JURISMA: Jurnal Riset Bisnis dan Manajemen
Volume 14 Nomor 1 (April 2024)
E-ISSN: 2338-292X (Online) P-ISSN: 2086-0455 (Print)
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Big Data's Future Potential as an Innovation in Competitive Advantage and Decision-Making Techniques

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Received Date *:* ***12.03.2024***
Revised Date *:* ***27.04.2024***
Accepted Date *:* ***02.05.2024***

ABSTRACT

This research highlights the challenges of big data integration in organisational decision-making processes, illustrating the gap between big data capabilities and their effective utilisation. An analytical descriptive qualitative method was used to study the use of big data in supporting sustainable innovation and competitive advantage of organisations in Indonesia. The results show that big data can improve the effectiveness of decision-making strategies by understanding market trends and consumer behaviour, which contributes to improving organisational performance and competitive advantage. These results are expected to contribute to the strategic management and innovation literature and encourage business practices in designing effective big data strategies to achieve sustainable competitive advantage.

Keywords : Big Data; Technological Innovation; Strategic Decision Making; Competitive Advantage; Sustainable Innovation

ABSTRAK

Penelitian ini menyoroti tantangan integrasi big data dalam proses pengambilan keputusan organisasi, yang menggambarkan celah antara kemampuan big data dengan pemanfaatannya yang efektif. Metode kualitatif deskriptif analitis digunakan untuk mempelajari penggunaan big data dalam mendukung inovasi berkelanjutan serta keunggulan kompetitif organisasi di Indonesia. Hasil penelitian menunjukkan bahwa big data dapat meningkatkan efektifitas strategi pengambilan keputusan dengan memahami tren pasar dan perilaku konsumen yang berkontribusi pada peningkatan kinerja dan keunggulan kompetitif organisasi. Hasil ini diharapkan dapat berkontribusi pada literatur manajemen strategis dan inovasi serta mendorong praktik bisnis dalam merancang strategi big data yang efektif untuk mencapai keunggulan kompetitif berkelanjutan.

Kata Kunci : Big Data; Inovasi Teknologi; Strategi Pengambilan Keputusan; Keunggulan Kompetitif; Keberlanjutan Inovasi

INTRODUCTION

In today's digital era, big data has emerged as one of the most significant innovations that has the potential to change the landscape of decision-making strategies and create competitive advantages for companies (Farida & Setiawan, 2022; J. Mazzei & Noble, 2020; Shahid & Sheikh, 2021). The power of big data lies not only in large volumes of data, but also in the ability to analyse and make strategic use of that information (Dash et al., 2019; Hussein, 2020; Mikalef et al., 2019; Sivarajah et al., 2017). A qualitative study of the potential of big data offers in-depth insights into how organisations can harness data for innovation, formulate more appropriate strategies, and effectively achieve competitive advantage in an increasingly competitive market (Babu et al., 2024; Cato, 2015; Gao & Sarwar, 2022; Rodríguez et al., 2023; Shahid & Sheikh, 2021).

The specific issue addressed by this research topic relates to the challenges faced by organisations in integrating big data into their decision-making processes. While the potential of big data to improve decision-making and competitive advantage is widely recognised, many companies still struggle to overcome the technical, organisational and cultural barriers to big data utilisation (Bozkus, 2024; Hussein, 2020; Lunde et al., 2019; Sivarajah et al., 2017). This creates a gap between big data capabilities and their effective utilisation in business strategy (Ejuma Martha Adaga et al., 2024; Gao & Sarwar, 2022; Mikalef & Krogstie, 2020). This research is important because it identifies and explores these barriers, providing insight into how organisations can overcome them to maximise the value of big data (Amana et al., 2022; Cato, 2015; Perifanis & Kitsios, 2023; Shabbir & Gardezi, 2020).

The impact of these issues in the context of business management and technology is significant. Firstly, the inability to utilise big data effectively can cause companies to miss out on valuable insights that can support strategic decision-making, stifle innovation and lower competitive advantage. Second, challenges in big data integration can slow down a company's response to changing market and customer needs, thereby affecting company performance and growth. Through a qualitative study, this research seeks to reveal strategies and best practices in overcoming these challenges, thereby making a significant contribution to the theory and practice of business management and technology.

In (Korayim et al., 2024) study, it was found that organisational innovation acts as a mediator in the relationship between big data utilisation and competitive advantage creation. The study highlighted the importance of a technologically proactive climate and a data-driven culture as significant moderators in the relationship, suggesting that companies can maintain a focus on continuous innovation by fostering a technologically proactive environment and a data-orientated culture. Furthermore, (Montecchi et al., 2020) investigated how big data analytics can accelerate the process of new product idea generation and decision-making through the use of machine learning and artificial intelligence techniques. The research revealed that high-sensitivity analytics can increase "creative intensity" and be a source of competitive advantage in highly competitive markets, requiring a continuous degree of product novelty. The potential of big data in providing new insights for decision-making and innovation. Through academic and industry panel discussions, the study identified research gaps and proposed a big data analytics framework that described a process view of the components required for big data analytics in organisations (Phillips-Wren et al., 2015).

Big data analytics capability has a positive moderating effect, increasing the impact of big data on sales growth and gross margin. These findings provide guidance for companies in making strategic decisions about resource allocation for big data and big data

analytics capabilities (Hao et al., 2019). Investigates the role of big data analytics as one of the key pillars of Industry 4.0 in supporting firms' sustainable competitive advantage. This study suggests that big data analytics capabilities, supported by high levels of data availability, can enhance innovation capabilities and, therefore, lead to the development of sustainable competitive advantage. It analysed that IC has a significant and direct effect on a firm's SCA, while BDAC has no direct effect on SCA (Ramadan et al., 2020).

The proposed research aims to address the knowledge gaps identified from the literature review regarding the use of big data and big data analytics capabilities in the creation of competitive advantage and sustainable innovation. While previous research (Babu et al., 2024; Farida & Setiawan, 2022; Hao et al., 2019; Mikalef & Krogstie, 2020; Ramadan et al., 2020; Seetharaman et al., 2016) has explored the impact of big data on innovation and competitive advantage, there is still room for research on how organisations can optimise their big data resources and analytics capabilities to generate sustainable innovation. This research is expected to fill this gap by providing a deeper understanding of the processes and mechanisms behind the influence of big data on the creation of sustainable innovation.

The expected outcome of the research is the development of a conceptual model that explains how organisations can leverage big data and its analytics capabilities to not only achieve momentary competitive advantage but also to nurture sustainable innovation. The model is expected to include key factors such as organisational culture, technological adaptability, and effective resource management strategies. Thus, this research aims to provide new insights to business practitioners on how to integrate big data into their innovation strategies in an effective and sustainable manner.

The contribution of the proposed research lies in developing a more holistic understanding of the role of big data in the innovation process. In contrast to previous studies (Alghamdi & Agag, 2023; Astuti et al., 2018; Cao et al., 2022; Cui et al., 2022; Hao et al., 2019; Ji et al., 2024; Otchere et al., 2022; Ramadan et al., 2020; H. Zhang & Yuan, 2023; Z. Zhang et al., 2022) that have focused on the influence of big data on innovation performance in a specific context or its direct effect on competitive advantage, this research explores how big data can be used strategically to support sustainable innovation. As such, it offers a new perspective in the business management and technology literature, highlighting the importance of integration between big data technologies and organisational innovation strategies as key to long-term success.

This research is expected to make a significant contribution to the business management and technology literature by expanding the understanding of how organisations can leverage big data for sustainable innovation. In addition, the results of this study are expected to provide practical guidelines for companies in designing and implementing effective big data strategies, ensuring that investments in big data and data analytics can generate maximum value for innovation and sustainable competitive advantage.

RESEARCH METHOD

This research was designed as a qualitative study using an analytical descriptive method. This approach was chosen to deepen the understanding of how organisations in Indonesia are leveraging big data to support sustainable innovation and create competitive advantage. Through this approach, it is possible to describe and analyse phenomena related to the use of big data in the context of business management and technology in detail.

Data sources in this research include journal reviews, documentation, and literature relevant to the research topic. Data were collected through literature searches in accredited and Scopus-indexed scientific journal databases, with a focus on publications that review big data, innovation and competitive advantage in an organisational context. In addition, documentation and reports from related case studies conducted in Indonesia will also be analysed to gain deeper insights.

The research location was chosen in Indonesia as the country is showing significant growth in the digital economy, with many organisations starting to adopt big data technologies to enhance innovation and competitive advantage. Indonesia, as the largest economy in Southeast Asia, provides a unique and relevant context for understanding how big data is utilised in business practices, especially among companies operating in emerging markets. The reason for selecting this location was also based on the availability of sufficient data and literature on the use of big data in Indonesia.

Data analysis was conducted inductively, where the data collected was analysed to identify patterns, themes and relationships. This process involved categorising the data, interpreting and synthesising the findings to develop a broader understanding of the research subject (Byrne, 2022; Dufour & Richard, 2019; Naeem et al., 2023; Pope, 2000; Skjott Linneberg & Korsgaard, 2019). Through inductive analysis, this research aims to produce findings that can make theoretical and practical contributions to the existing literature, as well as provide recommendations for business practice and policy in Indonesia.

This study acknowledges several limitations that could potentially affect the generalisability of the findings. Firstly, the selection of the literature sample may not include all relevant publications, which could cause bias in the analysis results. Secondly, the selected case studies may not represent all types of organisations in Indonesia, especially those that have not yet implemented big data technologies. These limitations are important to consider when extrapolating the findings to apply to a broader context. Future research could improve generalisability by expanding geographical and industry coverage and using more diverse methodological approaches to gain more representative and inclusive insights.

RESULTS AND DISCUSSION

Big Data Capabilities as an Innovation and Decision-Making Strategy

The first finding of this research shows that big data has great capabilities as an innovation in organisational decision-making strategies which is in line with previous research (Binsaeed et al., 2023; Capurro et al., 2022; Chioma Ann Udeh et al., 2024; Cui et al., 2022; Shahid & Sheikh, 2021; Yoshikuni et al., 2023). By collecting, storing and analysing large and diverse amounts of data, big data enables organisations to generate deep insights into various aspects of their operations and business environment. This enables decision-makers to make more informed and evidence-based decisions, as they have access to more complete and accurate information. In the context of innovation, big data also enables organisations to identify new opportunities and emerging market trends, so that they can design products and services that better suit customer needs and wants.

Furthermore, the findings suggest that the integration of big data in decision-making strategies can result in fundamental changes in the way organisations operate. Using advanced algorithms and data analysis techniques, organisations can analyse complex patterns in their data, identify unseen causal relationships, and better anticipate market changes. This allows organisations to be more responsive to changes in their business

environment, allowing them to take the right steps more quickly and effectively. As such, big data is not only a tool for decision-making, but also a catalyst for broader organisational transformation.

In addition, this research also highlights the importance of effective data management in achieving the full potential of big data as an innovation in decision-making strategies. By having a robust data infrastructure and good data management processes in place, organisations can optimise the use of their big data to support better decision-making. This includes accurate and relevant data collection, fast and efficient data processing, and in-depth and detailed data analysis. Therefore, investment in technology and human resources to support good data management will be the key to success in harnessing the innovative potential of big data in decision-making strategies in line with previous research (Binsaeed et al., 2023; Hamilton & Sodeman, 2020; Martínez-Peláez et al., 2023; Nocker & Sena, 2019; Yousuf, 2020; J. Zhang & Chen, 2023).

The Strategic Role of Big Data in Creating Competitive Advantage for Organisations

In this context, effective and in-depth data analysis enables organisations to identify market trends, consumer behaviour patterns, and business opportunities that competitors may have missed. By leveraging big data, organisations can develop more effective marketing strategies, optimise their supply chains, and improve the quality of their products and services(Alsolbi et al., 2023; Brewis et al., 2023; Mageto, 2021). Thus, big data is not only a supporting tool in decision-making, but also a key to creating significant added value for organisations in an increasingly fierce market competition with the support of previous research (Mikalef et al., 2019; Mikalef, Boura, et al., 2020; Mikalef & Krogstie, 2020; Shahid & Sheikh, 2021; Wang et al., 2023).

Furthermore, the findings show that organisations that are able to integrate big data in their business strategies tend to have a stronger competitive advantage than their competitors who do not. By having access to better and faster information, organisations can respond more efficiently to market changes, identify new growth opportunities, and anticipate threats that may arise in the future. This gives organisations a sustainable edge in keeping up with market trends and winning the competition, as they can take the necessary steps to maintain and improve their position in the market.

The research also highlights the importance of developing a data-oriented organisational culture to support the application of big data in decision-making strategies and the achievement of competitive advantage with research support (Aseeri & Kang, 2022; Bozkus, 2024; Farida & Setiawan, 2022; Lunde et al., 2019; Shabbir & Gardezi, 2020; Szukits & Móricz, 2023; Yousuf, 2020). This requires full support from upper management to promote the use of big data in decision-making, as well as investment in training and development of employees to improve their data literacy and analytical skills. By creating this kind of culture, organisations can ensure that big data becomes not just a technology tool, but an integral part of how they operate and innovate to achieve sustainable competitive advantage (Barham, 2017; Leso et al., 2023; Lunde et al., 2019; Martínez-Peláez et al., 2023).

The Positive Impact of Implementing Big Data Technology Innovations in Organisations' Decision-Making Strategies

Through in-depth analysis of large and complex data, organisations can generate deep insights into markets, industry trends and consumer behaviour. This enables organisations to make more informed and strategic decisions, which in turn can lead to improved performance and competitive advantage. By using advanced Big Data analytics

tools, organisations can identify new growth opportunities, improve operational efficiency, and reduce business risks, in line with previous research (Arusyak Ivanyan et al., 2023; Marcel Schramm & Mathew Shafaghi, 2020; Mikalef, Krogstie, et al., 2020; Ren et al., 2019).

Furthermore, the findings also show that the use of Big Data innovations in organisational decision-making can improve their response to rapid and complex market changes. By having access to real-time data and accurate analytics, organisations can be more responsive to changing customer needs, industry competition, and other external factors that affect their business performance (Agag et al., 2024; Chen et al., 2012; Farida & Setiawan, 2022; McKinsey & Company, 2014; McKinsey, 2015). This enables organisations to take more proactive steps in adjusting their business strategies, reduce the risk of loss, and improve adaptation to the dynamic business environment.

The findings also underscore the importance of investment in the technological infrastructure and human resources required to support the application of Big Data innovations in decision-making strategies, which aligns with previous research (Ahmed et al., 2022; Ashsifa & Ali, 2019; Basile et al., 2024; Cui et al., 2022; Gravili et al., 2023; Keshavarz et al., 2021; Koshcheeva & Lyapina, 2022; Perifanis & Kitsios, 2023; Wang, 2023). In an increasingly connected and digital business environment, organisations need to ensure that they have robust technology systems and employees skilled in data analysis and interpretation. This includes investing in advanced data analysis software, reliable network infrastructure, and ongoing employee training in data literacy and analysis. By having the right infrastructure and human resources in place, organisations can maximise the benefits of Big Data innovation in their decision-making and achieve a sustainable competitive advantage in the market.

The Important Role of Big Data in Creating Competitive Advantage for Organisations

By analysing large and complex data, organisations can identify relevant patterns, market trends and new opportunities that may not be detected by traditional methods. This allows organisations to develop smarter and more innovative strategies, which can ultimately improve their position in the market and provide a significant competitive advantage.

Furthermore, these findings suggest that Big Data innovations can assist organisations in optimising their decision-making processes. By using advanced data analysis algorithms, organisations can process the collected information quickly and efficiently, thus enabling more timely and evidence-based decision-making. This helps organisations to reduce the risk of errors in decision-making and improve the accuracy of their business strategies, which in turn can improve overall performance, as noted in previous research (Abubakar et al., 2019; Chatterjee et al., 2023; Farida & Setiawan, 2022; Gravili et al., 2023; Keshavarz et al., 2021; Mikalef, Krogstie, et al., 2020; Yallop & Seraphin, 2020).

The findings also highlight the importance of adopting a data-driven culture within organisations. Organisations that are successful in implementing Big Data innovations not only rely on state-of-the-art technology, but also pay attention to developing a culture that encourages the use of data in day-to-day decision-making. This involves training employees on data literacy, promoting collaboration between departments, and ensuring that decision-making is based on empirical evidence generated by data analysis. By building a culture that supports the use of data, organisations can more effectively integrate Big Data innovations into their business strategies and create a sustainable competitive advantage (Aseeri & Kang, 2022; Chatterjee et al., 2024; Chaudhuri et al., 2021; Leso et al., 2023; Lunde et al., 2019; Schlegel et al., 2023).

The Importance of Adopting a Data-Driven Culture Within Organisations to Enhance Competitive Advantage

In this context, a data-driven culture refers to an environment where decision-making is based on data analysis and empirical evidence, rather than on intuition or individual experience. The findings suggest that organisations that are able to effectively implement this culture are likely to be more successful in leveraging Big Data innovations to achieve sustainable competitive advantage which previous research supports (Acciarini et al., 2023; Arshad et al., 2020; Banholzer et al., 2023; Capurro et al., 2022; Farida & Setiawan, 2022; Shahid & Sheikh, 2021).

Furthermore, the findings highlight that the adoption of a data-driven culture requires commitment and support from all levels of the organisation (Nguyen et al., 2024; Sonmez Cakir et al., 2023). This not only depends on top management initiatives, but also requires active participation from employees at all levels. The researcher found that organisations that successfully integrate a thorough data-driven culture often involve employees in the decision-making process, provide training on data literacy, and encourage interdepartmental collaboration to maximise data utilisation (Anton et al., 2023; Lam et al., 2021; Rožman et al., 2023; Ryketeng et al., 2023).

In addition, the findings also show that the adoption of a data-driven culture can yield significant long-term benefits for organisations. By encouraging evidence-based decision-making and data analysis, this culture can help organisations to reduce the risk of errors, improve operational efficiency, and identify new opportunities for innovation and growth. Over time, organisations that internalise this culture are likely to become more responsive to market changes and more adaptive in the face of complex business challenges.

These findings emphasise the importance of continuity in the development of a data-driven culture within organisations. The implementation of this culture is not an instantaneous process, but an ongoing endeavour that requires long-term commitment and investment in employee capacity building and technological infrastructure. However, the researcher concludes that the potential long-term benefits of adopting a data-driven culture clearly show that this investment can provide significant returns in the long run, both in the form of competitive advantage and overall better business performance.

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In addition, the findings also suggest that the adoption of a data-driven culture can result in significant long-term benefits for organisations which aligns with previous

research (Babu et al., 2024; Chatterjee et al., 2024; Korherr et al., 2022; Li et al., 2022; Ramadan et al., 2020). By encouraging evidence-based decision-making and data analysis, this culture can help organisations to reduce the risk of errors, improve operational efficiency, and identify new opportunities for innovation and growth. Over time, organisations that internalise this culture are likely to become more responsive to market changes and more adaptive in the face of complex business challenges.

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The Importance of Big Data as an Innovation in Decision-Making Strategies and Competitive Advantage in an Era of Increasingly Digitally Connected Businesses

The research findings suggest that organisations that are able to effectively harness the potential of Big Data can integrate this innovation in their decision-making strategies, which in turn can lead to significant competitive advantage. With the adoption of a strong data-driven culture, organisations can improve their operational performance, respond more quickly to market changes, and create new opportunities for business growth.

In the context of existing literature, the findings of this study are consistent with the results of previous studies that highlight the importance of Big Data in creating competitive advantage and driving innovation. Several previous studies have also found that organisations that are able to effectively adopt a data-driven culture tend to be more successful in leveraging Big Data for better decision-making and identifying new opportunities for growth (Brewis et al., 2023; Chatterjee et al., 2023, 2024; Martínez-Peláez et al., 2023; Schlegel et al., 2023; Szukits & Móricz, 2023; Tran, 2017; Wei, 2023).

The main contribution of this research is to provide a deeper understanding of how Big Data can serve as an innovation in decision-making strategies and create a competitive advantage for organisations. By highlighting the importance of a data-driven culture and the integration of Big Data in the decision-making process, this research provides valuable insights for practitioners and decision-makers to develop more effective strategies to face complex business challenges in this digital era. Through these findings, this research contributes to answering the main question posed in the Introduction regarding the potential of Big Data as an innovation that can improve decision-making strategies and create competitive advantage for organisations in this digital era. By providing strong empirical evidence and insights, this paper strengthens our understanding of the critical role of Big Data in transforming today's business landscape.

CONCLUSION

This research successfully answers the main question posed, namely regarding the potential of Big Data as an innovation in decision-making strategies and competitive advantage. This study found that the effective use of Big Data can increase innovation in decision-making strategies and provide a competitive advantage for companies. The main finding of this study is that the comprehensive adoption of Big Data can significantly contribute to improving the quality of decision-making and enhancing the competitiveness of the company. By making good use of Big Data, companies can be more responsive to

market changes, identify new opportunities and optimise their operational performance. The implication of these findings for practice and theory in management is that Big Data is not just an additional tool in decision-making, but an integral part of an effective business strategy. Companies need to pay attention to the importance of investing in adequate infrastructure and human resources to optimally utilise the potential of Big Data. On the other hand, management theory must continue to evolve to understand the dynamics of using Big Data in a rapidly changing business context. While this research provides valuable insights, there are some limitations that need to be noted.

RECOMMENDATIONS

While this research provides valuable insights into the role of Big Data in decision-making strategy innovation and competitive advantage, there are some limitations that need to be noted. One of them is the limitation in the data used. While efforts have been made to collect representative data, there is potential for bias or uncertainty in the data analysed. In addition, since this study focused on a specific context, i.e. in a specific industry or in a specific geographical area, the generalisability of the findings to various business contexts may be limited. Future research can address these limitations by conducting more comprehensive data collection and diversifying the research sample. In addition, further research can expand the geographical and industry coverage to gain a more holistic understanding of the use of Big Data in the context of strategic decision-making and competitive advantage. Research methodologies can also be expanded to include more in-depth qualitative approaches, such as case studies or in-depth interviews with business stakeholders. In addition, future research could delve deeper into the moderating factors that influence the relationship between Big Data, decision-making strategy innovation and competitive advantage. For example, further research could explore the role of organisational culture, leadership, or other contextual factors in influencing the effectiveness of Big Data application in business decision-making. In the face of continuous technological advances, future research should also pay attention to new developments in Big Data analysis, such as artificial intelligence, machine learning, or other predictive analysis techniques. Thus, future research can provide deeper and more relevant insights for practitioners and academics in understanding the role of Big Data in creating competitive advantage in this digital era.

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