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BIG DATA: USING DATA ANALYTICS TO SPARK INNOVATION IN THE 5.0 ECONOMY

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Abstract

In the era of Economy 5.0, the use of Big Data and data analytics has become a key driver of business innovation and transformation. The utilisation of large amounts of data enables companies to uncover deep insights and support smarter and more timely decision-making. Data analytics not only helps in understanding customer needs and preferences but also in identifying new business opportunities, improving operational efficiency, and developing better products and services. In addition, Economy 5.0 emphasises the importance of collaboration between humans and technologies such as artificial intelligence and machine learning, which are capable of analysing data quickly and efficiently. To adopt these technologies successfully, organisations need to build a data-driven culture, conduct effective change management, and improve analytics skills within the team. With the right strategy, Big Data and analytics can be a strong foundation for achieving continuous innovation and maintaining competitiveness in a dynamic global market.

Keywords: Big Data, Data Analytics, Innovation, Economic Era 5.0.

Introduction

The 5.0 Economic Era is a phase of economic development that focuses on the integration of digital technology, sustainability, and improving the quality of human life. The Industrial Revolution 4.0 characterised by automation, the Internet of Things (IoT) and artificial intelligence (AI) has paved the way for this new era. Economy 5.0 seeks to balance technological progress with social and environmental well-being, promoting an ideology where innovation is centred not only on efficiency and profit, but also on social awareness and environmental sustainability (Demchenko et al., 2013) .

The Economic Era 5.0 is a new paradigm in economic development that emphasises harmonisation between advanced technology, environmental sustainability, and social welfare. The concept emerged in response to the Industrial Revolution 4.0, where automation, the Internet of Things (IoT), and artificial intelligence (AI) have dominated various aspects of life and industry (Aneja et al., 2000) . Economy 5.0 aims to integrate technological advances with the needs of humans and nature more holistically, creating a new essence of doing business that not only prioritises profit, but

also maintains ecological balance and fulfils social aspirations. Thus, Economic Era 5.0 not only drives economic growth but also contributes to the achievement of sustainable development goals (SDGs) through ethical and responsible innovation (Gandomi & Haider, 2015) .

Amidst these changes, Big Data is becoming one of the key drivers of innovation. Big Data is a term that refers to very large data sets, both structured and unstructured, generated from various sources such as social media, sensor devices, business transactions, and others. Managing and analysing this massive amount of data requires advanced technology and specialised algorithms to extract valuable information, understand patterns, trends, and generate deep insights (Buhl et al., 2013) . Big Data has the potential to transform the way organisations and industries make strategic decisions, improve operational efficiency, and deliver more personalised experiences to customers (Big Data & AI World, 2021) .

The volume of data generated globally is growing exponentially, providing endless opportunities for in-depth analyses and more accurate data-driven decision-making. According to a report from International Data Corporation (IDC), the amount of global data will increase from 33 zettabytes in 2018 to 175 zettabytes by 2025. This increase indicates an urgent need for industries to adopt data analytics technologies to remain competitive (Russom, 2013) .

However, while many organisations have started adopting Big Data technologies, many are still struggling to turn these large volumes of data into meaningful business insights. Key challenges include data privacy and security issues, technical difficulties in data processing and analysis, and skills gaps within their teams. Without adequate understanding and management, the full potential of Big Data to drive innovation could be hampered (KDnuggets ., 2021)

As such, this research aims to explore the role of Big Data analytics in fuelling innovation in the era of Economy 5.0. Through a literature review, this research will uncover how companies can utilise Big Data to improve efficiency, create new products and services, and overcome the challenges they may face on this journey.

Research Methods

The study in this research uses the literature method. The literature research method, or literature review, is an approach that prioritises the collection and analysis of information from various written sources such as books, academic journals, articles, research reports, and other scholarly publications to answer research questions or examine a particular topic (Torraco, 2005) ; (Gough et al., 2012) . This method involves the process of identifying, evaluating, and synthesising relevant literature to form the theoretical and contextual framework of the research. With this method, researchers can avoid duplication of research, understand previous developments and findings, and identify gaps or areas that require further exploration. Through a comprehensive

literature review, the researcher is able to justify the significance and contribution of his/her study within a broader scientific context (Webster & Watson, 2002) .

Results and Discussion

The Role of Big Data in Innovation in the Era of Economy 5.0

Big Data plays a central role in driving innovation in the era of Economy 5.0, which places importance on the balance between technological advancement, environmental sustainability, and social well-being. This era requires approaches and solutions that are holistic, people-focused, and resilient to the complex challenges of the times. Big Data is a key pillar in supporting digital transformation and more accurate and efficient data-driven decision-making (Hilbert, 2013) .

First, Big Data enables companies and organisations to collect and analyse big data in real time, providing deeper insights into consumer behaviour, market trends, and internal operations. By analysing this data, companies can develop more precise and innovative products and services, better meet consumer needs, and open up new opportunities for untapped markets. For example, analysis of sales data and customer preferences can help companies to introduce more personalised and relevant products to consumers (Junk, 2016) .

Second, in the context of environmental sustainability, Big Data plays a role in more effective monitoring and management of natural resources. Data collected from various sensors and IoT devices in the field can be used to monitor environmental conditions, optimise energy use, and reduce negative impacts on nature. With modelling and data analysis, more sustainable strategies can be designed for agriculture, water management, and the energy sector, all of which contribute to environmental sustainability in the era of Economy 5.0 (Davenport & Dyché ., 2013)

Thirdly, Big Data also contributes significantly to improving operational efficiency in industry and the service sector. For example, in manufacturing production, data analytics can be used to detect potential machine breakdowns before they occur, thereby preventing costly downtime and improving production efficiency. In the logistics sector, data analytics can help with the optimisation of delivery routes, more accurate stock management, and reduction of operational costs (Marr, 2016) .

Fourth, in terms of social welfare, Big Data can help governments and non-profit organisations to identify pressing social issues and design more effective and evidence-based policies. Data from various sources, including health, education and demographic data, can help in mapping community needs and more appropriate resource allocation. For example, analysis of population health data can help in creating better preventive health programmes and targeting health interventions to groups most in need (Minelli et al., 2013) .

Finally, in the era of Economy 5.0, ethics and data security are very important issues. The use of Big Data must be done with individual privacy in mind and data must

be managed securely to prevent misuse and leakage. A transparent and ethical approach to data management not only increases public trust but also ensures that the resulting innovations are widely accepted and provide maximum benefits to all parties. This approach is in line with the principles of Economy 5.0 which not only prioritises advanced technology but also respects human rights and needs as a whole (Mayer-Schönberger & Cukier, 2013) .

As such, Big Data has a crucial role in driving innovation in the era of Economy 5.0, with a focus on the balance between technology, environmental sustainability and social welfare. Through real-time data collection and analysis, companies and organisations can make more informed decisions, create relevant products and services, and identify new market opportunities. On the other hand, Big Data helps create more efficient and sustainable solutions in managing natural resources and industrial operations, reducing environmental impact and improving operational efficiency.

In addition, Big Data also plays a role in improving social welfare by providing deeper insights to governments and non-profit organisations to design more effective and evidence-based policies. However, the use of Big Data must be done by considering ethics and data security to protect individual privacy and ensure transparent and reliable data management. Thus, the application of Big Data in the era of Economy 5.0 not only encourages technological innovation, but also prioritises human values and sustainability.

Challenges in Data Analytics Implementation

The implementation of data analytics presents a variety of complex challenges across different sectors. One of the biggest challenges is data quality. The data used in analytics must be accurate, complete, and relevant. Often, companies face problems with data scattered in different formats and different locations, which makes data integration a complicated and time-consuming process. Without ensuring high data quality, analytics results will not be reliable and may mislead decision-making (Chen et al., 2012) .

In addition, scalability is another important challenge. The volume of data generated by companies or organisations continues to increase along with technological developments. Managing and analysing data on a large scale requires adequate technology infrastructure, including hardware and software capable of handling large workloads. Companies must invest in scalable infrastructure solutions and think ahead about how they will handle future data growth (Kaisler et al., 2013) .

The challenge in skills and expertise is also a significant factor. Implementing data analytics requires a team that has skills in data science, machine learning, and various related technologies. Unfortunately, talent with these capabilities is limited and in high demand in the labour market. Companies often need to provide internal training

or attract outside talent to fulfil this need, which can be an expensive and time-consuming process (McAfee & Brynjolfsson, 2012) .

Data privacy and security is another critical aspect that needs to be considered. As cyberattacks become more sophisticated, keeping customer and company data safe is of utmost importance. The implementation of data analytics must be compliant with applicable regulations, such as GDPR in Europe or CCPA in California, which require companies to be very careful in how they collect, store, and process data. Failure to address this aspect can lead to huge financial and reputational losses (Manyika & Chui, 2013) .

Then, organisational culture can also be a barrier. Transforming into a data-oriented organisation often requires a major change in the way people think and work. Employees and management need to be empowered to understand the importance of data and how it can be used in decision-making. This requires strong leadership and commitment from all levels of the company to ensure that the cultural change can be adopted effectively (Marr, 2016) .

Finally, the challenges in measuring the ROI (Return on Investment) of data analytics are also significant. Many endeavours in data analytics require a large initial investment with results that may only be seen in the long term. Determining the right metrics and KPIs to measure the success of analytics projects is an important but difficult step. Companies must be patient and disciplined in evaluating the benefits of their data analytics initiatives to ensure the expected return on investment.

Strategies to Overcome Challenges in Data Analytics Implementation

Meeting the challenges of data analytics implementation requires a structured and goal-focused strategy. To address data quality issues, organisations must implement robust data management practices. This involves collecting verified data, standardising data to ensure consistency, and using validation tools to detect errors and mismatches. Building a dedicated data management team responsible for keeping data clean and in order is a critical first step (Chen et al., 2012) .

To overcome scalability challenges, companies should invest in flexible and scalable cloud solutions. Cloud technology allows companies to scale up resources according to their needs without having to spend heavily on physical infrastructure. It also provides flexibility in storing and processing large volumes of data as well as data accessibility from various locations. Using modern data architectures such as data lakehouses can help simplify the management of large-scale data (Labrinidis & Jagadish, 2012) .

In terms of skills and expertise, companies can address this gap with two main approaches. First, organising continuous internal training and development programmes for existing staff to enhance their analytics capabilities. Second, building collaborations with universities and educational institutions to access new talent. In

addition, utilising freelancers or consultants for short-term projects can also be a solution to address the shortage of experts (Provost & Fawcett, 2013) .

To ensure data security and privacy, companies should implement strict cybersecurity policies. This includes encrypting sensitive data, using strong firewalls, and adopting two-factor authentication technology. Conducting regular audits and conducting cybersecurity training for employees can increase awareness and minimise the risk of breaches. Complying with global and local data privacy regulations through an integrated compliance strategy will help in maintaining the company's reputation and preventing legal consequences (Wamba et al., 2015) .

Changing an organisation's culture to become more data-driven requires an effective change management approach. Company leaders must lead by example in using data in all aspects of decision-making and encourage their teams to do the same. Setting clear goals and rewarding employees who successfully implement analytics solutions can increase motivation. Involving all levels of the organisation in training and discussions about the importance of data and analytics is key in facilitating this cultural change (Towards Data Science, 2021) .

Finally, to measure the ROI of data analytics, companies must establish clear metrics and KPIs from the start of the project. Using a phased approach, such as running a pilot project before full implementation, can help test assumptions and measure impact incrementally. Analysing short-term and long-term results based on these metrics will provide a more informed view of the success of analytics investments. Adjusting strategies based on the results of such analyses can ensure that companies get maximum value from their data analytics efforts (Strata Data Conference, 2020) .

Overall, successfully overcoming the challenges of data analytics implementation requires a comprehensive and coordinated approach. Critical steps include implementing robust data management, leveraging cloud technology for scalability, improving analytics skills through training programmes and collaboration with educational institutions, and keeping data secure with strict cybersecurity policies.

Companies should also focus on developing a data-driven culture through effective change management and leadership that encourages the use of data in decision-making. In measuring the success of analytics investments, establishing clear metrics and KPIs and conducting regular evaluations and adjustments are essential.

By implementing these strategies, organisations can overcome the obstacles to data analytics implementation and truly harness the full potential of their data to provide valuable insights and support better decision-making.

Conclusion

The use of Big Data is key to stimulating innovation in the Economic 5.0 era, which is characterised by technology-intelligent integration and extensive data utilisation. In this era, data analytics bridges the gap between raw data and valuable

insights, enabling companies to make faster, more informed and data-driven decisions. Effective implementation of data analytics not only helps in understanding customer preferences, but also identifying new market opportunities, optimising operations, and creating better products and services.

In addition, Economy 5.0 encourages collaboration between humans and machines, where artificial intelligence and machine learning play an important role in analysing large amounts of data quickly. A data-driven culture, good change management and analytics skills are crucial factors in adopting Big Data successfully. As such, organisations that can overcome the technical and human challenges of implementing data analytics will be in pole position to drive continuous innovation and remain competitive in an increasingly dynamic global marketplace.

References

Aneja, A., Rowan, G., Brooks, D., & Spotts, J. (2000). Agile Real-time E-Business Intelligence. *Proceedings. 12th IEEE International Conference on Tools with Artificial Intelligence (ICTAI)*, *1*, 234–242.

Big Data & AI World. (2021). *Big Data & AI World: Innovation Through Data.* https://www.bigdataworld.com/

Buhl, H. U., Röglinger, M., Moser, F., & Heidemann, J. (2013). Big Data. *Business & Information Systems Engineering*, *5*(2), 65–69.

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Quarterly*, *36*(4), 1165–1188.

Davenport, T. H., & Dyché, J. (2013). *Big Data in Big Companies*. International Institute for Analytics.

Demchenko, Y., Zhao, Z., Grosso, P., Wibisono, A., & de Laat, C. (2013). *Addressing Big Data Issues in Scientific Data Infrastructure*. 48–55.

Gandomi, A., & Haider, M. (2015). Beyond the Hype: Big Data Concepts, Methods, and Analytics. *International Journal of Information Management*, *35*(2), 137–144.

Gough, D., Thomas, J., & Oliver, S. (2012). *An Introduction to Systematic Reviews*. SAGE Publications Ltd.

Hilbert, M. (2013). Big Data for Development: A Review of Promises and Challenges. *Development Policy Review*, *32*(1), 135–174.

Junk, B. (2016). *Big Data For Dummies*. Wiley & Sons, Inc.

Kaisler, S., Armour, F., Espinosa, J. A., & Money, W. (2013). Big Data: Issues and Challenges Moving Forward. *Proceedings of the 46th Hawaii International Conference on System Sciences*, *2013*, 995–1004.

KDnuggets. (2021). *Big Data and Innovation: How to Create a Competitive Advantage.* https://www.kdnuggets.com/

Labrinidis, A., & Jagadish, H. V. (2012). Challenges and Opportunities with Big Data. *Proceedings of the VLDB Endowment*, *5*(12), 2032–2033.

Manyika, J., & Chui, M. (2013). *Big Data: The Next Frontier for Innovation, Competition, and Productivity.*. 56–76.

Marr, B. (2016). *Big Data in Practice*. Wiley.

Mayer-Schönberger, V., & Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Houghton Mifflin Harcourt.

McAfee, A., & Brynjolfsson, E. (2012). Big Data: The Management Revolution. *Harvard Business Review*, *90*(10), 60–68.

Minelli, M., Chambers, M., & Dhiraj, A. (2013). *Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*. Wiley.

Provost, F., & Fawcett, T. (2013). *Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking*. O'Reilly Media.

Russom, P. (2013). Big Data Analytics. *TDWI Best Practices Report*, *4*(1), 1–35.

Strata Data Conference. (2020). *Proceedings of the Strata Data Conference 2020*.

Torraco, R. J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. *Human Resource Development Review*, *4*(3), 356–367.

Towards Data Science. (2021). *How Big Data Analytics Can Drive Innovation.* https://towardsdatascience.com/

Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'Big Data' Can Make Big Impact: Findings from a Systematic Review and a Longitudinal Case Study. *International Journal of Production Economics*, *165*, 234–246.

Webster, J., & Watson, R. T. (2002). Analysing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*,*26* (2), xiii-xxiii.