



REVIEW

## Using data and analytics to optimise the human resources processes

### Uso de datos y análisis para optimizar el proceso de RR.HH.

Anastasiia Danilkova<sup>1</sup>  , Volodymyr Bondar<sup>2</sup>  , Kateryna Bannikova<sup>3</sup>  , Svitlana Prokhorovska<sup>4</sup>  ,  
Tetiana Vodolazhska<sup>5</sup>  

<sup>1</sup>Department of HR-Engineering in Business Economics, Faculty of Economics and Management, Khmelnytskyi National University, Khmelnytskyi, Ukraine

<sup>2</sup>Department of Management, Interregional Academy of Personnel Management, Kyiv, Ukraine

<sup>3</sup>Department of Sociology, Faculty of Social Management, Kharkiv University of Humanities People's Ukrainian Academy, Kharkiv, Ukraine

<sup>4</sup>Department of Management, Public Administration and Personnel, West Ukrainian National University, Ternopil, Ukraine

<sup>5</sup>Department of Management, Faculty of Management and Business, Kharkiv National Automobile and Highway University, Kharkiv, Ukraine

Cite as: Danilkova A, Bondar V, Bannikova K, Prokhorovska S, Vodolazhska T. Using data and analytics to optimise the human resources processes. Data and Metadata. 2024; 3:.243. <https://doi.org/10.56294/dm2024.243>

Submitted: 06-03-2024

Revised: 29-06-2024

Accepted: 09-10-2024

Published: 10-10-2024

Editor: Adrián Alejandro Vitón-Castillo 

Corresponding author: Anastasiia Danilkova 

#### ABSTRACT

**Introduction:** business development and HR management systems based on modern technologies open up significant prospects for companies to actively promote themselves in the market and achieve positive results in the context of HR management. Currently, many companies are implementing modern HR tools aimed at increasing efficiency and reducing ongoing risks at minimal cost. In this regard, HR analytics has become a necessary tool to help find information about employees and make informed decisions based on it.

**Objective:** given the relevance of the research topic, it is possible to determine its purpose, which is to summarize the approaches to the use of modern HR analytics to optimize the HR management process.

**Method:** to achieve this goal, the general scientific methods of analysis, synthesis, generalisation, induction and deduction were used.

**Results:** to achieve this goal, the following results were obtained: the essence of HR analytics and the possibilities of its application for personnel management were determined; software products and platforms for analysing personnel management processes were generalised; the main analytical tools used in the field of personnel management were systematised. It is proved that one of the most important areas of application of HR analytics is the recruitment process.

**Conclusions:** with the help of data and new existing analytical methods, HR professionals have the opportunity to optimise recruitment procedures, identify suitable candidates, which will ultimately contribute to improving the company's condition, provided that the labour resources and intellectual capital are used in a rational and balanced manner.

**Keywords:** Automation of HR Processes; Use of Big Data in HR; Optimisation of the Workplace, Optimisation of Personnel Costs; Application of Biometrics in HR.

#### RESUMEN

**Introducción:** el desarrollo empresarial y los sistemas de gestión de RRHH basados en tecnologías modernas abren importantes perspectivas para que las empresas se promocionen activamente en el mercado y consigan resultados positivos en el contexto de la gestión de RRHH. En la actualidad, muchas empresas están implementando herramientas modernas de RRHH con el objetivo de aumentar la eficiencia y reducir los riesgos actuales con un coste mínimo. En este sentido, la analítica de RRHH se ha convertido en una

herramienta necesaria para ayudar a encontrar información sobre los empleados y tomar decisiones informadas basadas en ella.

**Objetivo:** dada la relevancia del tema de investigación, es posible determinar su propósito, que consiste en resumir los enfoques del uso de la analítica moderna de RRHH para optimizar el proceso de gestión de RRHH.

**Método:** para lograr este objetivo, se utilizaron los métodos científicos generales de análisis, síntesis, generalización, inducción y deducción.

**Resultados:** para lograr este objetivo, se obtuvieron los siguientes resultados: se determinó la esencia de la analítica de RRHH y las posibilidades de su aplicación para la gestión de personal; se generalizaron los productos de software y las plataformas para analizar los procesos de gestión de personal; se sistematizaron las principales herramientas analíticas utilizadas en el ámbito de la gestión de personal. Se demuestra que uno de los ámbitos de aplicación más importantes de la HR analytics es el proceso de contratación.

**Conclusiones:** con la ayuda de los datos y los nuevos métodos analíticos existentes, los profesionales de RRHH tienen la oportunidad de optimizar los procedimientos de contratación, identificar a los candidatos adecuados, lo que en última instancia contribuirá a mejorar la situación de la empresa, siempre que los recursos laborales y el capital intelectual se utilicen de forma racional y equilibrada.

**Palabras clave:** Automatización de los Procesos de RRHH; Uso de Big Data en RRHH; Optimización del Puesto de Trabajo; Optimización de los Costes de Personal; Aplicación de la Biometría en RRHH.

## INTRODUCTION

Analytics in HR management is a tool for making balanced and informed decisions when hiring, managing, developing, and optimising staff performance.<sup>(1)</sup> The data obtained during the analysis and expressed in numerical indicators provide an objective assessment of the ongoing processes. As a result, decision-makers in the company rely on real facts, not on professional gut feelings or unfounded assumptions. HR analytics is useful for recruiters, business leaders, and anyone involved in human resources management.<sup>(2)</sup> It also includes the collection, analysis, interpretation, and use of data in further processes. The goal of analytics is to understand which processes can be improved to work more efficiently in the area of HR management.

Big data, which is one of the main areas of modern analytics, is getting closer to HR processes: it makes it easier for recruiters to find and select candidates for vacant positions, helps HR managers analyse employee workload and prevent the outflow of key specialists from the company. For job seekers, Big Data creates a comfortable and positive environment in the labour market:<sup>(3)</sup> it allows them to avoid biased interviews and adapt to a new work team effectively and without stress.

However, it should be borne in mind that Big Data is only a tool for working with candidates and employees. HR professionals should use it carefully and remember that they are primarily working with people, to whom dry facts and digital analysis cannot always be applied. Data analytics is playing an increasingly important role in modern business, and HR is no exception. It allows managers to make informed management decisions, increase team efficiency and effectiveness, and create strategies for company growth.

The advantage of HR analytics is that it can receive information from a variety of sources, including CRM systems, ATS and HRIS. It can also analyse survey results and information from job posting platforms. Another way to improve the recruitment process is to implement software that can make the process more systematic. This process is also known as blind recruitment because it eliminates random bias in hiring, which ultimately increases the efficiency of the recruitment system. In general, the importance of HR analytics is manifested in the fact that it has the necessary tools to manage personnel, which include key advantages:

1. HR analytics operates with specific data required to make the right decision in the field of HR management;
2. By analysing HR data, companies will be able to predict what skills will be needed in the future and develop strategies for managing people. Knowing current and future staffing needs will help address existing issues and ensure staff development;
3. Through ongoing analysis, it will be possible to identify factors that contribute to increased employee productivity, knowing what measures can be developed to create the necessary conditions for improving the quality of HR management;
4. By automating data collection and subsequent analysis and providing a ready-made report, HR analytics optimises company processes, which in turn reduces the chances of errors arising from manual data processing and the cost of processing.

Thus, data analytics in HR management opens up a wide range of opportunities for managers to develop their staff and reduce staff costs. Given the relevance of the research topic, it becomes possible to define its purpose, which is to summarise approaches to the use of modern HR analytics to optimise the HR management

process. To achieve this goal, it is necessary to solve the following urgent tasks: to define the essence of HR analytics and specify the possibilities of its application for personnel management; to generalise software products and platforms for analytics of personnel management processes; to systemise the main analytics tools used in the field of personnel management.

## **METHOD**

To achieve the study's objectives, a comprehensive analysis of scientific literature on HR analytics and its applications in modern HR management was conducted. The study employed a systematic literature review approach to identify key challenges and prospects in HR analytics, focusing on recent advancements in digital tools and data processing methods.

### **Research Design**

The study is exploratory and descriptive, aiming to elucidate current trends and practices in HR analytics. It is based on a systematic review of relevant scientific literature and expert opinions.

The research is aimed at conducting an analysis of promising directions for the development of modern personnel management systems using data analysis tools, in particular specialized software products. The analysis of scientific literature is aimed at identifying the possibilities of using modern tools for working with data to improve the work of personnel management specialists and increase the effectiveness of the analysis of information about the state of personnel management systems.

The scientific works of leading domestic and foreign scientists served as the information base of the research, in particular, the literature of the last 5 years was analyzed in order to provide an up-to-date view of the issues under development, classic scientific works of scientists of the beginning of the 21st century were also considered.

In the process of developing the topic, attention was paid to the issue of determining the essence of the analysis of personnel management systems and the specifics of using special software products for this.

### **Limitations**

Access Issues: Some relevant studies may have been inaccessible due to subscription limitations.

Time Frame: The focus on recent literature may exclude earlier influential studies.

### **Recommendations and Implications**

The study provides actionable recommendations for HR practitioners, including specific software tools and methods for integrating analytics into HR processes. These insights can be applied across various organizational contexts and adapted to different countries and industries.

## **RESULTS AND DISCUSSION**

In today's environment, HR analytics helps companies make informed decisions when hiring, training, retaining and motivating staff. It also includes the collection, analysis, interpretation and use of data in further processes. The goal of analytics is to understand which processes can be improved to work more efficiently.

The main goal of HR analytics is to assess the real situation in the company, find weaknesses and offer tools for improvement.<sup>(4)</sup> More broadly, HR analytics aims to improve the HR system in a variety of ways, from recruitment to workflow optimisation.

The first area of analytics application is hiring planning. With HR analytics, it is possible to predict how many employees a company will need in the near future and what characteristics they should have. After research, an accurate understanding emerges:<sup>(5)</sup>

- Frequency of past staff hires and the duration of the hiring process.
- Average employee tenure and turnover rates.
- The company's strategic growth plans and whether the current staff levels are sufficient to achieve them.

Knowing the answers to these questions, you can open vacancies in advance and avoid creating a staff shortage in the company.

The second area of application noted by researchers<sup>(6,7,8)</sup> concerns the assessment of staff performance. With analytics, it is easier to implement a KPI (key performance indicators) system and evaluate work objectively. Thanks to the analysis, it becomes clear how an employee achieves the company's goals and who should be rewarded for exceeding the plan. By setting KPIs and analysing the dynamics of their achievement, a company can increase productivity and motivate employees.

A separate area of analytics application, which is highlighted in the scientific literature,<sup>(9,10,11)</sup> concerns employee retention. Thanks to HR analytics, managers know why staff turnover occurs. Exit interviews, analyses of dismissal reasons, and job satisfaction surveys provide valuable insights into employee turnover. Additionally,

indirect indicators such as average length of service and employee engagement are crucial. By understanding the underlying causes of employee departures, organizations can implement targeted interventions to reduce turnover and enhance employee retention.

The main area of application of analytics concerns the management of personnel costs.<sup>(12,13)</sup> A company that does not plan HR costs for the long term is at great risk. Analytics allows you to calculate real costs, optimise them, and build a budget plan that won't harm your business. It's important to take into account salaries, social packages, non-financial incentives, and compare costs with market indicators. This information allows you to create personal development plans for valuable employees.

HR analytics plays a crucial role in enhancing the emotional climate within teams by enabling early identification and resolution of conflict situations, thus fostering a more positive and supportive work environment. Through the analysis of data from employee surveys, performance reviews, and other sources, HR can detect patterns of dissatisfaction and potential issues before they escalate. This allows for targeted interventions such as team coaching, personalized feedback, and collaborative problem-solving. By leveraging these insights, HR can address issues proactively, improve communication, and create a more comfortable atmosphere for employees.

Researchers<sup>(14,15)</sup> focus on categorizing analytics within the field of HRM, distinguishing between different types such as descriptive analytics and others. Its task is to describe what is happening in the company and answer the question "What has already happened?". It is the first step in any research, as it provides an objective understanding of the strengths and weaknesses of the current situation, helps to identify existing trends and factors in HR management.

Descriptive HR analytics works like this: a specialist gathers information on a topic by asking questions to managers and studying documentation. Then they write a report describing the current situation and the factors affecting HR processes. The result is an understanding of the staff turnover in the company in recent years, its causes and possible ways to influence it.

Predictive HR analytics deserves special attention from researchers.<sup>(16,17,18)</sup> Its task is to answer the question "What can happen next?". It creates models of the future, predicts several development scenarios and tries to implement the most positive one. Descriptive statistics tools, neural networks, and an accumulated knowledge base are used to do this.

Diagnostic Analytics include information on diagnostic analytics, focusing on understanding the causes behind specific outcomes.

Comparative Analytics discuss research on comparative analytics, which involves benchmarking and comparing different data sets.

Real-time Analytics review studies on real-time analytics and its application in HR for immediate decision-making.

Predictive analytics is used to estimate the chances of success of a new employee in any position, taking into account their qualifications.<sup>(19)</sup> This type of analytics is used in conjunction with other types of HR analytics for greater objectivity and accuracy of calculations. Reliable results can be obtained, for example, by using predictive and strategic analytics together.

Separately, scholars<sup>(20,21,22)</sup> pay attention to prescriptive analytics. It is used to answer the question "What should happen?". This tool helps to determine more accurately what will happen in the future, as it is based on the company's long-term performance and industry benchmarks. Predictive analytics helps determine how many vacancies should be opened next year to support the planned growth rates. It is most effective when used in systems with well-established internal rules, so that long-term trends can be identified and an accurate model of the future can be built.

Strategic HR analytics<sup>(23,24,25)</sup> also stands out, answering the question "What should the company do?". It helps to formulate a step-by-step plan for the near future to achieve tangible results. For example, strategic analytics can be used if you need to change your employee incentive system. To do this, data on the current situation is analysed, and information on competitors' offers is collected. After that, the effectiveness of existing tools is assessed, and weaknesses in the performance management system are identified. Then a new reward strategy is developed that will be more competitive and interesting for employees.

Thus, after analysing the scientific literature on the chosen issue, it is possible to state that for a modern HRM system, the use of analytical tools and the latest data processing tools opens up significant opportunities to improve the HRM system by changing the quality of the hiring process and the overall workflow in the company.

Nowadays, personnel management information systems play an increasingly important role in the activities of enterprises. They allow you to automate many business processes related to human resources, which leads to increased employee efficiency and reduced costs.

Information systems can be used to automate the following processes:

1. Personnel accounting: collection and storage of information about employees, including personal data, employment contracts, work schedules, etc.

2. Recruitment and selection of personnel: conducting interviews, evaluating candidates, forming a personnel reserve.
3. Personnel assessment: certification, testing, determination of training needs.
4. Training and development of personnel: planning and conducting training, evaluation of training effectiveness.
5. Payroll and HR administration: calculation of wages, registration of vacations, sick leaves, etc.

IT solutions are also used to automate personnel accounting. They allow you to store and process information about employees, such as employment data, wages, vacations, etc. This allows the HR department to keep records of employees more efficiently and accurately.

IT solutions can also be used to automate training and staff development. They allow you to create and conduct online courses and trainings, as well as track the results of employee training. This allows companies to improve the effectiveness of training and staff development.<sup>(26)</sup>

IT solutions allow companies to collect and analyze data about their employees. This can be useful for increasing work productivity, motivating employees and improving the corporate climate. They also allow companies to introduce new technologies and work methods. This can help them stay competitive in a changing business environment.

Information technology allows companies to create a more personalized work experience for their employees. This can increase employee satisfaction and loyalty to the company.

Modern technology is transforming all aspects of business, and HR is no exception. With the development of data management and analytics, companies have a unique opportunity to use information to optimise all human resources processes. This innovative field is helping organisations make more informed decisions, increase employee productivity and improve the overall health of the business. Analysts study large amounts of information by collecting, organising, analysing and visualising it. For these tasks, the standard Microsoft Office suite is usually not enough, and more sophisticated tools and data sources are required.

The sources of data for HR management are corporate information systems (CIS). They contain corporate information about internal business processes. CIS, which can also be used for HR analysis, include HRM systems, CRM, ERP and WMS systems.<sup>(27)</sup> Surveys and research usually form the basis for further analytical procedures. The systems described above usually provide accurate information for precise analysis. However, surveys and research help to identify certain social and psychological trends in the team, to determine why motivation is decreasing or turnover is increasing.<sup>(28)</sup>

Data analytics enables the creation and customization of candidate search platforms, offering valuable insights into talent acquisition system performance. These platforms can generate detailed reports on the hiring process, including metrics such as response rates to job postings, the time and cost associated with filling positions, and employer ratings. Companies can also download data to assess the efficiency of their HR departments through comprehensive big data analysis.

It is also worth emphasising that data processing and analytics are used to analyse the effectiveness of strategic HR management in a company. To assess the effectiveness of HR strategies, various metrics are used, such as the cost of hiring, time to fill a vacancy, the level of employee engagement, and others. Metrics allow you to translate the soft aspects of HR management into hard numbers that you can work with. All of this can be done through big data analysis or other tools and specific software. (table 1)

**Table 1. Summary of software products and platforms for analysing HR processes**

Software	Platforms for analytics of HR processes	Features
HR accounting and record keeping, payroll, reporting, taxes and payroll contributions, staffing, recruitment and onboarding, KPIs, training, HR analytics	SAP HR, SAP SuccessFactors, Oracle HCM, Workday	Reducing and optimising costs, creating an optimal staffing structure, optimising staff work schedules according to the specifics and productivity of each employee
Services for employees	SAP HR, SAP Success Factors, HCM	Analysis of career opportunities for each employee, analysis and optimisation of working time
HR document management	IBM FileNet, OpenText, Documentum, Microsoft SharePoint	Using biometric data for staff work and providing access to different areas of responsibility in the company
Managing staff working hours	Kronos WFM, Infor WFM, Teleopi, Verint	Optimising working hours and reducing staff costs

**Source:** Compiled by the authors based on <sup>(14,29,30,31)</sup>

HR analytics tools provide an opportunity to collect and systematise employee data for further processing.

In turn, the presentation of information on personnel based on graphs and tables allows making informed decisions in the field of personnel management. Table 2 shows the main analytics tools used in the field of HR management.

Name of the analytics tool	General characteristics	Advantages	Disadvantages
Visier	Analyzes HR data using AI, including salary and work history, to predict employee value and turnover. Useful for identifying high-risk employees and optimizing performance. Reliable AI-driven analytics; accurate data visualization; custom report generation; supports resource and staff time optimization. High cost; requires robust data protection measures	Reliable AI analytics of the workforce, as it is based on accurate data, which in turn will eliminate the possibility of making wrong decisions. Data visualisation and infographics. Custom reports. Allows you to create the basis for saving resources and optimising staff time	The main drawback is the pricing options for using the tool. The need to ensure the protection of personal data
DreamTeam	Focuses on talent acquisition analytics with customizable HR dashboards that integrate data from applicant tracking systems. Detailed tracking of talent acquisition KPIs; candidate satisfaction surveys; benefits from Big Data analysis. Possible difficulties with data import; requires significant involvement from data specialists	More detailed tracking of key performance indicators in recruitment. The ability to conduct a survey of candidates to assess their level of satisfaction. Based on Big Data analysis	In some cases, there may be difficulties with importing data from the company's internal management systems. Requires significant involvement of data processing specialists for successful implementation in companies
Deel	Facilitates hiring from various countries and offers extensive selection criteria. Simplifies international hiring; integrates with multiple platforms; saves on post-talent acquisition costs. Challenges in adapting to various talent acquisition platforms; differing criteria across countries	Simplifies the process of hiring teams for international companies. Integrates with a wide range of platforms. With more significant costs at the stage of recruitment, it allows you to save on the stage of work of an already qualitatively selected team	Difficulty in adapting to different recruitment platforms. In different countries, different recruitment criteria may underlie a particular selection of candidates
ChartHop	Provides visualization of workforce data and supports DEI (Diversity, Equity, Inclusion) efforts. Includes DEI dashboards for identifying diversity gaps and optimizing employee comfort and productivity. DEI dashboards; employee surveys; real-time reporting enhances data utility. High initial resource expenditure for maximizing staff efficiency	Availability of DEI dashboards. It is possible to set up employee surveys. Real-time reporting, which greatly improves the use of data on the company's status.	Highly staff-oriented with the possibility of significant resource expenditures at the start to maximise staff efficiency

**Source:** Compiled by the authors based on<sup>(32,33,34,35)</sup>

HR management has changed significantly in the modern world. Just 20 years ago, to find a new employee, it was enough to create a vacancy announcement, post it in a job aggregator, and interview several candidates to hire a new employee. However, with more and more vacancies and applicants on the labour market, it's becoming more difficult to search for specialists manually. However, the correct and balanced selection of a candidate does not mean his or her successful development in the workplace, which is why the HR management system has become so developed and full of various tools and means of staff development.<sup>(36)</sup>

At the same time, the use of the latest digital tools, such as Big Data or AI, allows managers and recruiters to create a portrait of an ideal candidate to determine where to look for them. They also analyse the "profitability" of a future employee, for example, by linking the company's business performance to personal qualities and behaviour. And then these technologies are used to properly adapt specialists in the company to maximise their efficiency. Thus, big data and AI simplify the work of HR specialists by improving the company's talent search and management technologies.

## CONCLUSIONS

Modern analytics and the latest digital tools enable organisations to effectively manage their workforce and make informed decisions based on data. They help to optimise the processes of recruitment, retention, training and development of employees, increase their productivity and reduce costs. The introduction of HR analytics

into the HR management process is a step towards more efficient and strategic human resource management, which allows organisations to be more competitive and successful in the modern business world.

Big data and AI are one of the main areas of digital optimisation of the HR management system, and they are becoming increasingly close to HR processes: they make it easier for recruiters to find and select candidates for vacant positions, help HR managers analyse employee workload and prevent the outflow of key specialists from the company. In general, based on the analysis of scientific literature, it has been proven that HR analytics provides many benefits that help improve all aspects of HR management. The main advantages include the following:

- Improving the recruitment process: data analysis allows us to identify the most effective sources of recruitment, evaluate the success of various recruitment methods and reduce the time spent searching for suitable candidates;
- Increasing the level of employee retention: HR analytics can help identify reasons for resignations and develop strategies to retain talented employees;
- Optimisation of the training and development process: analysing data on training needs and training results allows us to develop more effective employee development programmes;
- increase productivity: HR analytics helps identify factors that affect productivity and develop measures to improve employee performance;
- Cost reduction: Data analytics can help you optimise processes and reduce costs associated with HR management.

Accordingly, provided that the analytical procedures are implemented rationally and actions are planned correctly, HR analytics opens up wide opportunities for companies to actively develop and maintain their competitiveness.

## REFERENCES

1. Lv X, Li M. Application and research of the intelligent management system based on internet of things technology in the era of big data. *Mobile Information Systems* 2021;2021(1):6515792. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1155/2021/6515792>.
2. Kucherov D., Kozub A, Sushchenko O, Skrynkovskyy R. Stabilising the spatial position of a quadrotor by the backstepping procedure. *Indonesian Journal of Electrical Engineering and Computer Science* 2021;23:1188. DOI: 10.11591/ijeecs.v23.i2.pp1188-1199.
3. Dobrovolska O. Management of innovative development of agriculture in the digital era. 26th Conference on Communities in New Media. Inclusive Digital: Forming Community in an Open Way Self-Determined Participation in the Digital Transformation, GeNeMe 2023, Dresden, 2023; 110-125. DOI: <https://doi.org/10.25368/2024.7>
4. Bag S, Wood LC, Xu L, Dhamija P, Kayikci Y. Big data analytics as an operational excellence approach to enhance sustainable supply chain performance. *Resources, Conservation and Recycling* 2020; 153:104559. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0921344919304653>.
5. Abdeldayem MM, Aldulaimi SH. Trends and opportunities of artificial intelligence in human resource management: Aspirations for public sector in Bahrain. *International Journal of Scientific and Technology Research* 2020;9(1):3867-3871. Available from: <https://d1wqtxts1xzle7.cloudfront.net/75869495/Trends-And-Opportunities-Of-Artificial-Intelligence-In-Human-Resource-Management-Aspirations-For-Public-Sector-In-Bahrain-libre.pdf>.
6. Chowdhury S, Dey P, Joel-Edgar S, Bhattacharya S, Rodriguez-Espindola O, Abadie A, Truong L. Unlocking the value of artificial intelligence in human resource management through an AI capability framework. *Human Resource Management Review* 2023;33(1):100899. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S1053482222000079>.
7. Dorogyy Y, Tsurkan V, Mokhor V, Doroha-Ivaniuk O. Critical IT Infrastructure Resource Distribution Algorithm. *Proceedings of the 11th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, IDAACS 2021, 2021;632-639*. DOI: 10.1109/IDAACS53288.2021.9660948
8. Qamar Y, Agrawal RK, Samad TA, Jabbour CJC. When technology meets people: the interplay of artificial intelligence and human resource management. *Journal of Enterprise Information Management* 2021;34(5):1339-1370. Available from: <https://www.emerald.com/insight/content/doi/10.1108/JEIM-11-2020-0436/full/full/html>.

9. Mohammadpoor M, Torabi F. Big Data analytics in the oil and gas industry: An emerging trend. *Petroleum* 2020;6(4):321-328. Available from: <https://www.sciencedirect.com/science/article/pii/S2405656118301421>.
10. Nikonenko U, Shtets T, Kalinin A, Dorosh I, Sokolik L. Assessing the policy of attracting investments in the main sectors of the economy in the context of introducing aspects of industry 4.0. *International Journal of Sustainable Development and Planning* 2022;17(2):497-505. DOI: 10.18280/ijstdp.170214
11. Pavlenchuk N, Horbonos F, Pavlenchuk A, Skrynkovskyy R, Pawlowski G. Increasing the competitiveness of enterprises based on the use of marketing management tools. *Agricultural and Resource Economics: International Scientific E-Journal* 2021;7(3):77-89. DOI: <https://doi.org/10.51599/are.2021.07.03.05>
12. Rakhimov T. (2023). Research on moral issues related to the use of artificial intelligence in modern society. *Future Philosophy* 2023;2(2):30-43. DOI: <https://doi.org/10.57125/FP.2023.06.30.03>
13. Vrontis D, Christofi M, Pereira V, Tarba S, Makrides A, Trichina E. Artificial intelligence, robotics, advanced technologies and human resource management: a systematic review. *The International Journal of Human Resource Management* 2022;33(6):1237-1266. Available from: <https://www.tandfonline.com/doi/abs/10.1080/09585192.2020.1871398>
14. Sayed R. Exploring Cultural Influences on Project Management Approaches in Global Business Development. *Future of Social Sciences* 2023;1(4):38-60. DOI: <https://doi.org/10.57125/FS.2023.12.20.02>
15. Zybarena O, Verbitska L, Lopashchuk I, Kalaman O, Derkach T, Smentyna T. Strategically Oriented Enterprise Management through Information Systems. *International Journal of Recent Technology and Engineering* 2019;8(2):3014-3017. Available from: <https://www.ijrte.org/wp-content/uploads/papers/v8i2/B2900078219.pdf>.
16. Di Vaio A, Hassan R, Alavoine C. Data intelligence and analytics: A bibliometric analysis of human-Artificial intelligence in public sector decision-making effectiveness. *Technological Forecasting and Social Change* 2022;174:121201. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S004016252100634X>.
17. Dykha M, Dykha V, Pylypyak O, Poplavska O, Tanasiienko N, Tanasiienko V. Risk Management of The Startup Projects. 2023 IEEE 4th KhPI Week on Advanced Technology (KhPIWeek). Kharkiv, 2023;616-621
18. Hamouche S. (2023). Human resource management and the COVID-19 crisis: implications, challenges, opportunities, and future organisational directions. *Journal of Management & Organisation* 2023;29(5):799-814. DOI:10.1017/jmo.2021.15
19. Hrosul V, Kovalenko S, Saienko V, Skomorovskyi A, Kalienik K, Balatska N. Research of logical contradictions in the conditions of cluster management of the enterprise. *Journal of Management Information and Decision Sciences* 2021;24(1):1-4. Available from: <https://www.abacademies.org/articles/research-of-logical-contradictions-in-the-conditions-of-cluster-management-of-the-enterprise.pdf>.
20. Harsch K, Festing M. Dynamic talent management capabilities and organisational agility-A qualitative exploration. *Human Resource Management* 2020;59(1):43-61. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/hrm.21972>.
21. Hutsaliuk O, Koval V, Tsimoshynska O, Koval M, Skyba H. Risk Management of Forming Enterprises Integration Corporate Strategy. *TEM Journal* 2020;9(4):1514-1523. Available from: [https://www.temjournal.com/content/94/TEMJournalNovember2020\\_1514\\_1523.pdf](https://www.temjournal.com/content/94/TEMJournalNovember2020_1514_1523.pdf)
22. Ilyina A. Mechanism of Innovation and Investment Development in Modern Economy. *Economic Affairs*. October 2022;67:825-835. Available from: <http://ndpublisher.in/admin/issues/EAv67n4sp.pdf>.
23. Garg S, Sinha S, Kar AK, Mani M. A review of machine learning applications in human resource management. *International Journal of Productivity and Performance Management* 2022;71(5):1590-1610. Available from: <https://www.emerald.com/insight/content/doi/10.1108/IJPPM-08-2020-0427/full/html>.
24. Humeniuk T, Perchuk O, Petko St, Turchynova G, Tytova N, Babiy S. Sustainable development of ecotourism



in international entrepreneurship coordinates. *International Journal of Entrepreneurship* 2020;24:1-5. Available from: <https://www.abacademies.org/abstract/sustainable-development-of-ecotourism-in-international-entrepreneurship-coordinates-9324.html>.

25. Levytska S, Pershko L, Akimova L, Akimov O, Havrilenko K, Kucherovskii O. A risk-oriented approach in the system of internal audit of the subjects of financial monitoring. *International Journal of Applied Economics, Finance and Accounting* 2022;14(2):194-206. DOI: 10.33094/ijaefa.v14i2.715

26. Halachev P. Application of artificial neural networks for prediction of business indicators. *Mathematical Modelling of Socio-Economic Processes and Systems* 2021;5(4):141-144.

27. Gupta, S, Drave, V. A, Dwivedi, Y. K, Baabdullah, A. M, & Ismagilova, E. Achieving superior organisational performance through big data predictive analytics: A dynamic capability view. *Industrial Marketing Management* 2020;90:581-592. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0019850118307508>.

28. Halachev P. Big data and cloud computing - issues and problems. *Science, Engineering & Education* 2016;1(1):83-88.

29. Kashchena N, Nesterenko I, Chmil H, Kovalevska N, Velieva V, Lytsenko O. Digitalisation of biocluster management on the basis of balanced scorecard. *Journal of Information Technology Management* 2023;15:80-96. Available from: [https://jitm.ut.ac.ir/article\\_94711.html](https://jitm.ut.ac.ir/article_94711.html).

30. Mykhailo O, Nataliia V, Tatyana O, Anastasiia P, Larysa R, Reznik PN. Methods of Calculating the Integrated Indicator for Assessing the Socio-Economic Development of the Territory: A Marketing Approach. *Lecture Notes in Networks and Systems* 2023;620. [https://doi.org/10.1007/978-3-031-26953-0\\_36](https://doi.org/10.1007/978-3-031-26953-0_36)

31. Halachev P. Big Data - SQL vs NOSQL. *International Electronic Journal of Pure and Applied Mathematics* 2016;10(1):41-51. DOI: 10.12732/iejpam.v10i1.4.

32. Prokopenko O, Järvis M, Prause G, Kara I, Kyrychenko H, Kochubei O, Prokopenko M. Economic Features of the Use of Electric Vehicles in Delivery Services in Estonia. *International Journal of Energy Economics and Policy* 2022;12(6):340-349. DOI: <https://doi.org/10.32479/ijeep.13617>

33. Suprunenko S, Pishenina T, Pitel N, Voronkova A, Riabovolyk T. Analysis of the Impact of Globalisation Trends in the Digital Economy on Business Management and Administration Systems of Enterprises. *Future Economics & Law* 2024;4(2):131-147. DOI: <https://doi.org/10.57125/FEL.2024.06.25.08>

34. Yuzevych V, Klyuvak O, Skrynkovskyy R. Diagnostics of the system of interaction between the government and business in terms of public e-procurement. *Economic Annals-XXI* 2016;160:39-44. DOI: 10.21003/ea.V160-08.

35. Bondar A, Tolchieva H, Bilyk M, Slavkova O, Symonov V. (2024). The role of digitization in management and strategic decision-making in modern management. *Financial and Credit Activity-Problems of Theory and Practice* 2024;2(55):214-227. DOI: 10.55643/fcaptp.2.55.2024.4349

36. Halachev P. Model for evaluation of the effectiveness of training of human resources. *International Electronic Journal of Pure and Applied Mathematics*, 2016;10(1):53-61:1314-0744. DOI: 10.12732/iejpam.v10i1.5.

#### **FINANCING**

None.

#### **CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

#### **AUTHORSHIP CONTRIBUTION**

*Conceptualization:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Data curation:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana

Vodolazhska.

*Formal analysis:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Research:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Methodology:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Project administration:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Supervision:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Visualization:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Writing - original draft:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.

*Writing - revision and editing:* Anastasiia Danilkova, Volodymyr Bondar, Kateryna Bannikova, Svitlana Prokhorovska, Tetiana Vodolazhska.