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The Effectiveness of Data Analytics Tools in the Implementation of Human Resource Management Strategies

Dmytro Kobets[1]*, Krystyna Kovalska[2], Nataliia Zozulia[3], Tamara Lozynska[4], Mariia Zaslavska[5]

[1]Faculty of Economics and Management, Khmelnytskyi National University, Ukraine, [2]Faculty of Business, Law and Criminology, Liverpool Hope University, UK, [3]Faculty of Transport and Information Technologies, National Transport University, Ukraine, [4]Department of Public Management and Administration, Poltava State Agrarian University, Ukraine, [5]Department of Management and Administration, Education and Research Institute "Karazin business school", V. N. Karazin Kharkiv National University, Ukraine. *Email: dmytrokobets.khmnu@gmail.com

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ABSTRACT

The application of data analytics tools in the field of human resource (HR) management is becoming the most urgent issue in view of the growing need to optimize management processes. The aim of this research is to study the influence of analytical technologies on the improvement of decision-making processes in HR management. The research employs the methods of statistical analysis, comparative and survey methods with secondary data processing. The article outlines key data analytics tools: Tableau, Power BI and SAP SuccessFactors; their role in increasing productivity and reducing staff turnover is determined. The results of the study demonstrate that the effective implementation of analytical solutions enables companies to increase the accuracy of forecasts regarding employee productivity and improve management processes. The article also analyses the main challenges that organizations face when integrating analytical systems, including the lack of skilled personnel and the complexity of technology integration. The practical significance of the study is recommendations for optimizing the implementation of analytical tools to increase the effectiveness of HR management. Further research can be aimed at exploring innovative approaches to integrating analytics into business processes and further improving technologies for HR management.

Keywords: Data Analytics, HR Management, Digitization, Automation, Labour Productivity, Management Efficiency, Human Capital
JEL Classifications: C53, M15, M54

1. INTRODUCTION

Data analytics tools are a key component of the modern HR business environment. They enable collecting and storing large amounts of data, process them in real time to make informed decisions. Digital data processing tools are powerful platforms for creating analytical reports, data visualization, predicting employee behaviour, and optimizing management processes. It is important to note that data analytics is not reduced to simple information processing. It combines the use of artificial intelligence (AI), machine learning (ML), and cloud solutions to accurately analyse complex relationships: employee turnover, employee engagement, and employee training effectiveness. Their combination makes data analytics an indispensable tool for companies seeking to remain competitive in a rapidly changing global economy.

HR management has undergone drastic changes under the influence of mass digitization and automation of processes. Traditional approaches to working with HR are giving way to new models based on the use of digital platforms for HR management. Modern Workday and SAP SuccessFactors systems automate key HR functions — from hiring to evaluating employee productivity and talent development. The introduction of analytical tools into these processes allows for faster and more efficient management

of employee data. There is an opportunity to receive accurate forecasts regarding their professional development and ensure continuous improvement of work processes. Innovations significantly reduce time for routine operations and allow HR specialists to focus on strategic tasks related to the development of corporate culture, employee engagement, and the formation of sustainable teams.

The increased need for monitoring the effectiveness of the implementation of analytical tools in HR processes determines the need to build appropriate metrics to assess their impact. Companies increasingly use complex systems to measure such indicators as employee productivity, their level of satisfaction and engagement, and the effectiveness of training and development. Clear metrics are created to assess current staff performance and predict future results. The mentioned functionality is especially important in view of global competition, when the company's ability to quickly adapt to market changes determines its success. Therefore, the construction of a system for measuring the effectiveness of the application of analytical tools becomes a critical component for maintaining the sustainability and competitiveness of business.

The aim of the study is to analyse the effectiveness of data analytics tools in HR management in the context of digitization and automation of modern business processes. The aim was achieved through the:

- Analyse the current trends in the market development of data analytics tools for personnel management and their impact on organizational processes;
- Investigate key technological solutions and their technical parameters to determine their practical effectiveness;
- Evaluate the answers of respondents of the 1Path (2024) study regarding the use of analytical tools in HR management;
- Identify the main challenges faced by companies when implementing data analytics, and develop recommendations for increasing the efficiency of their use.

2. LITERATURE REVIEW

The issue of the effectiveness of data analytics tools in personnel management occupies an important place in current studies in connection with mass digitization and automation of HR processes. The researchers (Feng and Luo, 2023) draw attention to the fact that the use of analytical platforms, for example, Power BI, allows companies to significantly improve the decision-making process based on data on employee productivity. The study (Peng and Bao, 2023) analyses the impact of analytics tools on HR management in large companies, in particular, increasing the level of employee engagement and reducing staff turnover. The authors (Cameron et al., 2024) emphasize the importance of integrating data analytics with cloud technologies to ensure flexibility and speed of processing large volumes of information, which is especially relevant for international corporations. An article (Alzboun, 2023) identifies the role of analytics tools such as SAP SuccessFactors in implementing talent development programmes. This make it possible to increase productivity and adaptability of personnel to changes in the market.

Other researchers also focus on the technical and organizational aspects of the implementation of analytics in HR management. The work (Zhao et al., 2023) deals with the analysis of the difficulty of implementing analytical tools in medium and small companies because of limited resources and insufficient training of personnel. The researchers (Barišić et al., 2021) analyse the impact of the use of data analytics on building forecasts regarding personnel needs and the development of career trajectories, which enables companies to manage human capital more effectively. The statement (Haleem et al., 2023) addresses the challenges organizations face when integrating complex analytics solutions like R Studio and Python.

Research conducted as part of the analysis of the market for analytical tools demonstrates the importance of clear metrics for evaluating the effectiveness of these technologies in companies. The work (Tang and Chen, 2023) emphasizes the need to implement monitoring and evaluation systems that allow measuring the impact of analytics on employee productivity and reducing costs for management processes. The researchers (Okrushko et al., 2023) point to the importance of proper staff training to ensure effective use of such platforms. The article (Anaconda et al., 2021) emphasizes the importance of integrating data analytics into decision-making processes for strategic HR management, particularly in the context of global digitalization. The study (Cho et al., 2023) examines the benefits of using platforms that integrate analytics with management processes through cloud services, allowing companies to reduce operational costs. According to Mihaljević et al. (2023), the article explores examples of the implementation of analytical solutions in the field of financial technologies for HR management. Other authors also study the problems and challenges of implementing analytical tools. The article (Kondratiuk, 2023) states that insufficient technical training of personnel is a significant obstacle to the full automation of HR processes with the help of analytics. The author's hypothesis (Habtu and Mezgobo, 2024) shows that medium-sized companies face difficulties in implementing analytical tools because of the high cost of these technologies and the need for specialized personnel.

The article (Todoshchuk et al., 2023) explores the difficulty of integrating analytics in companies with a low level of digital infrastructure, which is a common problem in emerging markets. The work (Aji Nugroho et al., 2023) deals with the development of employee productivity measurement models using analytical platforms that allow for accurate assessment and timely adjustment of management decisions. The study (Devi et al., 2024) examines the importance of integrating data analysis systems with HR platforms to create a unified information space that increases the accuracy and efficiency of HR management. The works (Wulandari et al., 2023) emphasize the need for greater implementation of innovative technologies to increase the effectiveness of the use of analytics in HR management. An article (Said et al., 2023) analyses the prospects for the AI use in combination with analytical tools to predict employee turnover and increase employee engagement. The opinion of (Mihaljević et al., 2023) is the need to create new methods to improve the integration of analytical tools in medium and small companies. This will allow them to access the benefits of large corporations without significant financial costs.

The review shows that data analytics is becoming an important tool for improving the efficiency of HR processes in various industries. At the same time, the successful implementation of analytical solutions depends on the technical training of personnel, integration with other digital technologies and the creation of effective metrics for evaluating results. Further research should be conducted in view of the constant modernization of existing digital technologies and the faster growth of automated analytics systems.

3. MATERIALS AND METHODS

3.1. Research Design

The research methodology included several successive stages, each aimed at a comprehensive analysis of the market for data analytics tools for HR management and an assessment of their effectiveness. The first stage of the research involves a market assessment of analytical technologies used in HR management. This provided for the collection and analysis of statistical data on the market size in different regions, as well as the dynamics of growth in demand for these tools. At the second stage, the main technological solutions used for data analytics in large companies were determined. Their technical parameters are also taken into account: integration capabilities, volumes of data processing, support for cloud services, and complexity of implementation. The third stage provided for an analysis of the answers of the respondents of the 1Path study regarding the effectiveness of the use of data analytics tools. Particular attention was paid to the following aspects: usage volumes, dependence on analytical tools and problems of implementation of analytical solutions. The final stage was drawing conclusions based on the obtained data, as well as the provision of recommendations for increasing the effectiveness of the use of data analytics in the business environment.

3.2. Sampling

The research sample consisted of two main components. The first component was a survey of a sample of technology companies actively implementing data analytics tools. The sample consisted of about 300 companies, including the largest market players: Google, Microsoft, Amazon, as well as other technological companies that use analytical solutions to optimize internal business processes. The second component of the sample was specific technological data analytics tools. The study analysed the use of the following solutions: Tableau, Power BI, Python with Pandas and Matplotlib, SAP SuccessFactors, Workday, and R Studio. Each of these tools had its own technical features and advantages, which were carefully studied to evaluate their effectiveness in various business processes, in particular in HR management.

3.3. Methods

Research methods included several analytical approaches that provided a comprehensive study of the issue. Statistical analysis methods were used to estimate market indicators and data analytics market volume growth. A comparative method was applied, which made it possible to analyse various analytical solutions according to technical parameters and their effectiveness in different business sectors. The secondary data processing was used to evaluate the responses of the respondents of the 1Path study. The survey method was used to analyse secondary data, including respondents' answers. They were processed using statistical analysis, which made it possible to single out the main trends, problems, and successes in the implementation of analytical tools. Comparative analysis was used to calculate and interpret the results, which made it possible to identify the dependencies between the implementation of analytical solutions and the company productivity.

3.4. Instruments

Excel capabilities were used to build charts that illustrate the research results. Open web resources were used to collect and analyse data for the 1Path study: academic articles, conference reports, and publications of analytical companies.

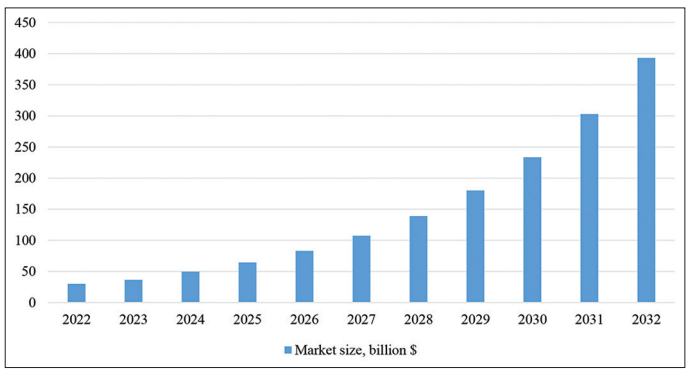
4. RESULTS

The development of data analytics tools has accelerated significantly in recent years and continues to increase today. Analytical tools have become indispensable for many companies in the field of HR management due to the ability to process large amounts of data and transform them into valuable information. The total data analytics industry grew from $ 30 billion in 2022 to a projected $ 393.35 billion in 2032. This is determined by the increased demand for effective decision-making tools, as well as the introduction of ML and AI technologies, as well as the need to automate processes in large companies. For example, from 2022 to 2023, the market grew by 22%, and it is predicted to grow by more than 1,200% by 2032. Figure 1 provides more details.

The following leading companies actively use data analytics tools: Google, Amazon, Microsoft, as well as large consulting agencies — McKinsey and Deloitte. They use such tools as Tableau, Power BI and Workday to analyse employee productivity, predict staffing needs and optimize management processes. Companies have implemented analytics solutions on their platforms to create flexible human resource management models. Amazon uses analytics to measure employee engagement and productivity, helping the company respond quickly to changes in the labour market. The tools are developed through integration with cloud services and databases, which allows you to quickly process huge amounts of information.

The effectiveness of data analytics tools (Table 1) is their ability to adapt to the needs of specific business processes and provide high

Figure 1: Data analytics market size, 2022–2032 (billion $)



Source: Created on the basis of Precedence Research (2022)

Table 1: Data analytics tools in the implementation of the HR management strategy

Data analytics tool	Technical parameters	HR management
Tableau	• Supports integration with various databases (SQL, Excel, Google Sheets). • Visualization of data in the form of dashboards and charts. • Drag-and-drop support for creating interactive reports	• Visualization of employee productivity indicators. • Monitoring staff turnover and training effectiveness
Power BI	• Cloud solution with the possibility of integration with Azure, SQL, Google Analytics. • Supports DAX languages for calculations. • Dynamic dashboards and access to them from mobile devices	• Analysis of employee involvement. • Assessment of employees' training and professional development needs
Python with Pandas and Matplotlib	• Using Pandas libraries to process large volumes of data. • Matplotlib for creating graphs and charts. • Support for integration with databases and other ML tools (Scikit-learn)	• Forecasting staff turnover based on historical data analysis. • Evaluation of the level of staff satisfaction based on social surveys.
SAP SuccessFactors	• Cloud platform for HR analysis. • Built-in tools for performance analysis, forecasting and talent management. • Support for integration with other SAP solutions	• Talent management and development based on analytics. • Performance evaluation of teams and individual employees
Workday	• Cloud solution for HR analysis and planning. • Support for integration with other corporate systems. • Using ML to predict staffing needs	• Optimization of personnel recruitment processes based on analytics. • Forecasting staff turnover and analysing the reasons for lay-offs
R Studio	• An open platform for statistical data processing. • Support for a large set of libraries for HR analysis (psych, car). • Ability to work with large data sets and integration with various sources	• Statistical analysis of training effectiveness and employee development. • Analysis of personnel productivity according to various indicators: duration of work, KPI indicators, productivity on projects

Source: Created by the author

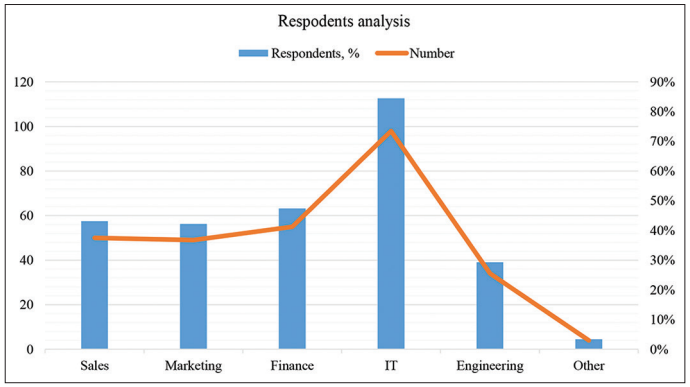
accuracy of forecasts based on historical data. SAP SuccessFactors enables companies to effectively manage talent and predict employee turnover, which is important for retaining key employees in the company. R Studio is used for in-depth statistical analysis that enables HR professionals to build accurate models to evaluate the effectiveness of trainings or analyse the impact of internal processes on employee productivity. This provides companies with the opportunity to strategically manage HR, improving efficiency and competitiveness.

Data analytics is an important component of modern business, especially in the HR management, finance, sales and other critical processes. Their effectiveness is due to the ability to process large volumes of information and provide businesses with clear, informed data-based decisions. According to numerous studies, including 1Path, analytical systems enable companies to significantly improve productivity and accelerate decision-making. In the developed regions of North America and Western Europe, more than 80% of large companies use analytics to optimize internal processes, which demonstrates a high level of adoption of such technologies.

1Path's research on the effectiveness of the use of data analytics tools revealed interesting results regarding the use of technology in different departments of companies. According to Figure 2, data analytics are most actively used by IT departments — 85% of respondents confirmed this. The IT sphere is key to the implementation of analytical solutions due to their close integration with technological processes.

In addition to IT, the highest level of use of analytics is observed in finance departments (47%) and sales departments (43%). This confirms the importance of data analysis in areas where it

Figure 2: Which departments in your company use the solution of analytics?

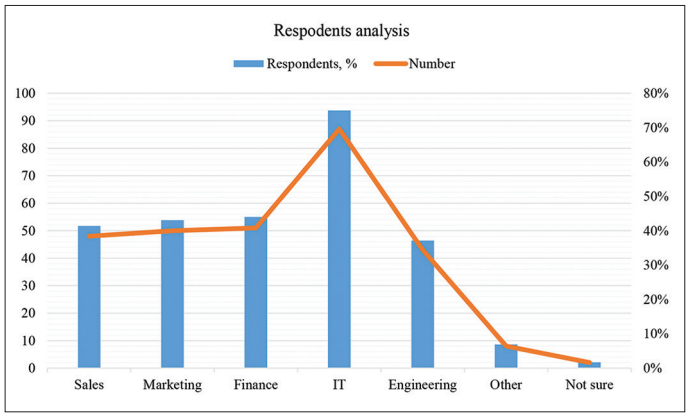


Source: Created on the basis of 1Path's data (2024)

is necessary to make quick decisions based on large amounts of information. Marketing departments are also heavily involved in analytics (42%), using it to monitor campaigns and evaluate advertising effectiveness. Engineering departments (29.3%) and other departments (3.4%) use analytics less actively.

The 1Path study found (Figure 3) that IT departments remain the leaders, with 75% of respondents stating that they cannot function without analytics. This shows the importance of analytical tools for data management, cyber security and optimization of internal processes in the company. Financial departments also cannot do without analytical solutions, as reported by 44% of respondents, and marketing departments — 43%. Sales departments (41%) recognized a critical dependence on analytics technology to help them effectively manage customer bases and forecast future sales. It is interesting that 6.9% of respondents from non-core

Figure 3: Which departments absolutely could not live without solution?



Source: Created on the basis of 1Path's data (2024)

departments also noted the impossibility of working without analytics, which demonstrates the wide applicability of these solutions.

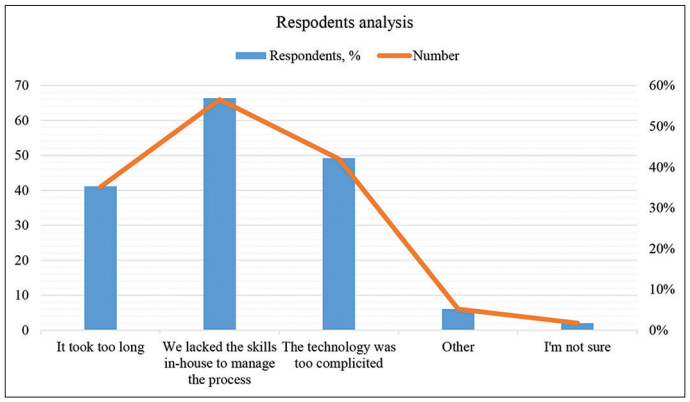
The technical efficiency of analytical tools is their ability to integrate with various data sources and automate processes. The high level of integration of these tools allows companies to store information in real time. It is also possible to analyse it using complex AI- and ML-based algorithms. The US and German markets are actively adopting cloud solutions that allow organizations to manage data more efficiently and reduce infrastructure costs. This increases overall productivity and enables competitive advantages in global markets.

Challenges in implementing data analytics tools are often related to a lack of internal skills, technology complexity, and lengthy integration processes. Many companies in the regions of Central and Eastern Europe, the Asia-Pacific region face a shortage of qualified specialists, which makes it difficult to quickly implement analytical solutions. This trend is especially noticeable among small and medium-sized enterprises (SME), where resources for training employees and attracting external experts are limited. Such problems can significantly reduce the overall effectiveness of the implementation of analytical systems.

One of the biggest challenges in implementing analytics solutions in companies was that many organizations did not have enough skills to manage these processes. According to the results of the study, 57% of respondents indicated that they lacked internal competencies to implement and configure analytics (Figure 4). This is a significant factor that holds back the effectiveness of implementing such technologies, as companies have to engage external experts or spend additional resources on training their employees. In addition, 42% of respondents indicated that the technologies they were using were too complex for their organization.

The duration of the implementation process was another significant problem, which was noted by 35% of companies. The slowness of the process negatively affects the ability to quickly integrate analytics into daily operations and achieve the desired results.

Figure 4: What was the biggest problem your company faced when implementing data analytics?



Source: Created on the basis of 1Path (2024)

Companies that face long-term implementations usually lose their competitive advantage, because the speed of decision-making in today's market is critical.

The uncertainty of the implementation process is a significant factor that affects the overall effectiveness of analytical tools. In most cases, as the studies in the countries of Western Europe and North America showed, large companies face the long-drawn implementation of analytical solutions. In most cases, it can take up to 6–12 months due to the need to adapt technologies to individual business needs. Accordingly, it significantly affects the companies' flexibility and their ability to quickly respond to changes in market conditions.

The effectiveness of using data analytics depends on regional characteristics, the level of technical training of personnel, and the complexity of technological solutions. In developed countries, which have access to highly qualified specialists and developed infrastructure, analytical tools are indispensable in the management of business processes. The effectiveness of analytics can be reduced because of insufficient training and long integration processes.

So, the study clearly demonstrates that while data analytics tools are becoming indispensable in many fields, their implementation faces numerous challenges. However, their application is confirmed by the effectiveness in HR management and strategy development. The main problems are related to insufficient technical skills within companies, the complexity of the technologies and the duration of implementation. However, those companies that successfully integrate analytics solutions obtain significant benefits in HR, finance, marketing, and sales, proving their high performance in today's business.

5. DISCUSSION

The results of the conducted research show that data analytics tools play a key role in increasing the effectiveness of HR management, especially in view of mass digitalization. This is confirmed by the study (Manikas et al., 2023), where it is noted that the use of modern platforms significantly improves decision-

making processes in the management of employee productivity and engagement. Our findings are also consistent with the work (Tessema et al., 2023), which demonstrates that the implementation of SAP SuccessFactors in large corporations significantly reduces staff turnover and improves staff development planning. According to the study (Bublyk and Kopach 2023), companies with limited resources face difficulties in implementing analytical tools because of high cost and technical complexity. It was also found that one of the main problems during the implementation of data analytics is insufficient training of personnel. The statement is consistent with the research (Chawla et al., 2024), which states that companies often face the need to invest in additional employee training.

Our results support the findings (Pilat, 2023) that training and professional development of employees can significantly increase the effectiveness of the use of analytics and contribute to the achievement of better indicators of personnel productivity. A study (Korherr and Kanbach, 2023) shows that data analytics tools significantly simplify forecasting processes in HR. At the same time, the researcher (Hinton, 2023) emphasize that companies mostly do not take into account all the possibilities of analytics tools because of the complexity of their integration into existing business processes. This hypothesis is supported by our data on the difficulties in implementing these solutions in companies with a low level of digital infrastructure. The article (Aydoğan, 2023) proves that it is important to increase the technical readiness of companies and develop appropriate metrics to evaluate the effectiveness of these solutions for the effective implementation of analytical tools. The thesis (Kolontaievskyi and Yatsiuk, 2023) is consistent with our results, where we emphasize the need to develop a system of indicators to measure the impact of analytical tools on employee productivity and the effectiveness of HR processes. The research findings (Shayegan et al., 2023) also confirm that companies risk underestimating the potential of analytical solutions and losing opportunities to optimize HR management without proper evaluation of the results. So, data analytics tools have significant potential to improve HR processes. Their effective implementation requires technical training of companies and a clear strategy for the development of infrastructure and personnel. The practical use of data analytics concerns the actual performance metrics of HR management with the help of digital technologies.

5.1. Limitations

A limitation of the study is the use of a sample of only certain data analytics tools, which may not take into account all options of existing solutions. Besides, the analysis is based on data from the 1Path study, which may affect the generalizability of the findings across regions and industries.

5.2. Recommendations

The conducted research gives grounds to propose the following measures for improving the effectiveness of the implementation of data analytics tools in HR management:

- Develop an integrated strategy for the implementation of data analytics, which will combine the use of tools with the automation of HR processes and the individual needs of companies.
- Invest in the development of digital infrastructure to support the operation of analytical tools, including cloud solutions, data management systems, and automated platforms.
- Ensure regular training and professional development of personnel responsible for the implementation and use of data analytics tools.

6. CONCLUSION

The research established that data analytics tools play a key role in the transformation of HR management processes in view of the current digitization and automation. The use of current digital solutions allows companies to significantly increase the efficiency of management processes by improving decision-making based on the optimization of the use of HR and forecasting future personnel needs. The research shows that companies that actively implement analytics platforms can significantly reduce employee turnover, increase employee engagement, and improve overall productivity. However, it was found that the effectiveness of the use of analytical tools depends on the level of training of personnel and the availability of the appropriate technical infrastructure. High-quality equipment integration for most enterprises is a significant challenge for SMEs.

The obtained results also indicate the need to develop a comprehensive strategy for the implementation of data analytics. It will include staff training, integration with existing management systems and the creation of clear metrics to evaluate the effectiveness of these solutions. It is important that companies invest in developing the technical readiness of their teams, as this will allow them to maximize the potential of analytical tools to improve HR processes. The successful implementation of analytical technologies can contribute to the creation of a sustainable HR management system that will be adapted to rapidly changing market conditions and global competition. Researchers may study the best practices of integrating analytical solutions into the business environment from a technical perspective. It is worth developing specialized solutions for SMEs, as well as for developing new approaches to building predictive models in the field of HR management. Further research should focus on studying methods to optimize the use of analytical platforms in SMEs. The main focus will be on the development of new approaches to the integration of these tools into broader business processes.

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