THE POTENTIAL OF BIG DATA IN ORGANIZATIONS: DETERMINANTS AND PREDICTORS OF WORKFORCE

Nur Aisyah

Universiti Sains Islam Malaysia

correspondence: aaisyah771@gmail.com

Abstract - This research examines the potential of Big Data technologies in managing workforce needs and organizational success planning. By leveraging Big Data, organizations can identify labor market trends, skill needs, and develop effective success strategies. The literature review shows that organizational, technological and individual factors influence the availability and quality of the Big Data workforce. Challenges in implementation include data integration, changing organizational culture, and improving employee competencies. In conclusion, Big Data technology can improve organizational efficiency and competitiveness through data-driven workforce planning. Suggestions are given to strengthen training, collaboration with educational institutions, and investment in technology infrastructure.

Keywords: Big Data potential, organizations, workforce determinants, workforce predictors, success planning.

INTRODUCTION

Throughout this digital age, increasingly complex challenges in managing workforce needs and planning for organizational success are faced by organizations around the world. Dynamic changes in the global economy, continuous technological developments, and unpredictable job market dynamics are driving organizations to seek more innovative and efficient approaches to managing their human capital. The application of Big Data technology is a promising solution in analyzing workforce needs and planning for organizational success. By leveraging big data and advanced analytics capabilities, organizations can identify trends and patterns in workforce needs, and develop effective success strategies. This implementation of Big Data technology provides an opportunity to improve efficiency, data-driven decision-making, and organizational competitiveness in the ever-evolving digital age.

Large and well-known companies have utilized Big Data technology in various ways to improve their efficiency, data-driven decision-making, and competitiveness. Some examples of companies that have utilized Big Data technology are Google, which has optimized their services by utilizing Big Data technology without compromising the privacy of their users. They have released a BDaaS (Big Data-as-a-Service) feature that allows companies to fully utilize Big Data technology without the need to hire data scientists or developers. There is also IBM providing Big Data solutions through products like IBM Watson and IBM InfoSphere. They help organizations manage and analyze big data effectively and efficiently. Many other large technology companies also utilize Big Data technology to perform data mining, manage and analyze large amounts of data, and develop strategies based on the information obtained. This utilization of Big Data technology provides opportunities for companies to improve operational efficiency, optimize data-driven decision-making, and increase competitiveness in the ever-evolving digital era.

Big Data, with its impressive power and capability to collect, store and analyze large volumes of diverse data at an incredible speed, has provided a better understanding of the complex dynamics of the workforce. In this digital age, Big Data technology has become an essential tool that enables organizations to make sense of the wide range of internal and external data at their disposal. Such data includes employee data, current industry trends, and valuable job market projections that can help organizations plan and implement their strategies more effectively. While the power and immense potential of Big Data technology has been widely recognized across various sectors and industries, its use in the context of workforce needs analysis and organizational success planning is still a relatively new concept.

There is still a lot of room for growth and improvement, as this technology has not been fully utilized optimally in this space. Many organizations still face challenges in integrating this big data into their decision-making processes (Arifin & Mardikaningsih, 2021). These challenges include various aspects, ranging from technical issues to the need to change the mindset and culture of the organization (Darmawan et al., 2020). However, despite these challenges, optimism is high that Big Data will continue to transform and revolutionize the way organizations manage and use their data to optimize their staffing strategies.

Big data technology has a lot of potential for workforce demand analysis and organizational success planning. While traditional methods make it difficult to effectively process and analyze large amounts of data, big data technology enables in-depth integration and analysis of multiple data sources. This can help organizations to analyze workforce needs. Thus, big data technology has a lot of potential for workforce needs analysis and organizational success planning. This technology allows organizations to manage their workforce more effectively and proactively, and develop a digitally

competent workforce, which will enable organizations to respond effectively to a rapidly changing environment (Mardikaningsih & Putra, 2021). Big data technology can help organizations to better understand and respond to their workforce needs such as analyzing labor market trends; analyzing supply-demand of future workforce needs; analyzing required competencies. Big data technology can help organizations to better understand and proactively meet their workforce needs. This allows organizations to plan and manage their workforce more efficiently now and in the future (Putra et al., 2022). Thus, organizations can better prepare themselves in recruiting, developing, and retaining a workforce that matches market demands. In addition, big data technology can also be used in analyzing organizational success, which is the process of identifying and developing potential employees to fill key positions in the future. This helps organizations to ensure that they have the right people at the right time. In this way, big data technology can help organizations manage their workforce more systematically and effectively. This allows organizations to respond quickly to changing market conditions and improve their competitiveness.

By understanding their profiles and characteristics, companies can prepare appropriate development and training plans to ensure smooth success within the organization. Thus, companies will be able to reduce the risk of vacant positions and maintain operational continuity by identifying qualified internal talent. This paper will examine the potential of big data in organizations as a workforce determinant and predictor. By understanding how big data technologies can be used to identify immediate workforce needs, forecast future needs, and plan for effective success, it is hoped that this review can provide practical guidance for organizations to improve their staffing strategies.

RESEARCH METHODS

A comprehensive literature study approach will be used in this review so as to observe related literature on current concepts, theories, and practices in the application of Big Data technology in relation to workforce needs and organizational success planning.

The literature search is conducted through academic databases, scientific journals, books, and other sources of information. The literature found was then screened based on certain inclusion and exclusion criteria. Inclusion criteria included relevance to the research topic, methodological quality, and accuracy of information. The evaluated literature was then systematically analyzed to identify key findings, trends and patterns relevant to the research topic.

The results of the literature analysis were synthesized and interpreted to identify key conclusions, better understanding, and implications for further research. This process involves grouping the findings based on specific themes or aspects, as well as noting differences of opinion or gaps in the existing literature. By following these stages systematically, research using the literature review method can provide an in-depth understanding of the issue under study and make a valuable contribution to the development of knowledge in the field.

RESULTS AND DISCUSSIONS

In the current digital era, data has become a very valuable resource for organizations. Technological advances have resulted in an ever-increasing amount of data at an incredible rate, known as the "big data" phenomenon (Mikalef et al., 2020). Big data refers to very large, complex, and diverse data sets that cannot be processed using traditional data processing techniques and technologies (Wamba et al., 2017). Organizations that can effectively harness the potential of big data will gain a significant competitive advantage over their competitors (Fosso Wamba et al., 2015).

One important aspect of harnessing the potential of big data is understanding the determinants and predictors of the workforce required to effectively manage and analyze big data. A workforce that has the right skills and competencies in big data management and analysis is a key success factor for organizations in extracting value from big data (Mikalef et al., 2019). Therefore, organizations need to understand the factors that influence the availability and quality of a workforce competent in big data, as well as their ability to predict future workforce needs. There are several factors that affect the availability and quality of a competent workforce in big data. These factors can be categorized into three main groups: (1) organizational factors, (2) technological factors, and (3) individual factors.

1. Organizational Factors

   One important organizational factor is an organizational culture that supports the development and use of big data. Organizations that have a culture that encourages innovation, collaboration and learning will be more effective in attracting and retaining big data talent (Ahmad et al., 2014, Mikalef & Krogstie, 2020; Mardikaningsih & Hariani, 2020). In addition, top management support is also an important factor, as they play a critical role in allocating resources and driving big data adoption across the organization (Wamba et al., 2017; Al Hakim & Hariani, 2021). An organizational culture that supports innovation, collaboration and learning enhances an organization's ability to attract and retain big data talent (Mikalef & Krogstie, 2020; Djaelani et al., 2021). Another influential organizational factor is a flexible and decentralized organizational structure (Masnawati & Hariani, 2023). More organic and less hierarchical organizational structures tend to be more effective in responding to the dynamic and fast-changing needs

of the big data workforce (Mikalef et al., 2019). In addition, organizational investment in employee training and development is also an important factor in building big data capabilities (Fosso Wamba et al., 2017).

2. Technology Factors

Technological factors that affect the availability and quality of the big data workforce include the organization's information technology (IT) infrastructure and the maturity level of data management. Organizations that have a strong and integrated IT infrastructure will find it easier to manage and analyze big data, thus increasing the need for a competent workforce in this field (Wamba et al., 2017). In addition, the maturity level of data management, such as the availability of big data analytics platforms and data quality, is also an important factor in determining the need and competence of the big data workforce (Mikalef et al., 2019). A robust and integrated IT infrastructure, as well as a high level of data management maturity, increases the need for a workforce competent in big data (Wamba et al., 2017; Mikalef et al., 2019).

3. Individual Factors

Individual factors that affect the availability and quality of the big data workforce include the skills, knowledge and personal characteristics of employees. Technical skills required in big data management and analysis, such as programming, statistics, and data visualization, are important factors (Fosso Wamba et al., 2017). Business domain knowledge is also needed so that the big data workforce can understand the organizational context and translate insights gained from big data analysis into useful actions (Mikalef et al., 2019). In addition, personal characteristics such as curiosity, creativity, and adaptability are also important factors in the success of the big data workforce (Wamba et al., 2017).

Technical skills, business domain knowledge, and personal characteristics such as curiosity and adaptability are important factors that determine the success of the big data workforce (Fosso Wamba et al., 2017; Mikalef et al., 2019; Sinambela et al., 2021). In addition to understanding the determinants of the big data workforce, organizations also need to be able to predict future workforce needs. There are several factors that can be used as predictors to determine future big data workforce needs, including:

1. Data volume growth

According to Manyika et al. (2011), "Global data volumes are expected to increase by 40% per year, with higher growth rates in some sectors such as media and entertainment". This suggests that the need for a workforce that is proficient in managing and analyzing big data will increase.

2. The development of big data technology

Wamba et al. (2015) state that the development of big data technologies, such as Hadoop, NoSQL, and data visualization tools, will drive the adoption of big data in various sectors, thereby increasing the demand for a workforce skilled in this field.

3. Growth of data-intensive industries

According to Davenport and Patil (2012), data-intensive industries, such as manufacturing, healthcare, and finance, will increasingly require a workforce capable of extracting insights from big data to support decision making and innovation.

4. Government policies

Rongala and Aithal (2019) revealed that government initiatives, such as investments in data infrastructure and training programs, can drive the growth of the big data industry and increase the need for a skilled workforce.

By considering the above factors, organizations and policymakers can conduct more effective workforce planning and development to meet future big data needs. Here are some ways to integrate the identified factors into an organization's big data workforce development strategy:

1. Data-driven workforce planning:
   a. Analyze data growth trends and big data technology developments to forecast future workforce needs.
   b. Evaluate the competencies and skills needed to manage and analyze big data.
2. Development of training and certification programs:
   a. Design training programs that focus on data analysis, modeling, and visualization skills.
   b. Create a certification program to ensure the workforce has the required competencies in big data.
3. Collaboration with educational institutions:
   a. Work with universities and training institutions to tailor curricula to the needs of the big data industry.
   b. Offer internship programs or on-the-job learning opportunities to bridge the gap between academia and the world of work.
4. Career development initiatives:
   a. Provide a clear career path for the big data workforce, including professional development opportunities and promotion paths.
   b. Connect the workforce with mentoring and coaching programs to help them develop the skills needed.
5. Investment in infrastructure and technology:
   a. Provide access to big data infrastructure, such as analytics platforms and data visualization tools, to enhance the practical skills of the workforce.
   b. Adopt the latest big data technologies and ensure the workforce is trained in their use.

6. Collaboration with industry and government:
   a. Participate in government initiatives or joint projects to develop a big data workforce.
   b. Network with other organizations facing similar challenges in recruiting and developing a big data workforce.

By integrating such factors into workforce development strategies, organizations can ensure that they have a workforce that is skilled and ready for the big data challenges of the future.

In retaining a skilled big data workforce, organizations face a variety of challenges. One of the main challenges is the scarcity of workers who are proficient in this field (Kiley et al., 2015). The demand for big data talent is increasing, while the supply of qualified human resources is still limited (Wahyudi et al., 2021). Organizations must compete fiercely in recruiting and retaining the best workforce in this field (Manyika et al., 2011; Eddine et al., 2023). In addition, the rapid development of big data technology makes workforce skills quickly obsolete. Organizations need to constantly evaluate and update employee competencies to stay relevant to technological advancements (Hüsig & Hipp, 2009). This is a challenge in itself, given the skills gap that must be addressed.

Another issue faced is uncompetitive compensation and benefits. Skilled big data workers are in high demand in the market, so they often get more attractive offers from other organizations. Therefore, organizations must offer competitive compensation and benefits packages to retain top talent (Halvorson, 2017).

In addition, the lack of a clear career development path is a challenge. The big data workforce needs structured career development opportunities, including promotion paths, job rotations, and leadership development programs (Rothwell, 2020). Organizations must provide an attractive career path for the big data workforce.

A less supportive organizational culture can also be a challenge in retaining top talent. Organizations need to build a culture that supports learning, innovation and collaboration so that the big data workforce can thrive. Lack of management and peer support can lead to high turnover rates (Schein, 2017).

To overcome these challenges, organizations need to implement a comprehensive strategy, including investing in competency development, providing competitive compensation, and creating a work environment that is supportive and attractive to the big data workforce.

CONCLUSIONS

This study confirms that Big Data technologies have great potential in workforce needs analysis and organizational success planning. With the ability to process large and complex data, Big Data helps organizations understand market trends, skill needs and develop more efficient success strategies. Big Data implementation can reduce the risk of vacant positions and improve organizational competitiveness.

The potential of Big Data within organizations has several determinants and predictors that are relevant in a workforce context. One important aspect is the development of workforce competencies in Big Data analysis. Organizations need to increase training and skill development of employees so that they can master Big Data analysis well. Another suggestion is that collaboration with universities and educational institutions is also an important factor. This collaboration is necessary to ensure that the curriculum taught is in line with the needs of the Big Data industry. Thus, employees can gain relevant knowledge and skills to face the demands of work in this field.

Investment in technology is also crucial. Organizations need to invest in the technological infrastructure and analytical tools required to support Big Data implementation. With adequate technology, organizations can collect, store and analyze data efficiently and accurately.

Next, it is important to build an organizational culture that supports innovation and learning. In the context of Big Data, this means creating an environment that encourages employees to think creatively, take risks, and continuously learn. With this supportive culture, organizations can optimize the utilization of Big Data for strategic purposes.

Finally, it is also important to offer a competitive compensation package. Employees who have skills and knowledge in Big Data analysis are valuable assets to the organization. Therefore, providing attractive compensation will help retain a qualified workforce in the Big Data field.

By combining all these factors, organizations can make good use of the potential of Big Data. From employee competency development to technology investment and a supportive organizational culture, all these aspects contribute to maximizing the benefits that can be derived from Big Data within the organization.

REFERENCES

Ahmad, N., Z. Yue, R. Saeed, D. Darmawan, M. Jaykumar & A. A. Mohamed. (2014). Effective Implementation of Strategic Plans and Actions in Modern Corporate Management. The Business & Management Review, 4(2), 295-312.

Al Hakim, Y. R. & M. Hariani. (2021). The Influence of Transformational Leadership Style on Organizational Commitment and Job Performance, Journal of Science, Technology and Society, 2(2), 19-24.

Arifin, S. & R. Mardikaningsih. (2021). The Effect of Employability, and Organizational Climate on Employee Performance, Studi Ilmu Sosial Indonesia, 1(2), 33-42.

Dahar, D. & R. Mardikaningsih. (2022). The Influence of Compensation and Work Environment on the Performance of Sub-District Employees, International Journal of Service Science, Management, Engineering, and Technology, 1(1), 28 – 32.

Darmawan, D., R. Mardikaningsih, E. A. Sinambela, S. Arifin, A.R. Putra, M. Hariani, M. Irfan, Y.R. Al Hakim, & F. Issalillah. (2020). The Quality of Human Resources, Job Performance and Employee Loyalty, International Journal of Psychosocial Rehabilitation, 24(3), 2580-2592.

Davenport, T. H., & Patil, D. J. (2012). Data scientist: the sexiest job of the 21st century. Harvard business review, 90(10), 70-76.

Djaelani, M., E. A. Sinambela, D. Darmawan, & R. Mardikaningsih. (2021). Strengthening the Culture of Occupational Safety and Health as a Contributor to the Formation of Construction Project Performance, Journal of Marketing and Business Research, 1(2), 59-70.

Eddine, B. A. S. & D. Darmawan. (2023). Sales Performance Improvement Through Monitoring of Work Experience and Quality Work of Life, Journal of Marketing and Business Research, 3(1), 71-80.

Fosso Wamba, S., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. International Journal of Production Economics, 165, 234-246.

Fosso Wamba, S., Gunasekaran, A., Akter, S., Ren, S. J. F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. Journal of Business Research, 70, 356-365.

Halvorson, H. G. (2017). Nine things successful people do differently. Harvard Business Review Press.

Mardikaningsih, R., & M. Hariani. (2020). Effect of Work Climate and Wages on Turnover Intention, Journal of Science, Technology and Society, 1(2), 21-28.

Hariani, M. (2023). Unleasing Organizational Commitment: Unravelling the Impact of Contract Worker Competence, Leadership, and Organizational Culture, International Journal of Service Science, Management, Engineering, and Technology, 3(1), 11–16.

Hüsig, S., & Hipp, C. (2009). Does disruptive innovation require organisational change? The case of automobile navigation. International Journal of Innovation Management, 13(03), 307-321.

Irfan, M. & Y. R. Al Hakim. (2022). The Effect of Perceived Organizational Support and Organizational Culture on Job Satisfaction, International Journal of Service Science, Management, Engineering, and Technology, 2(2), 25 – 30.

Jamaluddin, A., L. C. Hoe, A. A. Mohamed, D. Darmawan, A.T. Hannan, M. Ismail & N. Ahmad. (2013). Human resource management implications of technology-based organizational forms. Academy of Management Journal, 23(2), 83-94.

Kiley, A.M., B. Evans, M. Ismail, R. Saeed, D. Darmawan, L. C. Hoe & A.T. Hannan. (2015). Strategic Flexibility and the Virtue of Innovation in Responding to the Dynamics of Change. The Journal of Management Studies, 31(3), 865-878.

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Byers, A. H. (2011). Big data: The next frontier for innovation, competition, and productivity. McKinsey Global Institute.

Mardikaningsih, R. & A. R. Putra. (2021). Efforts to Increase Employee Work Productivity through Job Satisfaction and Job Training, Studi Ilmu Sosial Indonesia, 1(1), 51-64.

Masnawati, E. & M. Hariani. (2023). Impact of Leadership, Discipline, and Organizational Commitment on the Effectiveness of Teacher Work, Bulletin of Science, Technology and Society, 2(2), 20-24.

Mikalef, P., & Krogstie, J. (2020). Examining the interplay between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. Information & Management, 57(2), 103169.

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. Information & Management, 57(2), 103169.

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.

Putra, A. R., T. S. Anjanarko, D. Darmawan, J. Jahroni, S. Arifin & M. Munir. (2022). The Role of Remuneration, Leadership Behaviour, and Working Conditions on Job Satisfaction, Studi Ilmu Sosial Indonesia, 2(1), 61-74.

Putra, A. R. & R. Mardikaningsih. (2022). Study on Employee Performance Reviewing from Leadership, Innovative Behavior and Work Engagement, International Journal of Service Science, Management, Engineering, and Technology, 1(3), 4 – 10.

Putra, A.R. (2022). Improving Employee Performance through the Implementation of Total Quality Management and the Effectiveness of the Remuneration System, International Journal of Service Science, Management, Engineering, and Technology, 2(2), 1 – 5.

Rongala, S., & Aithal, P. S. (2019). Factors Influencing the Growth of Big Data Analytics Industry. International Journal of Applied Engineering and Management Letters (IJAEML), 3(1), 175-185.

Rothwell, W. J. (2020). Effective succession planning: Ensuring leadership continuity and building talent from within. AMACOM.

Schein, E. H. (2017). Organizational culture and leadership. John Wiley & Sons.

Sinambela, E. A., D. Darmawan, & V. Mendrika. (2022). Effectiveness of Efforts to Establish Quality Human Resources in the Organization, Journal of Marketing and Business Research, 2(1), 47-58.

Wahyudi, W., R. N. K. Kabalmay, & M. W. Amri. (2021). Big Data and New Things in Social Life, Studi Ilmu Sosial Indonesia, 1(1), 1-12.

Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. International Journal of Production Economics, 165, 234-246.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J. F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. Journal of Business Research, 70, 356-365.