# THE INFLUENCE OF BIG DATA ANALYTICS ON HUMAN RESOURCE MANAGEMENT STRATEGIES FOR COMPANY SUSTAINABILITY

**Albin Moniago Simanjuntak[1], Suyono Thamrin[2], Sri Sundari[3]**
*The Republic of Indonesia Defense University*
*Email: albin.simanjuntak@mp.idu.ac.id*

**ABSTRACT**

*This article explores the transformative role of big data analytics in human resources (HR) management, particularly in the context of improving corporate sustainability. This paper discusses the definition of big data and its importance in modern business, emphasizing the volume, velocity, variety, veracity, and value of data. The Industry 4.0 era is underscored, highlighting the importance of up-to-date HR skills and the application of advanced analytics to improve HR processes such as recruitment, retention and employee performance evaluation. This paper discusses how big data analytics facilitates a more objective and data-driven approach to HR decision making, leading to greater efficiency and effectiveness in HR processes. Key technologies such as Hadoop and Apache Spark are mentioned for their ability to manage large-scale data storage and processing. NoSQL database integrations, modern data warehouse solutions, and data visualization tools like Tableau or Power BI were highlighted for their role in helping HR professionals gain actionable insights. The bulk of the paper is dedicated to a literature review, synthesizing findings from various studies on this topic. This review examines the potential of big data in HR to improve the long-term performance and sustainability of companies, also addressing challenges related to privacy and ethical considerations in data handling. The paper concludes by emphasizing the importance of integrating big data analytics in HR management and a focus on sustainability, emphasizing that while challenges exist, the long-term benefits of effectively implementing these technologies are clear: stronger, more adaptive and sustainable business operations.*

**Keywords**: *Big Data Analytics, Human Resources (HR) Management, Corporate Sustainability, Industry 4.0 Technology, Data-Based Decision Making.*

## 1. Introduction

The term "big data" often refers only to the use of predictive analytics, user behavior analytics, or other specific advanced data analytics methods that extract value from data, and rarely to specific data set sizes (Diantaa et al., 2022). Big data is a condition where conventional database storage models can no longer handle large amounts of data (Shafiyah et al., 2022). Because more than 98% of the information stored worldwide is electronic, and the business community has accepted this new type of information because it can be useful (Sinosi et al., 2022). Big Data is a term that refers to data sets that are so large and complex that they are difficult to process using traditional data processing methods. This data is generated from a variety of diverse sources, such as social media, business transactions, sensors, and Internet of Things (IoT), which collect information continuously and in large volumes. The main characteristics of Big Data are often summarized as the "3Vs": volume (large amounts of data), velocity (the speed at which data is generated and processed), and variety (the variety of data types and sources). Apart from that, some add "veracity" (accuracy and reliability of the data) and "value" (the value that can be taken from the data).

a. *Volume*
Refers to the large amount of data generated. The volume of this data has increased significantly since 2012, with the volume of data managed by companies doubling approximately every 40 months (BBVA, 2020).

b. *Velocity*
Indicates the speed at which data is generated and processed. This includes how data moves quickly from source to source and how quickly it must be processed to generate insights.

c. *Variety*
Refers to the variety of data types and sources that exist. It includes data that comes from multiple sources and in a variety of formats, including text, video, images, and more.

d. *Veracity*
Relates to the accuracy and reliability of data. Veracity emphasizes the importance of the quality and reliability of the data collected and analyzed (Uk.indeed.com, 2023).

e. *Value*
Highlights the importance of extracting useful value from data. Just collecting data is not enough; the real value lies in the analysis and insights that can be drawn from that data to aid in decision making or operational improvements (Robinson et al., 2023).

The addition of "veracity" and "value" to the original 3V concept reflects the evolution of understanding of the complexity and potential of Big Data. While the original 3V focused on the technical and quantitative aspects of data, this addition emphasizes the importance of data quality and the benefits that can result from data analysis.

Many business experts call the era we are entering the era of Industrial Revolution 4.0, which is marked by the emergence of advanced technology such as artificial intelligence and a disruptive era, where it is feared that advanced technology could replace many human jobs (Azzahra, 2021). This revolution is also called the digital revolution which is marked by the rapid use of computers and automation of recording in all fields (Kustanti, 2021). The era of Industrial Revolution 4.0 opens up opportunities for industrial human resources (HR) to acquire the latest skills (Muhamad Irfan Kresnadi et al, 2023). The concept of Big Data relates not only to the amount of data, but also to the ability to identify patterns, trends and insights that can be obtained through analyzing that data. Advanced analytical technology allows organizations to process Big Data in real-time or near real-time, providing the ability to make more informed and faster decisions. Big Data carries significant potential in the worlds of business and science, where deep analysis of big data can provide insights that can change the way organizations operate their business strategies, understand customers, and customize products or services.

One of the capabilities that is considered to be able to add value to an organization's supply chain is big data analytics (Mardhiyah & Santosa, 2022). Big data analytics technology is a collection of tools and methods used to interpret large volumes of data, which are continuously growing and often complex. Based on the results of research on HR, it shows that many entrepreneurs struggle to incorporate sustainability in a strategic way into their business (Nurasia & Aprirachman, 2023). In human resource management strategy, big data analytics is applied to improve the efficiency and effectiveness of HR processes, from recruitment to employee retention. As the foundation of this process, platforms such as Hadoop and Apache Spark provide a strong infrastructure foundation for handling data storage and processing at scale. Hadoop, with its Hadoop Distributed File System, enables massive data storage, while Spark offers high processing speed with its ability to process data in-memory.

NoSQL databases and modern data warehouse solutions such as Amazon Redshift or Google Big Query have become increasingly important in managing and analyzing unstructured data. Extract Transform Load tools like Talend or Informatica play a role in preparing that data, ensuring that the resulting data is clean, accurate, and ready for analysis.

Data visualization tools like Tableau or Power BI enable HR professionals to visualize data and gain actionable insights more quickly and intuitively.

Cloud computing platforms such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform have become the foundation that enables the scalability and flexibility required for big data analysis, ensuring that resources can be easily scaled according to analytical needs. And when it comes to analyzing and interpreting data, machine learning and AI technologies like NLP come into play, helping in identifying patterns and trends, as well as providing predictive and prescriptive capabilities that were previously impossible with such large and complex datasets.

By combining all these technological elements, human resource management can change the way strategic decisions are made, moving from intuition to data-based decisions that support corporate sustainability. Thus, the key to utilizing big data analytics in HR lies not only in sophisticated technology, but also in expertise in interpreting the resulting data to inform and guide strategic decisions.

## 2. Literature Review

In the last decade, big data analytics has emerged as an important catalyst in understanding the complex dynamics of human resource management (HRM). Use of big data for strategic decision making, long-term performance and company sustainability (Moh. Halim, 2023). This, as explained by (Ahmad Firdaus Lingga et al, 2022), human resource development is needed to answer the challenges of the era of disruption 4.0.

### 2.1 Big Data Analytics in HR

In line with research by (Boudreau & Lakhani, 2013), the use of big data analytics in employee recruitment and retention has shown an increase in employee adjustment to appropriate roles. The development of a model for employee change readiness researched by (Shah et al., 2016), has been used to evaluate and predict employee performance, forming a basis for HR decision making.

### 2.2 HR Strategy and Corporate Sustainability

Corporate sustainability, as articulated by (Eccles et al., 2014), increasingly relies on sustainable HR practices. Big data analytics strengthens this approach by enabling organizations to conduct better assessments of the social and environmental impacts of their HR practices, which is in line with findings from research (Elkington, 1997) on the Triple Bottom Line.

### 2.3 Case Studies and Practical Applications

Examples of practical applications of big data analytics in HR are demonstrated through case studies by (Deloitte, 2018), which illustrate how Fortune 500 companies have integrated data to improve employee satisfaction and sustainability. Furthermore, research by (IBM, 2021) shows how analytics can be used to predict employee turnover trends and inform retention strategies.

### 2.4 Challenges and Limitations

Although the potential of big data analytics in HR is considerable, challenges related to privacy and ethics, as explained by (Martin & Murphy, 2017), should not be ignored. Research by (Dahlbom et al., 2019) emphasizes the importance of understanding these limitations in the context of applicable regulations.

## 3. Research Methods

A qualitative literature review is an important methodological approach in understanding the existing body of knowledge related to the influence of big data analytics on human resource (HR) management strategies for corporate sustainability. This method allows researchers to extract and synthesize findings from diverse studies to build a more comprehensive conceptual understanding of the research topic.

### 3.1 Research Design

This research design focuses on a systematic literature review, selecting and evaluating relevant qualitative research in the fields of big data analytics and HR management. This research uses a qualitative synthesis framework to identify themes, patterns, and relationships in the existing literature.

### 3.2 Literature Selection Process

The selection of literature sources is carried out based on clear inclusion and exclusion criteria, which include topic relevance, methodological quality, and significance of contribution to the research field. Academic databases such as JSTOR, Scopus, and Web of Science were used to collect relevant sources, using keywords related to big data analytics, HR strategy, and corporate sustainability.

### 3.3 Data Collection

This data refers to the texts and findings of the studies reviewed. The data collection process involves extracting essential information from each source, including the research objectives, methodology used, main findings, and conclusions. This information is then arranged in matrix form to facilitate comparison and analysis. There are eight papers that we will review.

### 3.4 Data Analysis

Data analysis was carried out through a structured text coding process. Each article or literature source is broken down into codeable units of meaning. These codes are grouped into larger themes that reflect key patterns or concepts in the literature. This method allows researchers to identify similarities and differences, as well as relationships between themes.

## 4. Research Findings and Discussion

Research findings and discussion are a crucial part of any academic study, providing insight into the results obtained and linking them to theoretical frameworks and previous research. In the journal entitled "*The Influence of Big Data Analytics on Human Resource Management Strategy for Corporate Sustainability"*, this section will explore and discuss findings related to the use of big data analytics in HR management and its impact on corporate sustainability.

Literature that highlights various important aspects of innovation, sustainability, data privacy, and the use of technologies such as AI and big data in business and HR environments. Each provides valuable insight into current and future trends in organizational management and business practices.

### a. *"Using the Crowd as an Innovation Partner"*

This article discusses how organizations can leverage crowdsourcing as a tool for innovation and problem solving. By analyzing the interactions between companies and the public, the authors reveal four main models of crowdsourcing that are effective in various situations.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Use of crowdsourcing as an innovation tool.
- *Similarities:* Focus on crowdsourcing.
- *Differences:* Variations in forms of crowdsourcing and their effectiveness.
- *Relationship to Other Themes:* Related to corporate sustainability and AI in HR.

b. *"Cannibals With Forks".*

Elkington introduced the concept of the 'triple bottom line' in the context of sustainable capitalism. This book details the seven revolutions necessary to achieve sustainability, including market value, transparency, and technology, offering a guide for companies to operate more sustainably.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Triple bottom line concept.
- *Similarities:* Seven major revolutions for sustainability.
- *Difference:* Focus on revolution in the context of sustainability.
- *Relationship to Other Themes:* Relates to social enterprise and big data in HR.

c. *"The Rise of the Social Enterprise".*

Based on global surveys and interviews, this article highlights the importance of social enterprise and how organizations are judged not only by financial performance but also by their relationships with employees, customers, and communities.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* The importance of social roles in business.
- *Similarities:* The shifting role of business in society.
- *Difference:* Focuses on the changing role of business.
- *Relationship to Other Themes:* Related to sustainable capitalism and big data in HR

d. *"Big Data and HR Analytics in the Digital Era".*

This article explores how human resources analytics and big data are used in HR. Based on a Finnish case study, the authors discuss the challenges and need for collaboration between HR professionals and data analysts.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Use of data and analytics in strategic decisions.
- *Similarities:* Focus on HR.
- *Difference:* Specific to application in HR.
- *Connections to Other Themes:* Linkages to AI in HR and privacy in marketing.

e. *"The Role of Data Privacy in Marketing".*

This article reviews various aspects of privacy in marketing. By analyzing existing literature, the authors show how a narrow view of privacy can limit a broader, integrative understanding.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* The importance of understanding and managing data privacy.
- *Similarities:* Focus on privacy in marketing.
- *Difference:* Specific to the privacy aspect of marketing.
- *Relationship to Other Themes:* Related to big data in HR and AI.

*f. "The Impact of Corporate Sustainability on Organizational Processes and Performance.*

This research shows that companies that adopt sustainability policies tend to have better performance in both the stock market and accounting. This research emphasizes the importance of sustainability in business strategy.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Use of advanced technology.
- *Similarities*: Focus on sustainability and corporate performance.
- *Difference*: Linkage of sustainability to financial and operational performance.
- *Relationship to Other Themes:* Relates to sustainable capitalism and social enterprise.

*g. "The Business Case for AI in HR".*

This article investigates how AI can improve efficiency and effectiveness in the HR function. IBM, as a case study, shows the implementation of AI in various aspects of HR such as learning and compensation.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Specific AI applications in HR.
- *Similarities*: Focuses on the human aspects of the organization.
- *Difference:* Specific to the application of AI in HR.
- *Relationship to Other Themes:* Related to AI in HR and big data.

*h. "Big Data in an HR Context: Exploring Organizational Change Readiness".*

This article explores organizational readiness in adopting big data. By assessing employee attitudes and behavior, this research shows that economic rewards and intrinsic satisfaction play an important role in the acceptance of organizational change.

Identify similarities and differences, as well as relationships between themes.
- *Theme:* Focus on the human aspect of the organization.
- *Similarities*: Organizational and employee readiness for change.
- *Difference:* Specific to change readiness in the HR context.
- *Relationship to Other Themes:* Related to big data and analytics in HR.

*4.1 Research Findings*

The article "Using the Crowd as an Innovation Partner" by (Boudreau & Lakhani.,2013) reveals that crowdsourcing is suitable for various types of challenges, with four main forms: contests, collaborative communities, complementarity, and labor markets. (Meanwhile, Elkington's "Cannibals with Forks", 1997) highlights seven major revolutions for sustainability, including market value, transparency, technology, life cycles, partnerships, time, and governance. In "The Rise of the Social Enterprise" (Deloitte., 2018), it was found that organizations are judged not only on financial performance but also on their relationships with workers, customers, and communities.

In the context of big data and HR analytics, "Big Data and HR Analytics in the Digital Era" by (Dahlbom et al.,2019) found that there are technical and human challenges in the adoption of advanced HR analytics, as well as the need for collaboration between data analysts and HR professionals. "The Role of Data Privacy in Marketing" suggested that narrow views of privacy constructed in consumer, organizational, ethical, or legal silos limit understanding of privacy. Furthermore, "The Impact of Corporate Sustainability on Organizational Processes and Performance" by (Eccles et al.,2014) shows that companies with high sustainability have more responsible organizational processes and better stock market and accounting performance.

"The Business Case for AI in HR" (IBM., 2021) reveals that AI increases efficiency and effectiveness in HR functions, including learning, compensation, and employee engagement.

Finally, "Big Data in an HR Context: Exploring Organizational Change Readiness" by (Shah et al., 2016) found that economic rewards and intrinsic satisfaction influence employee attitudes and behavior towards organizational change. These findings provide important insights into the role of technology, innovation and sustainability in the modern business context.

*4.2 Discussion*

The main findings of the two articles relevant to the use of big data analytics in human resource management (HR) and its impact on corporate sustainability can be explored and discussed as follows:

*4.2.1 "Big Data and HR Analytics in the Digital Era" (Dahlbom et al., 2019).*

The main findings of this article highlight the technical and human challenges in the adoption of advanced HR analytics, as well as the need for collaboration between data analysts and HR professionals. The use of big data in HR has the potential to revolutionize the way companies manage talent, from recruitment to employee development. Big data analytics enable HR leaders to make more objective, data-driven decisions, such as identifying patterns in employee turnover, predicting training needs, and optimizing recruiting strategies.

Challenges in implementation include difficulties integrating data from multiple sources, ensuring data privacy and security, and developing analytical competencies among HR professionals. However, by overcoming these challenges, companies can more effectively manage their human resources, which are a key asset for business sustainability.

*4.2.2 "The Impact of Corporate Sustainability on Organizational Processes and Performance" (Eccles et al., 2014).*

This research finds that companies with a high level of sustainability have more responsible organizational processes and better stock market and accounting performance. The use of big data analytics in this context can help companies identify and implement effective sustainability practices. By analyzing data from various aspects of operations, companies can find ways to reduce waste, increase energy efficiency and optimize resource use.

Big data analytics can also be used to measure the social and environmental impacts of company activities, which is important for sustainability reporting and meeting stakeholder expectations. Thus, big data analytics not only improves a company's sustainability performance but also supports strategic decision-making oriented towards long-term sustainability.

The use of big data analytics in HR management and corporate sustainability contains great potential to increase efficiency, effectiveness and corporate social responsibility. This creates a more dynamic and adaptive work environment, ultimately contributing to the long-term sustainability of the business.

## 5. Conclusion

The conclusions from the exploration of the main findings regarding the use of big data analytics in human resource management (HR) and its impact on corporate sustainability are as follows:

*5.1 Use of Big Data Analytics in HR Management.*

Big data analytics in HR management, as revealed in research by (Dahlbom et al.,2019), carries great potential to improve decision making in HR. By utilizing data efficiently, organizations can optimize recruitment, employee development and retention processes.

Implementing these technologies also presents challenges, including data integration, privacy, security, and developing analytical competencies among HR professionals.

### 5.2 Impact on Company Sustainability.

As illustrated by (Eccles et al.,2014), companies that integrate sustainability into their business processes tend to have better performance. The use of big data analytics supports sustainability by enabling companies to measure and manage the impact of their operations on the environment and society. This helps in identifying areas for improving efficiency, reducing waste, and optimizing resource use, as well as meeting stakeholder expectations and sustainability reporting standards.

### 5.3 General Conclusion

The integration of big data analytics in HR management and a focus on sustainability is a strategic step for modern companies. This not only improves operational efficiency and effectiveness but also strengthens the company's social and environmental responsibilities. While there are challenges to overcome, the long-term benefits of this approach are clear: companies that are able to effectively adopt these technologies will be more resilient, adaptable, and sustainable in the long term.

## References

Ahmad Firdaus Lingga et al. (2022). Mengoptimalkan Pengelolaan Inovasi dalam Manajemen SDM: Strategi dan Tantangan. *Jurnal Ilmu Komputer, Ekonomi Dan Manajemen (JIKEM)*, *2*(1), 1365–1371.

Azzahra, B. (2021). Akuntan 4.0: roda penggerak nilai keberlanjutan perusahaan melalui artificial intelligence &tech analytics pada era disruptif. *Jurnal Riset Akuntansi Dan Keuangan*. http://e-journalfb.ukdw.ac.id/index.php/jrak/article/view/376

BBVA. (2020). The five V's of big data. *Bbva*, *May*, 8–11. https://www.bbva.com/en/five-vs-big-data/

Boudreau, K. J., & Lakhani, K. R. (2013). Using the crowd as an innovation partner. *Harvard Business Review*, *91*(4).

Dahlbom, P., Siikanen, N., Sajasalo, P., & Jarvenpää, M. (2019). Big data and HR analytics in the digital era. *Baltic Journal of Management*, *15*(1), 120–138. https://doi.org/10.1108/BJM-11-2018-0393

Deloitte. (2018). The Rise of the Social: 2018 Deloitte Global Human Capital Trends. *Deloitte University Press*, 104. https://www2.deloitte.com/content/dam/insights/us/articles/HCTrends2018/2018-HCtrends_Rise-of-the-social-enterprise.pdf

Diantaa, I. A., Aqhamb, A. A., & Setiawan, D. (2022). Penerapan big data untuk mengatur sistem analisis data. *Jurnal Ilmiah Teknik Mesin, Elektro Dan Komputer*, *2*(1), 2809–0799. https://ejurnal.stie-trianandra.ac.id/index.php/JURITEK/article/view/271%0Ahttps://ejurnal.stie-trianandra.ac.id/index.php/JURITEK/article/download/271/281

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, *60*(11), 2835–2857. https://doi.org/10.1287/mnsc.2014.1984

Elkington, J. (1997). *Cannibals With Forks*.

IBM. (2021). The business case for AI in HR. *With Insights and Tips on Getting Started ….*

Kustanti, E. (2021). Implementasi Big Data Pada Manajemen Pengetahuan Komoditas Pertanian Big Data. *Jurnal Pustakawan Indonesia*, *20*(1), 1–9.

Mardhiyah, J. F., & Santosa, W. (2022). Pengaruh Kapabilitas Analitik Big Data terhadap Kinerja Rantai Pasok dengan mediasi Ketahanan Rantai Pasok. *Jembatan : Jurnal Ilmiah Manajemen*, *19*(2), 159–172. https://doi.org/10.29259/jmbt.v19i2.18317

Martin, K. D., & Murphy, P. E. (2017). The role of data privacy in marketing. *Journal of the Academy of Marketing Science*, *45*(2), 135–155. https://doi.org/10.1007/s11747-016-0495-4

Moh. Halim. (2023). *PERAN AKUNTANSI MANAJEMEN STRATEGIK TERHADAP PENGAMBILAN KEPUTUSAN BISNIS MELALUI ANALISIS BIG DATA DAN ARTIFICIAL INTELLIGENCE: SUATU STUDI LITERATURE REVIEW*. *8*(1), 31–41.

Muhamad Irfan Kresnadi et al. (2023). Transformasi Upskiling dan Reskiling Sumber Daya Manusia Dalam Mengahadapi Tantangan Revolusi 4.0 Di Sektor Kepelabuhanan dan Logistik. *EKONOMIKA45 : Jurnal Ilmiah Manajemen, Ekonomi Bisnis, Kewirausahaan*, *10*(2), 169–174. https://doi.org/10.30640/ekonomika45.v10i2.870

Nurasia, N., & Aprirachman, R. (2023). Pandangan Artistik dan Ilmiah tentang Peran Manajemen Sumber Daya Manusia dalam Keberlanjutan Strategis Organisasi. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, *6*(2), 909–915. https://doi.org/10.54371/jiip.v6i2.1627

Robinson, S., Kentucky Farm Bureau, Gillis, A. S., & Writer, T. (2023). *5V's of big data*. 1–5. https://www.techtarget.com/searchdatamanagement/definition/5-Vs-of-big-data#:~:text=The 5 V%27s of big,centric

Shafiyah, S., Ahsan, A. S., & ... (2022). Big Data Infrastructure Design Optimizes Using Hadoop Technologies Based on Application Performance Analysis. *Sistemasi: Jurnal Sistem* …. http://sistemasi.ftik.unisi.ac.id/index.php/stmsi/article/view/1510

Shah, N., Irani, Z., & Sharif, A. M. (2016). Big data in an HR context: Exploring organizational change readiness, employee attitudes and behaviors. *Journal of Business Research*, *70*, 366–378. https://doi.org/10.1016/j.jbusres.2016.08.010

Sinosi, S. M., Moerdianto, R., Pontoh, G. T., & ... (2022). IMPLEMENTASI BIG DATA ANALYSTICS DALAM PRAKTIK AUDIT PADA PERUSAHAAN: LITERATURE REVIEW. *Eqien-Jurnal Ekonomi* …. https://stiemuttaqien.ac.id/ojs/index.php/OJS/article/view/690

Uk.indeed.com. (2023). *A guide to the four V's of big data (with definitions)*. 31–41. https://uk.indeed.com/career-advice/career-development/the-four-vs-of-big-data