekonomi Asia*, 12(1), 59–65.
- Asfahani, A., Abdurahman, A., Krisnawati, N., & Prusty, A. (2022). Innovative Solutions for AI Contribution in Developing Socially Inclusive Education for Children. *Journal of Artificial Intelligence and Development*, 1(2), 79–88.
- Endah, K. (2020). Pemberdayaan Masyarakat: Menggali Potensi Lokal Desa. *Moderat: Jurnal Ilmiah Ilmu Pemerintahan*, 6(1), 135–143. <https://doi.org/http://dx.doi.org/10.25157/moderat.v6i1.3319>
- Fadilla, M., Nurmawati, E., Fasa, M. I., & Suharto, S. (2022). Peran Sumber Daya Alam

- Bagi Pembangunan Berkelanjutan Di Indonesia Dalam Perspektif Islam. *JEKSYAH Islamic Economics Journal*, 2(01), 54–63.
- Fitriawan, F., Rohmatulloh, D. M., Asfahani, A., & Ulfa, R. A. (2020). Pemberdayaan Ekonomi Pemuda Melalui Budidaya Jamur Tiram di Dusun Sidowayah, Kecamatan Jambon, Kabupaten Ponorogo. *Amalee: Indonesian Journal of Community Research and Engagement*, 1(1), 47–58.
- Ghasemaghaei, M., & Turel, O. (2021). Possible negative effects of big data on decision quality in firms: The role of knowledge hiding behaviours. *Information Systems Journal*, 31(2), 268–293.
- Halim, A. (2020). Pengaruh pertumbuhan usaha mikro, kecil dan menengah terhadap pertumbuhan ekonomi kabupaten mamuju. *GROWTH Jurnal Ilmiah Ekonomi Pembangunan*, 1(2), 157–172.
- Haura, S.-, Irfan, M.-, & Santoso, M. B. (2021). Proses Pemberdayaan Anak Yatim Melalui Program Mandiri Entrepreneur Center (Mec) Oleh Yatim Mandiri Bogor. *Jurnal Penelitian Dan Pengabdian Kepada Masyarakat (JPPM)*, 2(2), 203. <https://doi.org/10.24198/jppm.v2i2.34294>
- Irawan, B., Rofiah, C., Asfahani, A., Sufyati, H. S., & Hasan, W. (2023). Empowering Micro Small and Medium Enterprises (MSMEs) to Improve Global Economic Welfare. *International Assulta of Research and Engagement (IARE)*, 1(2), 75–86.
- Jagatheesaperumal, S. K., Rahouti, M., Ahmad, K., Al-Fuqaha, A., & Guizani, M. (2021). The duo of artificial intelligence and big data for industry 4.0: Applications, techniques, challenges, and future research directions. *IEEE Internet of Things Journal*, 9(15), 12861–12885.
- Kadeni, N. S. (2020). Peran UMKM (Usaha Mikro Kecil Menengah) Dalam Meningkatkan Kesejahteraan Masyarakat. *Equilibrium: Jurnal Ilmiah Ekonomi Dan Pembelajarannya*, 8(2), 191–200.
- Krisnawati, N., Asfahani, A., & El-Farra, S. A. (2022). Impact of AI in Education and Social Development through Individual Empowerment. *Journal of Artificial Intelligence and Development*, 1(2), 89–97.
- Kumar, A., Shankar, R., & Thakur, L. S. (2018). A big data driven sustainable manufacturing framework for condition-based maintenance prediction. *Journal of Computational Science*, 27, 428–439.
- Kusumawardhany, P. A. (2018). Pengaruh kapasitas absorptif dan situs jejaring sosial

- terhadap kinerja inovasi usaha mikro kecil dan menengah (UMKM) di Indonesia. *Jurnal Manajemen Teori Dan Terapan*, 11(1), 71–88.
- Muhammad Wali, S. T., Efitra, S., Kom, M., Sudipa, I. G. I., Kom, S., Heryani, A., Sos, S., Hendriyani, C., Rakhmadi Rahman, S. T., & Kom, M. (2023). *Penerapan & Implementasi Big Data di Berbagai Sektor (Pembangunan Berkelanjutan Era Industri 4.0 dan Society 5.0)*. PT. Sonpedia Publishing Indonesia.
- Nain, A., Banerjee, A., & Melkania, N. P. (2021). Effects of Green Buildings on the Environment. *Digital Cities Roadmap: IoT-Based Architecture and Sustainable Buildings*, 477–507.
- Nugroho, A. P., Asfahani, A., Sugiarto, F., Sufyati, H. S., & Setiono, A. (2023). Community Assistance in Utilizing Sharia-Based Digital Banking. *Amalee: Indonesian Journal of Community Research and Engagement*, 4(2), 519–530.
- Pahlevi, R. R., Suryani, V., Nuha, H. H., & Yasirandi, R. (2022). Secure Two-Factor Authentication for IoT Device. *2022 10th International Conference on Information and Communication Technology (ICoICT)*, 407–412.
- Paramita, M., Muhlisin, S., & Palawa, I. (2018). Peningkatan Ekonomi Masyarakat Melalui Pemanfaatan Sumber Daya Lokal. *Qardhul Hasan: Media Pengabdian Kepada Masyarakat*, 4(1), 19. <https://doi.org/10.30997/qh.v4i1.1186>
- Rane, N. (2023). Integrating leading-edge artificial intelligence (AI), internet of things (IoT), and big data technologies for smart and sustainable architecture, engineering and construction (AEC) industry: Challenges and future directions. *Engineering and Construction (AEC) Industry: Challenges and Future Directions (September 24, 2023)*.
- Rohman, A., Asfahani, A., & Iqbal, K. (2023). Comprehensive Analysis of AI's Contribution to Global Economic Development. *Journal of Artificial Intelligence and Development*, 2(2), 33–39.
- Sain, Z. H., Asfahani, A., & Krisnawati, N. (2022). Utilization AI for Socially Responsive Education as a Path to Inclusive Development. *Journal of Artificial Intelligence and Development*, 1(2), 69–78.
- Savira, R. N., Anindita, R., & Nugroho, C. P. (2022). Analisis Perdagangan Ekspor Kopi Indonesia di Pasar Internasional. *Jurnal Ekonomi Pertanian Dan Agribisnis*, 6(3), 963. <https://doi.org/10.21776/ub.jepa.2022.006.03.17>
- Setiawan, S. A. (2019). Mengoptimalkan Bonus Demografi Untuk Mengurangi Tingkat

Kemiskinan Di Indonesia. *Jurnal Analisis Kebijakan*, 2(2).
<https://doi.org/10.37145/jak.v2i2.34>

Sugiyono. (2019). *Metode Penelitian Pendidikan: Kuantitatif, Kualitatif, Kombinasi, R&D dan Penelitian Pendidikan*. Alfabeta.

Sundarakani, B., Ajaykumar, A., & Gunasekaran, A. (2021). Big data driven supply chain design and applications for blockchain: An action research using case study approach. *Omega*, 102, 102452.

Suyanto, U. Y., & Purwanti, I. (2021). Pengembangan Model Peningkatan Daya Saing UMKM Berbasis E-Commerce (Studi Pada UMKM Kabupaten Lamongan). *Jesya (Jurnal Ekonomi Dan Ekonomi Syariah)*, 4(1), 189–198.

Tabesh, P., Mousavidin, E., & Hasani, S. (2019). Implementing big data strategies: A managerial perspective. *Business Horizons*, 62(3), 347–358.