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The Use of Data Analytics in Human Resource Management

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Abstract:

Purpose*: The objective of the article is to investigate the role of data analysis and Big Data in managing human resources (HRM). The authors focus on identifying the benefits resulting from the use of data analysis in personnel management processes, understanding the threats and challenges associated with this practice, and presenting perspectives on the future of this field.*

Design/Methodology/Approach: *Perspectives on the development of data analysis and Big Data utilization in human resource management are presented, along with potential directions for further research in this area. The authors summarize the main conclusions and recommendations derived from the study. The research problem is formulated as follows: How does the use of data analysis and Big Data affect human resource management? Our research aims to explore the role and potential of data analysis in the context of human resource management, understand how organizations employ data analysis in recruitment, selection, training, performance assessment, and talent management processes. Another objective is to identify the primary benefits that organizations can attain through the use of data analysis in personnel management, such as enhanced decision-making, improved efficiency of personnel processes, and optimized utilization of human resources. The study does not confine itself solely to potential benefits. The authors endeavour to identify the principal challenges and risks associated with employing data analysis in human resource management. The study drew upon the latest research presented in documents and reports published by international organizations, as well as literature analysis based on scientific articles from recent years and credible online sources, which facilitated the discovery of new trends in human resource management.*

Findings: *Utilizing data analysis in human resource management yields numerous benefits (enhanced decision-making in personnel matters, optimization of recruitment and employee development processes, increased efficiency in performance evaluation, talent identification, and trend prediction, which aligns with organizational strategic goals), but it also presents*

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challenges (personal data protection, risk of discrimination, the imperative of ensuring data security) and responsibility.
Practical implications: *The article focuses on identifying threats and challenges linked with employing data analysis and Big Data in human resource management. Discussed are issues about personal data protection and data security, along with an analysis of challenges connected with data interpretation and ensuring adequate technological resources, analytical competencies, and ethical awareness. Responsible application of data analysis and Big Data in human resource management, in line with best practices, can yield significant benefits for organizations, enhancing both business outcomes and employee experiences.*
Originality/Value: *Global Big Data statistics indicate that data serves as the linchpin for transforming any company. However, numerous organizations still do not sufficiently invest in analytical solutions. The authors endeavour to provide concrete recommendations for organizations aiming to effectively utilize data analysis in personnel management while ensuring compliance with relevant legal regulations and respect for employees' rights.*

Keywords: *Data analysis, Big Data, management, human resources, organization*.

JEL codes: *M12, M21, M50*

Paper type: *Research article.*

1. Introduction

In today's dynamic business environment, where technological, social, and economic changes are becoming increasingly urgent, human resource management is becoming a key element of organizational success strategy. In this context, greater attention is being paid to the use of data analysis, including Big Data, as a tool supporting personnel management processes.

Our research aims to delve into the role and potential of data analysis in the context of human resource management. We want to understand how organizations use data analysis in recruitment, selection, training, performance evaluation, and talent management processes.

Furthermore, our goal is to identify the main benefits that organizations can achieve through the use of data analysis in personnel management, such as better decision-making, increased efficiency of personnel processes, and optimization of human resource utilization.

However, the study is not limited to potential benefits. We also aim to identify the main challenges and threats associated with the use of data analysis in human resource management. In particular, we are interested in issues related to personal data protection, the risk of discrimination, and data security challenges.

By exploring these issues, our goal is to provide specific recommendations for organizations that want to effectively use data analysis in personnel management, while ensuring compliance with applicable legal regulations and respect for employees' rights.

Our study aims to contribute to the expansion of knowledge about the role and significance of data analysis in the field of human resource management and to develop best practices in this area.

2. Human Resource Management in Organizations

During the analysis of the human resource management area, there is a need for the definition of the concept of human resources. It should be noted that people are not resources, but they possess a resource, namely a set of characteristics and properties embodied in them, which enable them to perform various roles in the organization (Leleń, 2010).

The main components of human resources are: knowledge, abilities, skills, health, attitudes and values, and motivation. It should also be remembered that individual employees are the owners of human resources, and they decide on the extent of engagement of this resource during work (Pocztowski 2003). Effective human resource management can be carried out according to many concepts and in various ways.

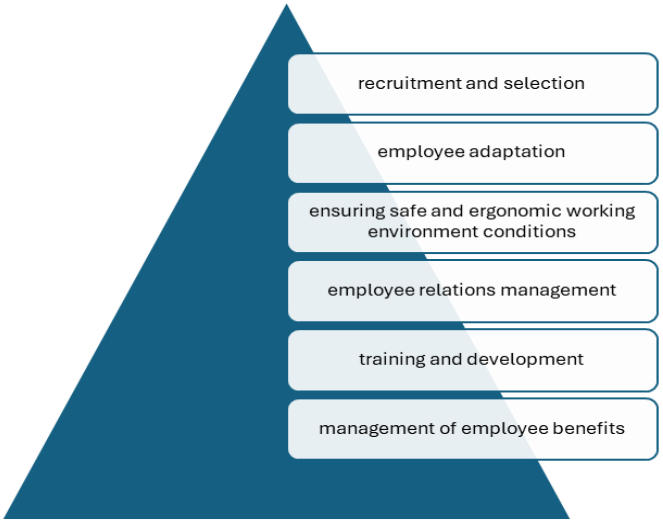
However, all contemporary methods of effective team management share 10 common characteristics:

- It is both an art and a science,
- It is omnipresent,
- It is a continuous process,
- It serves a service function,
- It must comply with legal regulations,
- It is interdisciplinary and rapidly changing,
- It focuses on results,
- It is people-oriented,
- It is a philosophy of interpersonal relations,
- It is an integrated concept (What is management…2024).

Human resource management involves the process of managing employees of an organization from recruitment to their departure (both initiated by the employee and the employer and in some cases retirement).

Among the many tasks set before employees in this area, six main functions of human resource management can be distinguished. These functions are presented in the diagram below.

***Figure 1**. Six main functions of the human resource management process*



***Source:** https://www.templatka.pl/zarzadzanie-zasobami-ludzkimi.html*

Human resource management in organizations mainly focuses on the relations between the employer represented by management and the workforce (Ciekanowski, 2012). Human resource management policy aims to achieve a common goal of people and organizations towards converging objectives.

It is a strategic approach to motivation and development issues, stimulating their engagement and dedication so that while pursuing their ambitions and goals, they also contribute incidentally to the achievement of organizational goals (Ciekanowski, 2012). It is a process that requires constant attention and commitment.

An organization needs to be aware of the value of its employees and invest in their development. Communication plays a crucial role in building trust and employee engagement, influencing the effectiveness of the entire organization. Additionally, managing diversity and equality in the workplace is becoming increasingly important as it benefits both employees and the organization itself.

Ultimately, effective human resource management is based on building relationships, supporting personal development, and creating an atmosphere conducive to maintaining motivation and achieving business goals.

3. Data Analysis and Big Data

We live in the era of the information society, for which data holds significant value. Information has been valuable to humans for centuries. With the knowledge possessed, more accurate decisions can be made, especially concerning business

activities. Information must be processed and analysed appropriately to serve as a source of answers to many pressing questions. Such functions information can fulfil through Big Data and the analysis of data in various ways (Practical Application of Big Data… 2024; Velinov *et al.*, 2023; Tyagi *et al.*, 2023).

Big data, or vast amounts of data, plays an increasingly significant role in today's world. More and more organizations realize the potential lying in collecting, analysing, and utilizing data in management processes (The Importance of Big Data…, 2024). It is a relatively new term, hence finding a consistent definition is challenging (Kania *et al.*, 2018; Norena-Chavez and Thalassinos, 2023).

Some researchers suggest that big data is a "moving definition" that changes over time and across industrial sectors (Manyika *et al.*, 2019). There is no established threshold for measuring the size and type of data that can be considered large datasets, considering their quantity is constantly growing (Sheng *et al.*, 2017). Below is a presentation of how much data was and still is created daily, as well as the scale of regularly used data:

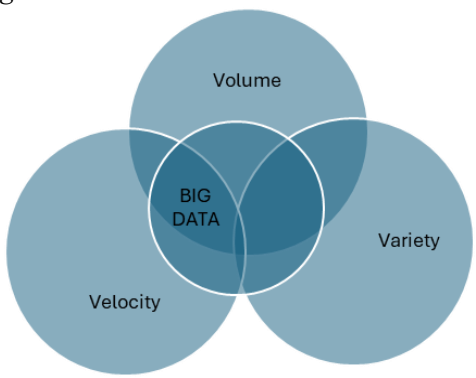
• In 2021, people created 2.5 quintillion bytes of data every day.
• By 2022, 70% of the world's GDP will be digitized.
• In 2022, 91% of Instagram users interact with brand videos.
• By 2025, 200+ zettabytes of data will be stored in the cloud worldwide.
• In 2022, users send about 650 million tweets per day.
• By the end of 2020, 44 zettabytes will constitute the entire digital universe.
• In 2022, 333.2 billion emails are sent daily (Rayaprolu, 2024).

Managing large datasets involves how organizations store and process data. Adhering to appropriate practices can facilitate management and provide organizations with the proper infrastructure for storing information now and in the future, maintaining an adequate level of personal or confidential data security (What is Big Data…, 2024). Proper management of large datasets ensures that an organization's data is accessible, well-organized, and accurate.

This is crucial for increasing people's trust in the information they rely on when making decisions. Focusing on data management as part of big data management can adequately protect the enterprise, mitigating the effects and risks of breaches and reducing regulatory issues by ensuring compliance with legal or jurisdictional data principles—such as the European Union's General Data Protection Regulation (GDPR) (Data Governance Best Practices…, 2024).

The concept of "big data" is gaining tremendous interest worldwide (Akter *et al.*, 2014). The amount of data collected and stored by organizations has never been higher and continues to grow steadily. Enterprises without proactive data management strategies risk both operational activities and reputation loss.

Figure 2. *"V" Big Data Terms*



Source: *https://bluesoft.com/pl/blog/niech-zyje-big-data-analytics/*

Experts define Big Data using three "V" terms, which are associated with unique technical challenges:

- *Volume - huge datasets pose significant technological demands in terms of processing, monitoring, and storage.*
- *Velocity - many organizations rapidly generate new data and must react to actions in real-time. Big Data particularly requires this type of velocity from companies involved in technologies related to social media platforms, the Internet of Things, and e-commerce.*
- *Variety - in Big Data, another challenge is the variety of data formats. Big Data warehouses contain documents from text editors, email messages, presentations, images, videos, and other formats (Big Data is Dead…, 2024).*

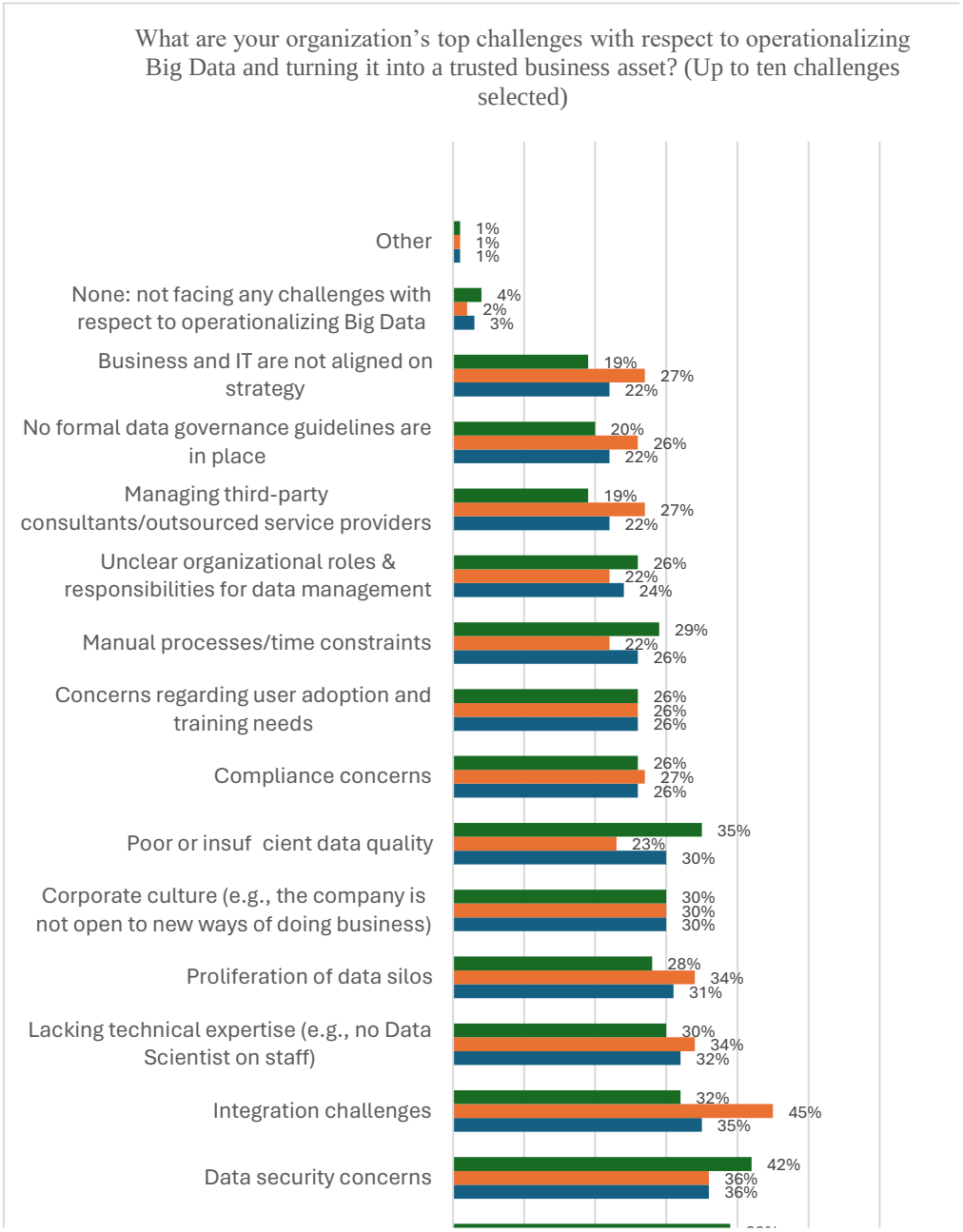
Most organizations constantly face typical barriers and challenges such as limited budget, concerns about data security, and integration issues (Mittal *et al.*, 2017). The study on these issues was included in a joint report by Informatica and Capgemini on the keys to operationalizing Big Data projects "The Big Data Payoff: Turning Big Data into Business Value." These data are presented in Figure 3.

The significance of Big Data in the functioning of every organization will increase in the coming years. Progress in this field will undoubtedly support the development of organizations, although it also brings many challenges for the future. Among the most important ones, we can definitely include:

- Data security - with the growing volume of collected data, their security becomes an increasingly important issue. It is necessary to ensure adequate

measures to protect personal and business data from cyber-attacks and privacy breaches.

***Figure 3**. Keys to Operationalizing Big Data Projects*

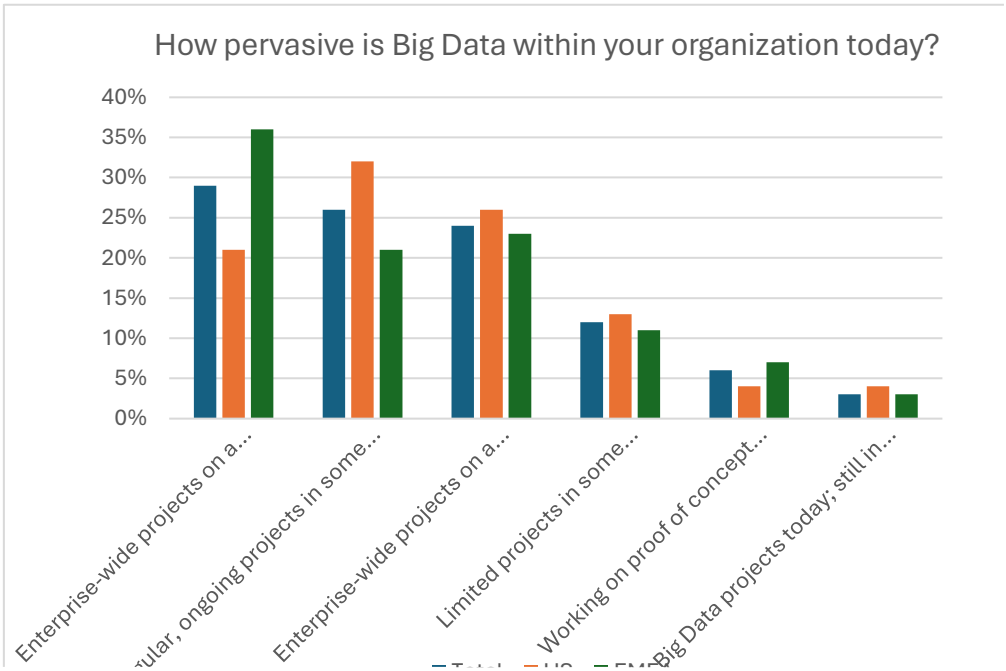


Source: *https://www.capgemini.com/.*

- Privacy protection - increasing societal awareness regarding the protection of personal data privacy requires companies to adopt more transparent and ethical practices in collecting, storing, and processing data.
- Managing data complexity - the increasing diversity of data types and formats requires flexible data management tools and techniques that enable effective storage, analysis, and extraction of valuable insights from data.

Nevertheless, over half (the majority of which are regularly involved in projects encompassing the entire enterprise or specific departments or groups) of the surveyed individuals indicate that Big Data has reached a level of ubiquity throughout their organization. Below are the respondents' responses to the question "How pervasive is Big Data in your organization today?".

Figure 4. *Ubiquity of Big Data in organizations*



Source: https://www.capgemini.com/

The future of Big Data entails not only challenges but also specific paths of development. Experts in the data analysis industry predict that the proliferation of Big Data will result in, among other things:

- Improved quality of real-time analytics - as the need for real-time decision-making grows, new techniques and tools for stream processing and ad hoc information analysis will be developed.
- Utilization of machine learning and AI - leveraging machine learning and artificial intelligence techniques will automate analytical processes and

detect hidden patterns and dependencies in data more effectively than manual analysis.
- Development of analytical tools and technologies - with technological advancements and the evolution of new tools such as cloud computing, NoSQL databases, and data analytics platforms, more efficient management of Big Data and utilization of their potential will become possible.
- Application of Big Data in new fields - including healthcare, science, transportation, and agriculture, which will impact process improvements and the speed of decision-making in these areas (Big Data - what is it..., 2014).

Big Data statistics from around the world indicate that data is the key to transforming any company. However, there are still many organizations that do not adequately invest in analytical solutions (The Ultimate List of Statistics..., 2024).

4. Data Analysis and Big Data in HR - Threats and Challenges

The introduction of data analysis and big data into human resource management opens up new opportunities for optimizing recruitment processes, employee development, and performance evaluation.

Data analysis can provide organizations with valuable information about the behaviours, preferences, and skills of employees, enabling more accurate personnel decisions.

By using data analysis in human resource management, organizations can:

- more accurately define candidate profiles and identify the best recruitment sources; data analysis also allows for predicting which skills and character traits are most relevant to success in a given position,
- track employees' progress in training and identify areas where additional support or supplementary training is required,
- objectively measure employee performance based on specific indicators, allowing for fairer and more accurate assessments,
- identify employees with high potential and create personalized development plans for them.

Introducing data analysis and big data into human resource management requires appropriate IT infrastructure and analytical skills. When effectively applied, it can bring significant benefits, improving both the efficiency of personnel processes and the achievement of organizational strategic goals. Big data is used in many fields.

According to Harvard Business Review, 71% of surveyed CEOs consider human capital resources the most important factor contributing to the maintenance of enduring economic value. Big Data in human resource management can significantly contribute to achieving organizational goals, including by:

- predicting the risk associated with turnover;
- analysing resources allocated to talent development;
- exerting pressure to return on investment in human capital;
- talent management and planning;
- meeting the demand for in-depth data;
- using appropriate (illustrating the level of effectiveness) indicators (Six Reasons for HR… 2024).

On the other hand, modern data analysis tools allow for the optimization of many processes in an organization, facilitating increased efficiency.

Data analysis will find application in sectors such as new technologies, finance, marketing, industry, logistics, telecommunications, healthcare, and medicine, including playing a significant role in human resource management (Data Analysis - how…, 2024). There is no doubt that data analysis and Big Data can certainly usher human resource management into a new digital era. However, it must be remembered that all new technologies come with risks and challenges that must be managed to ensure smooth digital development. The main threats associated with the use of data analysis and Big Data are presented below:

Personal data protection: Data analysis may violate employee privacy, especially if personal data is used without adequate protection and consent. Organizations must comply with data protection regulations such as the General Data Protection Regulation in the European Union to avoid legal consequences associated with illegal use of personal data.

Discrimination and algorithmic biases: Data analysis can lead to discrimination or algorithmic biases if algorithms based on historical data replicate unfair or biased decision-making patterns. Organizations must monitor and assess algorithms for fairness and equality to prevent unfair consequences for employees.

Data security: Large amounts of data stored and processed as part of Big Data analysis may be susceptible to cyberattacks or data security breaches. Organizations must implement appropriate security measures such as data encryption and access management to protect the confidentiality and integrity of data.

Ensuring proper data interpretation: Data analysis can provide organizations with vast amounts of information, but it is essential for this data to be correctly interpreted and used for decision-making. Incorrect data interpretations can lead to incorrect decisions, which can have negative consequences for employees and the organization as a whole.

Therefore, risk management and awareness of legal issues related to data analysis and Big Data are crucial for organizations wishing to utilize these tools in human resource management. Implementing appropriate policies, procedures, and training

for staff can help minimize these risks and ensure the safe and responsible use of data. Despite the above-mentioned threats, it should be noted that in most organizations, the positive effects of using data analysis and Big Data in human resource management prevail.

The primary challenge of Big Data is the collection (usually unstructured) of data from various systems and their integration. Often, employee data is scattered across different IT systems, making it difficult to obtain a comprehensive view of human resources. Additionally, data quality must be ensured to avoid erroneous conclusions resulting from incorrect data.

Another challenge is the development of appropriate data analysis tools and algorithms that will enable effective utilization of collected data in human resource management processes. Advanced technologies that enable real-time analysis of large datasets and identification of significant patterns and dependencies are necessary. Additionally, ensuring the security of employees' personal data and compliance with data protection regulations, such as the General Data Protection Regulation, is also crucial.

Improper use of personal data can expose an organization to high financial penalties and reputational damage. Finally, it is important to understand and consider the ethical aspects associated with the use of data analysis in human resource management. Transparency in analytical processes and protection of employee privacy are necessary. Responsible data usage should be based on principles of fairness, equality, and respect for employees.

5. Conclusions

Utilizing data analysis in human resource management brings numerous benefits but also entails challenges and responsibilities. In summary, valuable aspects include better personnel decision-making, optimization of recruitment and employee development processes, and increased performance evaluation efficiency. Data analysis also enables talent identification and trend prediction, supporting strategic organizational goals.

However, there are also certain threats and challenges, such as data protection, risk of discrimination, and the need to ensure data security. Organizations must take conscious and responsible actions, adhering to data protection regulations, ensuring fairness in processes, and respecting employee privacy. It is also worth emphasizing that the use of data analysis in human resource management requires appropriate technological resources, analytical skills, and ethical awareness.

However, when applied responsibly and following best practices, it can bring significant benefits to organizations, improving both business results and employee experiences.

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