-RESEARCH ARTICLE-

A SYSTEMATIC LITERATURE REVIEW: THE ROLE OF BIG DATA ON PROJECT MANAGEMENT AND PROJECT SUSTAINABILITY

Wihaga Satya Khresna

Management Department, BINUS Business School Doctor of Research in Management, Bina Nusantara University, Jakarta, Indonesia 11480
ORCID: https://orcid.org/0000-0001-8292-313X
Email: wihaga.khresna@binus.ac.id

Harjanto Prabowo

Management Department, BINUS Business School Doctor of Research in Management, Bina Nusantara University, Jakarta, Indonesia 11480
ORCID: https://orcid.org/0000-0002-9317-2818
Email: harprabowo@binus.edu

Mohammad Hamsal

Management Department, BINUS Business School Doctor of Research in Management, Bina Nusantara University, Jakarta, Indonesia 11480
ORCID: https://orcid.org/0000-0003-4472-2964
Email: mhamsal@binus.edu

Boto Simatupang

Management Department, BINUS Business School Doctor of Research in Management, Bina Nusantara University, Jakarta, Indonesia 11480
ORCID: https://orcid.org/0009-0009-6243-1846
Email: bsimatupang@binus.edu

─Abstract─

Technological advancements require that human labour adapt rapidly to process and utilise Big Data effectively. Big Data plays a critical role in enhancing productivity while mitigating risks associated with project execution. Leveraging Big Data allows

organisations to minimise losses and optimise output using available resources. Efficient project management can be facilitated through Big Data by improving stakeholder engagement and enabling more precise project planning. Furthermore, employing Big Data to enhance project management and promote project sustainability represents the highest value achievable through its application. Despite its potential, Big Data adoption remains limited, with most initiatives relying on conceptual or generalised approaches. While previous research has explored Big Data applications across various industries, findings remain somewhat fragmented and insufficiently detailed. Consequently, this study aims to identify the specific benefits of Big Data for project management and project sustainability, with the objective of determining the most significant aspects that justify its implementation in industrial and corporate projects. The study employs a systematic literature review methodology. The sample comprised 20 selected articles from an initial pool of 171, obtained via purposive sampling through Google Scholar and Scopus journal indexing portals. Data collection followed the PICOS framework and utilised a Systematic Review Diagram based on PRISMA, with analysis conducted through mapping using the Systematic Review model. Findings from the literature indicate that Big Data enhances project management by enabling organisations to acquire information efficiently and rapidly, thereby reducing project-related risks. In sustainability-oriented projects, Big Data facilitates the identification of critical information to ensure that project plans are executed with minimal risk. Organisations can utilise the insights from this literature review to improve both project management and project sustainability, enabling more effective, efficient, and structured planning processes.

Keywords: Big Data, Project Management, Project Sustainability

INTRODUCTION

The notion of "Sustainability" or sustainable development has been acknowledged for many years; however, recognising its significance in project contexts enables the enhancement and long-term viability of projects. Project sustainability rests upon three interdependent and mutually reinforcing pillars: economic development, social advancement, and environmental conservation (Hamid et al., 2021). Approximately one-third of the global Gross Domestic Product (GDP) is generated through projects, indicating the considerable influence that integrating sustainability principles into project management can have on promoting a more sustainable future (Økland, 2015).

By focusing on the pillars of project sustainability, it becomes feasible to design and implement processes that are future-oriented and properly aligned with sustainability goals (Wirawan, 2021). Project management can be conceptualised as a structured methodology through which an organisation or firm undertakes activities to achieve project objectives within defined constraints such as budget, timeline, and quality. This involves planning, organising, directing, and controlling project operations, alongside

managing human and material resources, to ensure that project aims are accomplished effectively and efficiently, thereby optimising management functions and achieving organisational objectives (Arianie & Puspitasari, 2017). Key considerations in project management encompass technical, managerial and administrative, organisational, commercial, financial, and economic dimensions (Slamet, 2016). Projects frequently encounter inefficiencies that hinder productivity, and given the scale of the global economy—where inefficiencies can cost trillions annually—project management increasingly relies on advanced technologies, including Big Data, to address these challenges (Barbosa et al., 2017).

Big Data refers to information assets characterised by high volume, velocity, and variety, which necessitate innovative and cost-efficient processing methods to enable improved insight, informed decision-making, and automated processes (Hassani & Gahnouchi, 2017). This technology transforms business operations by fostering product and service innovation, enhancing productivity, supporting strategic decision-making, and strengthening organisational capabilities in project execution (Dubey et al., 2019). In striving for efficiency and mitigating negative project impacts, Big Data offers a practical mechanism for alleviating organisational pressures (Barbosa et al., 2017). Data collected throughout various project phases can yield novel insights, enhancing predictive accuracy and facilitating more informed decisions (Bilal et al., 2017). Leveraging Big Data can reduce waste and improve the efficiency of resource utilisation. Applying Big Data in stakeholder engagement and project planning contributes to more productive and streamlined project management practices (Ekambaram et al., 2018).

Despite its potential, the current utilisation of Big Data represents only a fraction of the value it can deliver in optimising project management and promoting sustainability. Adoption remains limited, with most projects relying on general insights rather than systematic data analysis. Although research has explored Big Data applications across diverse industrial contexts, these studies often lack depth and clarity (Dubey et al., 2019). Consequently, this study undertakes a comprehensive literature review to examine the benefits of Big Data for project management and sustainability. The aim is to identify the most compelling factors demonstrating why Big Data adoption is essential across industrial projects, thereby providing companies with strategies to enhance project management effectiveness and sustainability through structured, efficient planning.

BACKGROUND THEORY

Big Data

Big Data can generally be described as extremely large datasets characterised by volume, rapid growth or change (velocity), diverse formats (variety), and inherent

value, provided the data originates from reliable sources (veracity) (Yu & Zhou, 2019). The principal distinction between Big Data and conventional datasets lies in the mechanisms used for management and processing (Mikalef et al., 2018). Traditional relational database systems, commonly employed in many organisations, often struggle to manage the complexity and scale of Big Data effectively (Intezari & Gressel, 2017). Researchers and practitioners frequently define Big Data as information derived from a variety of sources, including sensors, satellites, social media platforms, photographs, videos, and mobile devices (Joseph et al., 2018). Structured data, such as sales and production transactions, and unstructured data, such as content from Twitter, Facebook, WhatsApp, Instagram, CCTV, and other social media, can both be processed and analysed using Big Data technologies.

The advantages of Big Data are evident across multiple sectors. Businesses can leverage the insights generated from Big Data to enhance decision-making processes, thereby optimising operations and increasing profitability (Wang et al., 2018). Similarly, organisations involved in public services can utilise outputs from Big Data to improve service delivery and maximise client or customer satisfaction (Depari et al., 2022). By integrating both structured and unstructured data sources, Big Data enables organisations to extract meaningful information that drives strategic planning, operational efficiency, and performance improvements across various industries.

Project Management

Project management encompasses the systematic planning, organisation, direction, and control of both human and material resources to achieve predetermined organisational objectives (Zasa et al., 2020). Its primary aim is to optimise management functions and resource utilisation in accordance with defined requirements, ensuring that outcomes are both efficient and effective (Zidane & Olsson, 2017). Project management frameworks are specifically designed to prevent or mitigate risks and potential project failures (Kerzner, 2017). Organisations must pursue structured planning to enhance the quality of services delivered, thereby maximising resource efficiency and improving internal operational performance. In the absence of robust project management, organisational performance may decline, jeopardising the ability to meet stakeholder or customer expectations. Effective project management facilitates a more detailed, streamlined, and productive project execution phase (Wideman, 1992).

Project Sustainability

Sustainability has been defined in various ways, but it is commonly understood as the equilibrium between economic, social, and environmental objectives, as well as the consequences of human activities (Kuchta & Mrzygłocka-Chojnacka, 2020). Within project management, the concept of project sustainability denotes the capacity of a team to execute a project effectively (Pade-Khene et al., 2011). It encompasses the ability of

a management team to plan, implement, and close a project while fulfilling the organisation's current requirements and ensuring that future stakeholders can manage and benefit from the project's outcomes. This concept has several fundamental dimensions. Principles of sustainability should permeate all aspects of organisational operations and decision-making (Wiek et al., 2012), and project management is no exception. As projects become increasingly global in scope, they present challenges to local communities and governing bodies, with sustainable development being a central concern. A project cannot be deemed successful unless the principal stakeholders are adequately satisfied with both its results and its broader impacts (Turner & Zolin, 2012).

METHODOLOGY REVIEW

This study adopts a systematic literature review methodology, following the guidelines established by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) framework (Salameh et al., 2020). Conducting this type of review enables researchers to simultaneously identify, categorise, and map studies addressing similar research topics. The primary objective of this study is to delineate and organise variables pertaining to the influence of Big Data on project management and project sustainability. To address the research objectives, the study formulates research questions using the PICOS framework, which considers Participants, Intervention, Comparison, Outcomes, and optionally Time/Study design (see Figure 1). Accordingly, the systematic review is guided by the following research questions:

RQ1: *What is the role of big data in Project Management?*
RQ2: *What is the role of big data in Project Sustainability?*

Participants	All Companies
Intervention	The Role of Big Data
Comparison	N/A
Outcome	Mapping of The Bigger Role of Big Data in Project Management and Project Sustainability

Figure 1: RQ as Structured by PICOS Criteria

Overview of Systematic Literature Review Process

In conducting this systematic literature review, the researcher utilised journal indexing

portals accessed via Google Scholar and Scopus. The article search was specifically tailored to the study's focus on the role of Big Data in project management and project sustainability. The review process commenced with the definition of search strings or coding categories relevant to the research topic. In this study, the search strings employed were "The Role of Big Data on Project Management" and "The Role of Big Data on Project Sustainability." Using these search strings, articles were retrieved through the selected search engines and subsequently collected for further processing, including data reduction and extraction. The initial search yielded 114 articles from Google Scholar and 57 articles from Scopus. Following this, data reduction and extraction were performed by assessing the relevance of each article to the study topic, ensuring compliance with predefined inclusion and exclusion criteria, and eliminating duplicate entries. The detailed process of this systematic review is illustrated in Figure 2. After completing the extraction and screening procedures across the two journal indexing portals, a total of 30 articles were identified as suitable for inclusion in the review.
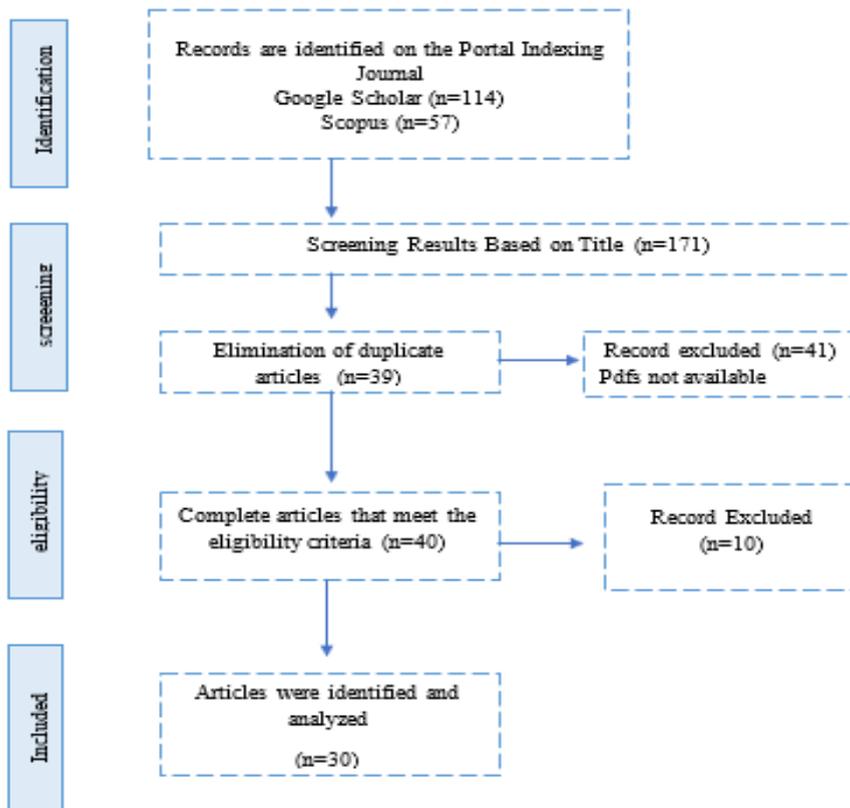

Figure 2: Systematic Review Diagram based on PRISMA

Data Extraction

The data extraction process in this study concentrated on examining the role of Big Data

in project management and project sustainability. A total of 40 articles, selected based on the established criteria, were subjected to extraction. This process enabled the researchers to systematically map the predominant and most significant contributions of Big Data as reported in the literature. The outcome of this procedure is a comprehensive mapping that illustrates the influence of Big Data on project management practices and project sustainability.

Search String

In this study, the initial step involved conducting a string-based search to identify articles relevant to the research topic. The search strings were derived from keywords appearing in article titles, with a focus on the role of Big Data in project management and project sustainability. The primary keywords used were "Big Data on Project Management" and "Big Data on Sustainability." During the search process, the researchers encountered some challenges in locating articles using these initial strings. To address this, an additional search string, "The Role of Big Data," was employed to capture studies that included related variables and broader contextual insights. This search strategy was implemented across the Google Scholar and Scopus journal indexing portals.

Inclusion and Exclusion Criteria

In this study, specific inclusion and exclusion criteria were established to narrow the scope of article selection. This approach ensures that, during the mapping process, researchers can focus on factors directly relevant to the research objectives. The criteria applied in this study are shown in Table 1.

Table 1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles written in English	Articles published in languages other than English
Articles published in journals or conference proceedings	Articles not classified as journals or proceedings
Articles specifically focused on the research topic, namely the role of Big Data in Project Management and Project Sustainability	Articles related to the research topic but not addressing the intended role of Big Data
Articles published between 2016 and 2022	Duplicate articles
Articles that are downloadable to facilitate the analysis process	Articles relevant to the topic but unavailable for download, preventing analysis

RESULTS AND DISCUSSION

Distribution of Paper

Following the data extraction process, the researchers identified a total of 30 articles

from the Google Scholar and Scopus journal portals, covering the period from 2016 to 2022. The distribution of these selected articles is presented in Figure 3. Moreover, as shown in Table 1, the final data reduction at the article extraction stage resulted in a total of 30 articles that were collected and analysed following the application of the inclusion and exclusion criteria. The distribution of publications from 2016 to 2022 indicates that the highest number of relevant articles—specifically addressing the role of Big Data in project management and project sustainability—was recorded in 2019, with nine articles indexed in Scopus. Conversely, the lowest publication counts occurred in 2017 and 2022. These findings highlight the need for further investigation into the role of Big Data in enhancing project management practices and promoting project sustainability.
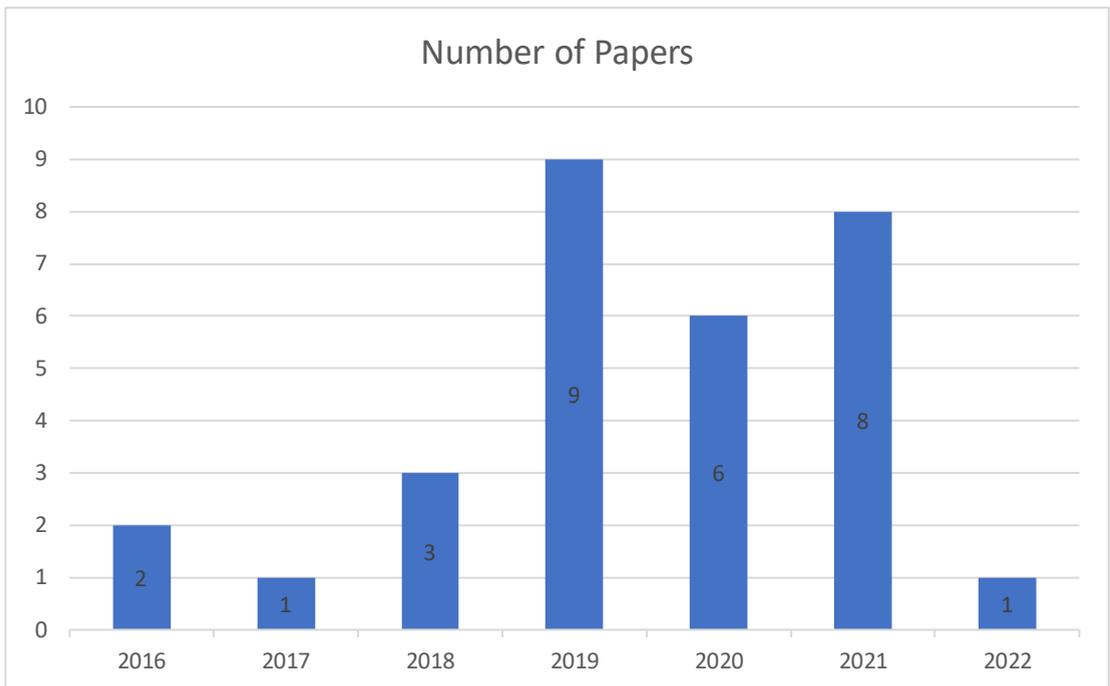

Figure 3: Article Distribution

The Role of Big Data in Project Management

Big Data represents a significant technological advancement that is increasingly essential due to its ability to store extensive datasets and integrate information from multiple sources. Within the context of project management, Big Data is applied across various domains to facilitate the efficient administration of organisational databases. Research findings indicate that many project management initiatives rely on Big Data to organise, manage, and summarise their datasets, thereby enabling companies to handle information more effectively. Examples of project management initiatives that incorporate Big Data are presented in Table 2.

Table 2: Selected Academic References on Strategic Project Management and Data-Driven Enterprise Systems

PID	Author	Title	Kinds of Project
5	(Franková et al., 2016)	Agile Project Management Approach and Its Use in Big Data Management	Agile Project Management
9	(Miller, 2018)	Quantitative Comparison of Big Data Analytics and Business Intelligence Project Success Factors	Business Intelligence Project
15	(Batkovskiy et al., 2019)	Sustainable Project Management for Multi-Agent Development of Enterprise Information Systems	Multi-Agent Development of Enterprise Information Systems
21	(Papadaki et al., 2019)	Big Data from Social Media and Scientific Literature Databases Reveals Relationships among Risk Management, Project Management, and Project Success	Big Data from Social Media and Scientific Literature Databases
23	(Dubey et al., 2019)	Adoption of Big Data Analytics in Construction: Development of a Conceptual Model	Augmented BDBIM Integration, BD Relative Advantage, Improved Design and Execution Efficiencies, Improved Project Management Capabilities, Augmented Availability of BD-Related Technology for Construction
77	(Piyathanavong et al., 2024)	Role of Project Management on Sustainable Supply Chain Development through Industry 4.0 Technologies and Circular Economy During the COVID-19 Pandemic: A Multiple Case Study of the Thai Metals Industry	Sustainable Supply Chain Development

Based on Table 2, Storey and Song (2017) demonstrated that Big Data enhances project management by enabling faster system operations. In their study, Big Data was applied to improve the handling of minor cases, particularly errors occurring during data analysis. Similarly, Sharma et al. (2021) highlighted the pivotal role of Big Data in identifying Business Intelligence (BI) projects. In this context, Big Data provides analytical algorithms that allow large volumes of BI data to be processed in a correlated manner. Within BI projects, Big Data links with project systems that encompass strategic and operational benefit items derived from cost and revenue performance, while project complexity is determined by the characteristics of BI initiatives. Consequently, Big Data analysis allows organisations to interpret interrelated system components efficiently, facilitating data analysis and decision-making. Raguseo (2018) further illustrated Big Data adoption at the international level, showing that companies utilised it at various stages: 29% during planning, 24% in implementation, and 13% in utilisation. This demonstrates the integral role of Big Data in effective project management across enterprises.

Nagoev et al. (2021) described advancements in algorithmic decision-making supported by multi-agent simulations. Companies tested heuristic methods to optimise model parameters. The multi-agent model developed by Aleksandr offers a higher level of detail compared with similar studies, encompassing task setting, requirement reviews, development, and familiarisation while incorporating individual preferences. This hybrid approach enables the identification of preferences for multi-criteria analysis in multi-agent development processes. The software includes independent services that communicate via network protocols, facilitating system adaptation and upgrades to changing needs. By integrating multi-agent decision support and simulation methods into a unified system, a synergistic effect is achieved in enterprise information system development. Big Data in this framework functions as a support mechanism, enabling multi-agent systems to prioritise and analyse information within the company.

Duan et al. (2019) examined corporate data governance, highlighting that Big Data provides novel techniques for managing, storing, and processing organisational data. By serving as a central repository, Big Data simplifies data collection and ensures more accurate, transparent information for system operators. Lai et al. (2018) emphasised that Big Data assists managers in understanding key drivers for adopting sustainable policies, thereby enhancing economic, social, and environmental outcomes. Jiwat noted that successful adoption of Big Data in corporate construction depends on technology, integration, organisational factors, and the corporate environment, enabling better project management, project success, and structured risk management. Similarly, Willumsen et al. (2019) demonstrated that Big Data analytics of social media, such as Twitter, can reveal patterns and practitioner insights related to project management, project success, and risk management. More recently, Piyathanavong et al. (2024) discussed the use of Big Data and data analytics to optimise production processes, highlighting the role of Industry 4.0 technologies—including Big Data, cloud computing, IoT, automation, robotics, and simulation—in supporting operational efficiency.

From these findings, it is evident that Big Data plays a critical role in managing and processing organisational and industrial datasets. Its utilisation improves accessibility, accelerates data handling, and facilitates the correlation of disparate factors within information systems, making it easier for operators to analyse data. Consequently, the application of Big Data in project management must continue to advance, particularly in managing increasingly complex datasets.

The Role of Big Data in Project Suitability

The data indicate that Big Data performs multiple functions and is integrated across various sustainability projects conducted between 2016 and 2022, as summarised in Table 3. Several studies illustrate the multifaceted role of Big Data in promoting project

sustainability. Bibri (2018), in research on analytics for smart sustainable urbanism, emphasised that Big Data addresses the complexities inherent in urban technologies, particularly in the development of smart cities, where high system complexity intersects with scientific relevance and practical usability. Similarly, Moro Visconti and Morea (2019) examined healthcare project financing and highlighted Big Data's critical function in the healthcare sector, a highly networked and systemic industry, where it provides timely feedback to support continuous business model re-engineering and narrow the gap between forecasts and actual outcomes.

Table 3: Literature Summary: Big Data and AI Applications in Sustainable Management and Industrial Systems

PID	Author	Title	Project Types
16	(Bibri, 2019)	Big Data Science and Analytics for Smart Sustainable Urbanism (Unprecedented Paradigmatic Shifts and Practical Advancements)	Analytics for Smart Sustainable Urbanism
17	(Moro Visconti & Morea, 2019)	Big Data for the Sustainability of Healthcare Project Financing	Healthcare Project Financing
33	(Beier et al., 2022)	Potentials of Big Data for Corporate Environmental Management	Corporate Environmental Management
43	(Zhang et al., 2020)	Achieving the Success of Sustainability Development Projects through Big Data Analytics and Artificial Intelligence Capability	Big Data Analytics and Artificial Intelligence Capability
51	(Andronie, Lăzăroiu, Iatagan, Hurloiu, et al., 2021)	Sustainable Cyber-Physical Production Systems in Big Data-Driven Smart Urban Economy: A Systematic Literature Review	Sustainable Cyber-Physical Production Systems
52	(Andronie, Lăzăroiu, Iatagan, Uță, et al., 2021)	Artificial Intelligence-Based Decision-Making Algorithms, Internet of Things Sensing Networks, and Deep Learning-Assisted Smart Process Management in Cyber-Physical Production Systems	Artificial Intelligence-Based Decision-Making Algorithms, Internet of Things Sensing Networks, and Deep Learning-Assisted Smart Process Management
54	(Chalmeta & Barqueros-Munoz, 2021)	Using Big Data for Sustainability in Supply Chain Management	Supply Chain Management
62	(Choi et al., 2021)	The Engineering Machine-Learning Automation Platform (EMAP): A Big-Data-Driven AI Tool for Contractors' Sustainable Management Solutions for Plant Projects	A Big-Data-Driven AI Tool

PID	Author	Title	Project Types
68	(Hinojosa-Palafox et al., 2021)	An Analytics Environment Architecture for Industrial Cyber-Physical Systems Big Data Solutions	Industrial Cyber-Physical Systems Big Data Solutions
75	(Mandičák et al., 2021)	Supply Chain Management and Big Data Concept Effects on Economic Sustainability of Building Design and Project Planning	Supply Chain Management and Big Data Concept
78	(Wang et al., 2016)	The Impact of Big Data on Logistic and Supply Chain Management	World-Class Sustainable Manufacturing
80	(Papadopoulos et al., 2017)	The Role of Big Data in Explaining Disaster Resilience in Supply Chains for Sustainability	Disaster Resilience in Supply Chains for Sustainability
81	(Ordóñez de Pablos & Lytras, 2018)	Knowledge Management, Innovation, and Big Data: Implications for Sustainability, Policy-Making, and Competitiveness	Sustainability, Policy Making, and Competitiveness
87	(Zeng, 2018)	Fostering Path of Ecological Sustainable Entrepreneurship within Big Data Network System	Ecological Sustainable Entrepreneurship
88	(Belaud et al., 2019)	Big Data for Agri-Food 4.0: Application to Sustainability Management for By-Products Supply Chain	Big Data for Agri-Food 4.0
89	(Ren et al., 2019)	A Comprehensive Review of Big Data Analytics throughout Product Lifecycle to Support Sustainable Smart Manufacturing: A Framework, Challenges, and Future Research Directions	Big Data Analytics
114	(Hao et al., 2019)	Big Data, Big Data Analytics Capability, and Sustainable Innovation Performance	Big Data Analytics
121	(Dubey et al., 2019)	Can Big Data and Predictive Analytics Improve Social and Environmental Sustainability?	Social Sustainability and Environmental Sustainability
123	(Zhang et al., 2020)	Achieving the Success of Sustainability Development Projects through Big Data Analytics and Artificial Intelligence Capability	Sustainable Innovativeness
135	(Lucivero, 2020)	Big Data, Big Waste? A Reflection on the Environmental Sustainability of Big Data Initiatives	Environmental Sustainability
137	(Zhang et al., 2020)	Achieving the Success of Sustainability Development Projects through Big Data Analytics and Artificial Intelligence Capability	Sustainable Growth and Performance
157	(Allen et al., 2021)	A Review of Scientific Advancements in Datasets Derived from Big Data for Monitoring the Sustainable Development Goals	Sustainable Development Goals (SDGs)
171	(Chalmeta & Barqueros-Munoz, 2021)	Using Big Data for Sustainability in Supply Chain Management	Sustainability in Supply Chain Management

Beier et al. (2022) identified Big Data as a primary driver for corporate environmental management, where it enables companies to realise potential environmental benefits. In

the context of innovation and organisational growth, Zhang et al. (2020) reported that Big Data Analytics Capability (BDAC) and Artificial Intelligence Capability (AIC) enhance sustainability design skills and commercialisation processes, with AIC exerting a stronger influence on commercialisation outcomes. Furthermore, Andronie, Lăzăroiu, Iatagan, Hurloiu, et al. (2021) demonstrated that sustainable smart manufacturing platforms, supported by cognitive decision-making algorithms, can network value chains across organisations, representing a form of innovative, industry-wide integration. Other studies reinforce these findings. Sharon and Lucivero (2019) argued that Big Data presents substantial opportunities for public sector applications. Allen et al. (2021) highlighted the utility of national Big Data in evaluating poverty levels and sustainable development opportunities. Chalmeta and Barqueros-Munoz (2021) noted that managerial competencies and technical skills are crucial for effective Big Data management within supply chain sustainability projects. Choi et al. (2021) emphasised that Big Data strengthens risk response and improves accuracy in increasingly complex AI applications.

In architectural and construction contexts, Marjani et al. (2017) observed that Big Data is indispensable for integrating contemporary technological developments into design processes. Kache and Seuring (2017) similarly highlighted its application in construction management to enhance production efficiency and optimise cost parameters. Dubey et al. (2021) noted that while social media platforms offer substantial opportunities for data collection in world-class sustainable manufacturing, challenges related to data authenticity and ethical considerations remain significant. Finally, Jin et al. (2022) demonstrated that Big Data plays an important role in education, particularly in developing mathematics education applications. Collectively, these studies illustrate that Big Data has a wide-ranging and critical influence on sustainability projects, spanning economic sectors, information technology, artificial intelligence, architecture, and education.

The Correlation between Big Data, Project Management, and Project Sustainability

Based on the reviewed literature, it is evident that Big Data, project management, and project sustainability are closely interrelated. Big Data encompasses large volumes of both structured and unstructured information that can be analysed to uncover patterns, trends, and correlations (Kivilä et al., 2017). It enables the identification of areas requiring improvement, supports informed decision-making, and facilitates forecasting of future outcomes. Project management, on the other hand, involves systematically planning, organising, and directing resources to achieve specific project objectives, encompassing activities such as scheduling, risk management, budgeting, and stakeholder communication. Project sustainability refers to the capacity of a project to fulfil present needs without compromising the ability of future generations to meet their

own, incorporating measures to assess and mitigate environmental, social, and economic impacts (Epstein, 2018).

In practice, Big Data can enhance project management by enabling the analysis and prediction of project outcomes, improving decision-making, and identifying potential risks and challenges (Duan et al., 2019). Project managers can leverage Big Data insights to monitor performance, pinpoint areas for optimisation, and refine project plans. Additionally, Big Data can facilitate the measurement of environmental, social, and economic impacts, which are fundamental to project sustainability (Bibri, 2018). By analysing metrics such as resource consumption, carbon emissions, and social indicators, managers can devise strategies to reduce negative impacts and ensure long-term project viability. Project sustainability can, in turn, be embedded within project management practices to ensure projects are designed and executed in ways that minimise adverse environmental, social, and economic effects. This may involve setting targets for carbon reduction, employing sustainable materials and energy sources, and engaging stakeholders to align with their needs and expectations (Karlsson et al., 2020). Overall, the integration of Big Data, project management, and project sustainability creates a synergistic framework that enhances project success and ensures enduring sustainability (Sánchez, 2015). The findings of this study suggest that these three variables collectively form a foundational basis for further research, particularly in exploring innovative approaches that leverage their combined potential.

CONCLUSION

Based on the study findings, experts assert that Big Data holds a pivotal role in managing information for companies and industrial organisations. It facilitates the ongoing accessibility revolution by enabling the processing and management of large datasets more efficiently and rapidly, eliminating lengthy procedures required to locate information within systems. By correlating queried problems with other relevant criteria, Big Data simplifies data analysis and allows operators to identify critical information within data collection frameworks. Consequently, there is a pressing need to apply Big Data more effectively in project management, particularly when handling complex operational data. Big Data performs diverse and significant functions across sustainability projects, spanning sectors such as finance, information technology, artificial intelligence, architecture, and education. The literature review indicates that in project management, Big Data contributes when organisations successfully operate information acquisition systems to swiftly and accurately reduce project risks. In the context of sustainable projects, Big Data assists in identifying critical information, ensuring that project plans are executed with minimal risk. These insights from the literature review can be leveraged by organisations to enhance both project management and project sustainability, facilitating more effective and structured planning processes.

BIBLIOGRAPHY

Allen, C., Smith, M., Rabiee, M., & Dahmm, H. (2021). A review of scientific advancements in datasets derived from big data for monitoring the Sustainable Development Goals. *Sustainability Science*, *16*(5), 1701-1716. https://doi.org/10.1007/s11625-021-00982-3

Andronie, M., Lăzăroiu, G., Iatagan, M., Hurloiu, I., & Dijmărescu, I. (2021). Sustainable cyber-physical production systems in big data-driven smart urban economy: a systematic literature review. *Sustainability*, *13*(2), 751. https://doi.org/10.3390/su13020751

Andronie, M., Lăzăroiu, G., Iatagan, M., Uță, C., Ștefănescu, R., & Cocoșatu, M. (2021). Artificial intelligence-based decision-making algorithms, internet of things sensing networks, and deep learning-assisted smart process management in cyber-physical production systems. *Electronics*, *10*(20), 2497. https://doi.org/10.3390/electronics10202497

Arianie, G. P., & Puspitasari, N. B. (2017). Perencanaan manajemen proyek dalam meningkatkan efisiensi dan efektifitas sumber daya perusahaan (Studi Kasus: Qiscus Pte Ltd). *J@ ti Undip: Jurnal Teknik Industri*, *12*(3), 189-196. https://doi.org/10.14710/jati.12.3.189-196

Barbosa, F., Woetzel, J., Mischke, J., Ribeirinho, M. J., Sridhar, M., Parsons, M., Bertram, N., & Brown, S. (2017). Reinventing construction through a productivity revolution. *McKinsey Global Institute*, *27*, 1. https://www.mckinsey.com/capabilities/operations/our-insights/reinventing-construction-through-a-productivity-revolution

Batkovskiy, A. M., Kurennykh, A. E., Semenova, E. G., Sudakov, V. A., Fomina, A. V., & Balashov, V. M. (2019). Sustainable project management for multi-agent development of enterprise information systems. *Entrepreneurship and Sustainability Issues*, *7*(1), 278. https://doi.org/10.9770/jesi.2019.7.1(21)

Beier, G., Kiefer, J., & Knopf, J. (2022). Potentials of big data for corporate environmental management: A case study from the German automotive industry. *Journal of industrial ecology*, *26*(1), 336-349. https://doi.org/10.1111/jiec.13062

Belaud, J.-P., Prioux, N., Vialle, C., & Sablayrolles, C. (2019). Big data for agri-food 4.0: Application to sustainability management for by-products supply chain. *Computers in Industry*, *111*, 41-50. https://doi.org/10.1016/j.compind.2019.06.006

Bibri, S. E. (2018). The IoT for smart sustainable cities of the future: An analytical framework for sensor-based big data applications for environmental sustainability. *Sustainable cities and society*, *38*, 230-253. https://doi.org/10.1016/j.scs.2017.12.034

Bibri, S. E. (2019). Big data science and analytics for smart sustainable urbanism. *Unprecedented Paradigmatic Shifts and Practical Advancements; Springer:*

Berlin, Germany. https://doi.org/10.1007/978-3-030-17312-8

Bilal, M., Oyedele, L. O., Munir, K., Ajayi, S. O., Akinade, O. O., Owolabi, H. A., & Alaka, H. A. (2017). The application of web of data technologies in building materials information modelling for construction waste analytics. *Sustainable materials and technologies*, *11*, 28-37. https://doi.org/10.1016/j.susmat.2016.12.004

Chalmeta, R., & Barqueros-Munoz, J.-E. (2021). Using big data for sustainability in supply chain management. *Sustainability*, *13*(13), 7004. https://doi.org/10.3390/su13137004

Choi, S.-W., Lee, E.-B., & Kim, J.-H. (2021). The engineering machine-learning automation platform (emap): A big-data-driven ai tool for contractors' sustainable management solutions for plant projects. *Sustainability*, *13*(18), 10384. https://doi.org/10.3390/su131810384

Depari, G. S., Shu, E., & Indra, I. (2022). Big data and metaverse toward business operations in indonesia. *Jurnal Ekonomi*, *11*(01), 285-291. https://www.ejournal.seaninstitute.or.id/index.php/Ekonomi/article/view/246

Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda. *International journal of information management*, *48*, 63-71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021

Dubey, R., Gunasekaran, A., Childe, S. J., Fosso Wamba, S., Roubaud, D., & Foropon, C. (2021). Empirical investigation of data analytics capability and organizational flexibility as complements to supply chain resilience. *International Journal of Production Research*, *59*(1), 110-128. https://doi.org/10.1080/00207543.2019.1582820

Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2019). Can big data and predictive analytics improve social and environmental sustainability? *Technological forecasting and social change*, *144*, 534-545. https://doi.org/10.1016/j.techfore.2017.06.020

Ekambaram, A., Sørensen, A. Ø., Bull-Berg, H., & Olsson, N. O. (2018). The role of big data and knowledge management in improving projects and project-based organizations. *Procedia computer science*, *138*, 851-858. https://doi.org/10.1016/j.procs.2018.10.111

Epstein, M. J. (2018). *Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts*. Routledge. https://doi.org/10.4324/9781351280129

Franková, P., Drahošová, M., & Balco, P. (2016). Agile project management approach and its use in big data management. *Procedia computer science*, *83*, 576-583. https://doi.org/10.1016/j.procs.2016.04.272

Hamid, N., Setyowati, D. L., Juhadi, J., Priyanto, A., Suswanti, S., Royyani, M., & Aroyandini, E. (2021). Sustainable development of the coastal environment through participatory mapping of abrasion-prone areas. *J. Environ. Manag.*

Tour, *12*(5), 1997-2009. https://www.ceeol.com/search/article-detail?id=1023158

Hao, S., Zhang, H., & Song, M. (2019). Big data, big data analytics capability, and sustainable innovation performance. *Sustainability*, *11*(24), 7145. https://doi.org/10.3390/su11247145

Hassani, A., & Gahnouchi, S. A. (2017). A framework for business process data management based on big data approach. *Procedia computer science*, *121*, 740-747. https://doi.org/10.1016/j.procs.2017.11.096

Hinojosa-Palafox, E. A., Rodríguez-Elías, O. M., Hoyo-Montaño, J. A., Pacheco-Ramírez, J. H., & Nieto-Jalil, J. M. (2021). An analytics environment architecture for industrial cyber-physical systems big data solutions. *Sensors*, *21*(13), 4282. https://doi.org/10.3390/s21134282

Intezari, A., & Gressel, S. (2017). Information and reformation in KM systems: big data and strategic decision-making. *Journal of knowledge management*, *21*(1), 71-91. https://doi.org/10.1108/JKM-07-2015-0293

Jin, S. J., Abdullah, A. H., Mokhtar, M., & Abdul Kohar, U. H. (2022). The potential of big data application in mathematics education in Malaysia. *Sustainability*, *14*(21), 13725. https://doi.org/10.3390/su142113725

Joseph, J. K., Dev, K. A., Pradeepkumar, A., & Mohan, M. (2018). Big data analytics and social media in disaster management. In *Integrating disaster science and management* (pp. 287-294). Elsevier. https://doi.org/10.1016/B978-0-12-812056-9.00016-6

Kache, F., & Seuring, S. (2017). Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management. *International journal of operations & production management*, *37*(1), 10-36. https://doi.org/10.1108/IJOPM-02-2015-0078

Karlsson, I., Rootzén, J., & Johnsson, F. (2020). Reaching net-zero carbon emissions in construction supply chains–Analysis of a Swedish road construction project. *Renewable and Sustainable Energy Reviews*, *120*, 109651. https://doi.org/10.1016/j.rser.2019.109651

Kerzner, H. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons. https://www.academia.edu/123134596

Kivilä, J., Martinsuo, M., & Vuorinen, L. (2017). Sustainable project management through project control in infrastructure projects. *International Journal of Project Management*, *35*(6), 1167-1183. https://doi.org/10.1016/j.ijproman.2017.02.009

Kuchta, D., & Mrzygłocka-Chojnacka, J. (2020). An approach to increase the sustainability of projects and their outcomes in public sector through improving project definition. *Sustainability*, *12*(12), 4804. https://doi.org/10.3390/su12124804

Lai, Y., Sun, H., & Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: An empirical

investigation. *The International Journal of Logistics Management*, *29*(2), 676-703. https://doi.org/10.1108/IJLM-06-2017-0153

Lucivero, F. (2020). Big Data, Big Waste? A Reflection on the Environmental Sustainability of Big Data Initiatives. *Science and Engineering Ethics*, *26*(2), 1025. https://dx.doi.org/10.1007/s11948-019-00171-7

Mandičák, T., Mésároš, P., Kanáliková, A., & Špak, M. (2021). Supply chain management and big data concept effects on economic sustainability of building design and project planning. *Applied Sciences*, *11*(23), 11512. https://doi.org/10.3390/app112311512

Marjani, M., Nasaruddin, F., Gani, A., Karim, A., Hashem, I. A. T., Siddiqa, A., & Yaqoob, I. (2017). Big IoT data analytics: architecture, opportunities, and open research challenges. *ieee access*, *5*, 5247-5261. https://doi.org/10.1109/access.2017.2689040

Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2018). Big data analytics capabilities: a systematic literature review and research agenda. *Information systems and e-business management*, *16*(3), 547-578. https://doi.org/10.1007/s10257-017-0362-y

Miller, G. J. (2018). Quantitative comparison of big data analytics and business intelligence project success factors. Conference on Advanced Information Technologies for Management, https://doi.org/10.1007/978-3-030-15154-6_4

Moro Visconti, R., & Morea, D. (2019). Big data for the sustainability of healthcare project financing. *Sustainability*, *11*(13), 3748. https://doi.org/10.3390/su11133748

Nagoev, Z., Pshenokova, I., Nagoeva, O., & Sundukov, Z. (2021). Learning algorithm for an intelligent decision making system based on multi-agent neurocognitive architectures. *Cognitive systems research*, *66*, 82-88. https://doi.org/10.1016/j.cogsys.2020.10.015

Økland, A. (2015). Gap analysis for incorporating sustainability in project management. *Procedia computer science*, *64*, 103-109. https://doi.org/10.1016/j.procs.2015.08.469

Ordóñez de Pablos, P., & Lytras, M. (2018). Knowledge management, innovation and big data: Implications for sustainability, policy making and competitiveness. In (Vol. 10, pp. 2073): MDPI. https://doi.org/10.3390/su10062073

Pade-Khene, C., Mallinson, B., & Sewry, D. (2011). Sustainable rural ICT project management practice for developing countries: investigating the Dwesa and RUMEP projects. *Information Technology for development*, *17*(3), 187-212. https://doi.org/10.1080/02681102.2011.568222

Papadaki, D. M., Bakas, D. N., Ochieng, E. G., Karamitsos, D. I., & Kirkham, D. R. (2019). Big data from social media and scientific literature databases reveals relationships among risk management, project management and project success. *Project Management and Project Success (September 26, 2019)*. https://dx.doi.org/10.2139/ssrn.3459936

Papadopoulos, T., Gunasekaran, A., Dubey, R., Altay, N., Childe, S. J., & Fosso-Wamba, S. (2017). The role of Big Data in explaining disaster resilience in supply chains for sustainability. *Journal of cleaner production*, *142*, 1108-1118. https://doi.org/10.1016/j.jclepro.2016.03.059

Piyathanavong, V., Huynh, V.-N., Karnjana, J., & Olapiriyakul, S. (2024). Role of project management on Sustainable Supply Chain development through Industry 4.0 technologies and Circular Economy during the COVID-19 pandemic: A multiple case study of Thai metals industry. *Operations Management Research*, *17*(1), 13-37. https://doi.org/10.1007/s12063-022-00283-7

Raguseo, E. (2018). Big data technologies: An empirical investigation on their adoption, benefits and risks for companies. *International journal of information management*, *38*(1), 187-195. https://doi.org/10.1016/j.ijinfomgt.2017.07.008

Ren, S., Zhang, Y., Liu, Y., Sakao, T., Huisingh, D., & Almeida, C. M. (2019). A comprehensive review of big data analytics throughout product lifecycle to support sustainable smart manufacturing: A framework, challenges and future research directions. *Journal of cleaner production*, *210*, 1343-1365. https://doi.org/10.1016/j.jclepro.2018.11.025

Salameh, J.-P., Bossuyt, P. M., McGrath, T. A., Thombs, B. D., Hyde, C. J., Macaskill, P., Deeks, J. J., Leeflang, M., Korevaar, D. A., & Whiting, P. (2020). Preferred reporting items for systematic review and meta-analysis of diagnostic test accuracy studies (PRISMA-DTA): explanation, elaboration, and checklist. *bmj*, *370*. https://doi.org/10.1136/bmj.m2632

Sánchez, M. A. (2015). Integrating sustainability issues into project management. *Journal of cleaner production*, *96*, 319-330. https://doi.org/10.1016/j.jclepro.2013.12.087

Sharma, K., Shetty, A., Jain, A., & Dhanare, R. K. (2021). A comparative analysis on various business intelligence (BI), data science and data analytics tools. 2021 International Conference on Computer Communication and Informatics (ICCCI), https://doi.org/10.1109/ICCCI50826.2021.9402226

Sharon, T., & Lucivero, F. (2019). Introduction to the Special Theme: The expansion of the health data ecosystem–Rethinking data ethics and governance. In (Vol. 6, pp. 2053951719852969): SAGE Publications Sage UK: London, England. https://doi.org/10.1177/2053951719852969

Slamet, K. (2016). Implementation of Project Management Courses in the Form of Mini Project Implementation. Journal of Financial and Accounting Information, 4(7), 121–142, https://doi.org/10.31092/jia.v4i4.54

Storey, V. C., & Song, I.-Y. (2017). Big data technologies and management: What conceptual modeling can do. *Data & Knowledge Engineering*, *108*, 50-67. https://doi.org/10.1016/j.datak.2017.01.001

Turner, R., & Zolin, R. (2012). Forecasting success on large projects: developing reliable scales to predict multiple perspectives by multiple stakeholders over

multiple time frames. *Project management journal*, *43*(5), 87-99. https://doi.org/10.1002/pmj.21289

Wang, G., Ngai, E. W. T., & Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, 176, 98–110. https://doi.org/10.1016/j.ijpe.2016.03.014

Wang, Y., Kung, L., & Byrd, T. A. (2018). Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations. *Technological forecasting and social change*, *126*, 3-13. https://doi.org/10.1016/j.techfore.2015.12.019

Wideman, R. M. (1992). Project and program risk management: a guide to managing project risks and opportunities. https://www.amazon.com/Project-Program-Risk-Management-Opportunities/dp/1880410060

Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F. S., & Farioli, F. (2012). From complex systems analysis to transformational change: a comparative appraisal of sustainability science projects. *Sustainability Science*, *7*(Suppl 1), 5-24. https://doi.org/10.1007/s11625-011-0148-y

Willumsen, P., Oehmen, J., Stingl, V., & Geraldi, J. (2019). Value creation through project risk management. *International Journal of Project Management*, *37*(5), 731-749. https://doi.org/10.1016/j.ijproman.2019.01.007

Wirawan, S. M. S. (2021). Evaluation of Participants' Perceptions in Project Management Training. . *Cetta: Journal of Educational Sciences*, *4*(3), 409-425. https://doi.org/10.37329/cetta.v4i3.1383

Yu, J.-H., & Zhou, Z.-M. (2019). Components and development in Big Data system: A survey. *Journal of Electronic Science and Technology*, *17*(1), 51-72. https://doi.org/10.11989/JEST.1674-862X.80926105

Zasa, F. P., Patrucco, A., & Pellizzoni, E. (2020). Managing the hybrid organization: How can agile and traditional project management coexist? *Research-Technology Management*, *64*(1), 54-63. https://doi.org/10.1080/08956308.2021.1843331

Zeng, J. (2018). Fostering path of ecological sustainable entrepreneurship within big data network system. *International Entrepreneurship and Management Journal*, *14*(1), 79-95. https://doi.org/10.1007/s11365-017-0466-3

Zhang, H., Song, M., & He, H. (2020). Achieving the success of sustainability development projects through big data analytics and artificial intelligence capability. *Sustainability*, *12*(3), 949. https://doi.org/10.3390/su12030949

Zidane, Y. J.-T., & Olsson, N. O. (2017). Defining project efficiency, effectiveness and efficacy. *International Journal of Managing Projects in Business*, *10*(3), 621-641. https://doi.org/10.1108/IJMPB-10-2016-0085