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# DIGITAL TECHNOLOGIES IN THE ANALYSIS, ACCOUNTING, AND MANAGEMENT OF LABOR RESOURCES IN INDUSTRIAL ENTERPRISES

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**Key words:**
human resource potential, personnel management, digital transformation, industrial enterprises, HRM systems, development strategy.

The article examines the theoretical and practical aspects of developing a strategy for managing the human resource potential of industrial enterprises in the context of digital transformation. The role of human resource potential is identified as one of the key factors in ensuring enterprise competitiveness in modern economic conditions. Contemporary approaches to personnel management are analyzed, including the use of information technologies, big data analytics, artificial intelligence, automated HRM systems, and other digital tools. The advantages of implementing digital technologies in human resource management processes are characterized, such as improving recruitment efficiency, automating personnel management processes, enhancing communication among employees, and optimizing training and professional development processes. The impact of digitalization on the efficiency of human resource management, personnel adaptation to changes, workforce optimization, and increasing enterprise competitiveness is studied. Special attention is given to the methodological aspects of developing human resource management strategies, including assessing the level of digital maturity of enterprises, selecting technological solutions, and implementing innovative personnel management models. The main challenges and risks associated with the digital transformation of human resource management are identified, such as the need for additional investments in digital infrastructure, resistance to change among employees, cybersecurity issues, and the necessity of continuous staff training. Methods for minimizing these risks are proposed through the gradual implementation of digital solutions, the creation of flexible personnel management models that combine traditional and innovative approaches. The research results indicate the need to integrate digital technologies into the personnel management system of industrial enterprises to enhance productivity, reduce costs, and improve personnel adaptability. Strategic directions for human resource development are proposed, contributing to the formation of a stable and efficient workforce management system in the context of dynamic market changes.

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# ЦИФРОВІ ТЕХНОЛОГІЇ В АНАЛІЗІ, ОБЛІКУ ТА УПРАВЛІННІ ТРУДОВИМИ РЕСУРСАМИ ПРОМИСЛОВИХ ПІДПРИЄМСТВ

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**Ключові слова:**
кадровий потенціал, управління персоналом, цифрова трансформація, промислові підприємства, HRM-системи, стратегія розвитку.

У статті розглядаються теоретичні та практичні аспекти розробки стратегії розвитку управління кадровим потенціалом промислових підприємств в умовах цифрової трансформації. Визначено роль кадрового потенціалу як одного з ключових факторів забезпечення конкурентоспроможності підприємств у сучасних економічних умовах. Проаналізовано сучасні підходи до управління персоналом, зокрема використання інформаційних технологій, аналітики великих даних (Big Data), штучного інтелекту, автоматизованих HRM-систем та інших цифрових інструментів.

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Охарактеризовано переваги впровадження цифрових технологій у процеси кадрового менеджменту, такі як підвищення ефективності рекрутингу, автоматизація процесів управління персоналом, покращення комунікації між співробітниками та оптимізація процесів навчання і підвищення кваліфікації. Досліджено вплив цифровізації на ефективність кадрового менеджменту, адаптацію персоналу до змін, оптимізацію трудових ресурсів та підвищення конкурентоспроможності підприємств. Особливу увагу приділено методологічним аспектам розробки стратегій управління кадровим потенціалом, включаючи оцінку рівня цифрової зрілості підприємств, вибір технологічних рішень та впровадження інноваційних моделей управління персоналом. Визначено основні виклики та ризики, пов'язані з цифровою трансформацією кадрового менеджменту, такі як необхідність додаткових інвестицій у цифрову інфраструктуру, опір змінам з боку персоналу, проблеми кібербезпеки та необхідність постійного навчання кадрів. Запропоновано шляхи мінімізації зазначених ризиків через поступову імплементацію цифрових рішень, створення гнучких моделей управління персоналом, що поєднують традиційні та інноваційні підходи. Результати дослідження свідчать про необхідність інтеграції цифрових технологій у систему управління персоналом промислових підприємств для підвищення продуктивності, зниження витрат та покращення адаптаційних можливостей персоналу. Запропоновано стратегічні напрямки розвитку кадрового потенціалу, які сприяють формуванню стійкої та ефективної системи управління трудовими ресурсами в умовах динамічних змін ринку.

**Statement of the problem**

In today's digital transformation of the economy, industrial enterprises are faced with the need to improve approaches to human resources management. Traditional methods of personnel analysis and planning are becoming less effective due to dynamic changes in the labor market, high competition for qualified personnel, and the growing need to automate management processes. In this regard, digital technologies play an important role, allowing for a comprehensive analysis of human resources potential, forecasting personnel needs, increasing the efficiency of labor resources use, and optimizing their management processes. The introduction of digital solutions in the field of human resources management contributes to increasing labor productivity, reducing costs for administrative procedures, increasing employee satisfaction, and ensuring the strategic development of enterprises. The use of HR analytics, artificial intelligence, human resource management systems (HRM systems), blockchain technologies for accounting for human resources, as well as Big Data and machine learning tools can significantly improve the process of making managerial decisions.

The relevance of studying digital technologies in the management of human resources of industrial enterprises is due to several key factors. Modern industrial enterprises are actively implementing Industry 4.0, which involves the automation and digitalization of all business processes, including personnel management. Industrial enterprises are faced with a shortage of qualified personnel, which requires effective forecasting of personnel needs and rapid adaptation of personnel strategies to changes in the external environment. Digital technologies allow to significantly increase the efficiency of the use of labor resources by analyzing labor productivity, optimizing personnel distribution and automating routine processes. The use of large data sets (Big Data), machine learning algorithms and predictive analysis contributes to informed decision-making regarding personnel development, motivation management and employee performance assessment. Thanks to digital technologies, it is possible to quickly respond to changes in production processes and adjust personnel policy in accordance with the strategic goals of the enterprise. Thus, the research and implementation of digital technologies in the processes of analysis and management of labor resources is an urgent need for modern industrial enterprises. This not only ensures the effective use of human resources, but also contributes to the competitiveness and sustainable development of enterprises in the long term.

**Analysis of recent studies and publications**

In the current conditions of digital transformation of the economy, the issue of introducing digital technologies into the management of human resources of industrial enterprises is becoming particularly relevant. Domestic researchers, such as A.S. Ustilovskaya, in their work emphasize the need to adapt personnel management systems to the requirements of the fourth industrial revolution [11]. She notes that the integration of digital technologies into HR processes helps to increase the efficiency of personnel management and ensures the competitiveness of enterprises in the market. Domestic researchers, such as M. D. Vedernikov, L. V. Volyanska-Savchuk, O. O. Chernushkina and N. P. Bazaliyska, in their work emphasize the need to adapt personnel management systems to the requirements of the fourth industrial revolution [5]. They note that the integration of digital technologies into HR processes helps to increase the efficiency of personnel management and ensures the competitiveness of enterprises in the market.

In modern research, foreign scholars pay considerable attention to the impact of digital technologies on the

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management of labor resources of industrial enterprises. In particular, Stefan Stromeyer explores the conceptual aspects of digital human resource management, emphasizing the importance of strategic integration of digital technologies into HR processes to improve the effectiveness of personnel management [2]. Mohammad Reza Azizi analyzes innovative HR management strategies during the COVID-19 pandemic, focusing on the use of digital technologies to support employee satisfaction, productivity, and adaptation to new working conditions [1]. Other researchers, such as L. Wang and G. Zheng, investigate the relationship between digital HR management practices and their effectiveness, emphasizing the role of the maturity of HRM capabilities in this context [3].

Thus, both domestic and foreign scientists are investigating various aspects of the implementation of digital technologies in human resources management, from conceptual foundations to practical strategies and their impact on the effectiveness of HR processes.

Thus, an analysis of recent research indicates that the implementation of digital technologies in human resources management is a key factor in increasing the efficiency and competitiveness of industrial enterprises both in Ukraine and abroad.

## Objectives of the article

The purpose of the article is to study the role and impact of digital technologies on the processes of analysis and management of labor resources of industrial enterprises, identify key trends in their implementation, and assess the effectiveness of digital tools in increasing labor productivity, optimizing personnel processes, and ensuring the competitiveness of enterprises in modern conditions of digital transformation.

## Statement of the main material

Digital technologies have undoubtedly become an important tool in the management of human resources of industrial enterprises, significantly changing both the management processes themselves and the role of labor potential in the activities of companies. The introduction of modern information technologies not only automates routine operations, but also makes it possible to more effectively analyze human resources, which allows you to increase productivity and reduce costs. Digital technologies in human resources management include various tools, such as human resource management systems (HRM systems), platforms for employee training and development, as well as programs for big data analytics (Big Data). They allow you to collect and process significant amounts of information about personnel, which is the basis for making more informed decisions at all stages of work with personnel: from personnel selection to employee development and performance evaluation [7].

One important aspect is the use of Big Data analytics, which helps not only to identify the needs for new employees, but also to predict potential problems in human resource management, for example, the level of staff turnover, trends in labor productivity or the effectiveness of training programs [7]. This allows enterprises to adapt their human resource management strategy in accordance with changes in the external environment and internal processes. For a more clear understanding of the impact of digital technologies on human resource management, we present Table 1, which reflects the main benefits of implementing digital tools in various aspects of human resource work.

This table demonstrates the variety of tools that can be used to optimize human resource management processes at industrial enterprises. The introduction of such technologies allows not only to increase the efficiency of internal processes, but also contributes to increasing the competitiveness of enterprises, which is important in the context of global competition and technological change. Thus, digital technologies allow enterprises in the industrial sector not only to optimize internal processes, but also to significantly improve the quality of human resource management. The introduction of such tools allows not only to increase the efficiency of employees, but also to adapt the enterprise to new challenges facing the industry in the context of rapid technological change. Analysis of the use of digital technologies in the processes of analysis and management of human resources of industrial enterprises is an important step for assessing the current state of innovation in this area, as well as for formulating a development strategy for the future. The use of digital tools allows to significantly improve management processes, reduce costs, increase the accuracy of decision-making and efficiency in performing tasks related to human resource management [4].

The first thing to note is that the introduction of digital technologies into HR practice allows enterprises to more effectively carry out personnel selection, automate the processes of labor productivity assessment, working time accounting and staff turnover. Tools for automating these processes significantly reduce the human factor, errors, and

Table 1 – The impact of digital technologies on human resource management processes

| Human resource management process | Digital technologies | Benefits |
|---|---|---|
| Selection of personnel | HRM systems, online interview platforms | Quick access to candidates, optimization of the selection process |
| Employee Performance Assessment | Big data analytics, performance appraisal software | Objective data on performance, reduction of subjectivity in assessments |
| Training and Development | Online learning platforms, artificial intelligence | Individualized training programs, availability of training materials |
| Personnel turnover management | Predictive algorithms, big data analytics | Identification of problems at early stages, prevention of personnel outflow |

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thereby contribute to improving the quality of personnel management.

Secondly, digital technologies, such as human resource management systems (HRM), data analytics tools and artificial intelligence, are able to provide deep analysis and forecasting, which allows you to optimize the use of labor resources. They allow you to accurately predict the need for labor in the future, help reduce staff turnover, and also predict the effectiveness of employees at different stages of their careers.

Thirdly, the need for such analysis is due to the rapid development of digital technologies, which are constantly being improved. Assessing the effectiveness of these technologies in industrial enterprises allows you to identify problem areas, for example, insufficient use of system capabilities or problems with integrating new technologies into existing business processes. Such analysis makes it possible to timely adjust innovation implementation strategies and adapt them to changing labor market conditions.

Determining directions for further development of digital solutions allows enterprises to remain competitive, increasing the efficiency of personnel management. This includes not only improving internal processes, but also involving innovative methods of training, employee development, as well as the use of the latest technologies to ensure the adaptability and flexibility of organizational structures.

The main stages where digital technologies can be applied to automate management processes are (Fig. 1):

Thus, the analysis of the use of digital technologies in the processes of analysis and management of labor resources is not only important for assessing the current state, but also for forming a development strategy in the future, which contributes to increasing productivity and efficiency of work at industrial enterprises.

The introduction of digital technologies in labor resources management at industrial enterprises directly contributes to the automation of various management processes. This aspect of digitalization is key, since automation not only reduces the amount of manual labor, but also significantly increases the accuracy and efficiency of task performance. For industrial enterprises, where the scale of production and the number of employees can be very large, automation becomes a necessary condition for achieving high results. Digital technologies in all these processes allow not only to increase efficiency and reduce costs, but also to reduce the human factor, which makes personnel management processes more transparent, objective and operational. Thanks to the integration of such systems, enterprises can focus on more strategic aspects of management, such as talent development and workflow optimization [6].

The introduction of digital technologies in the automation of human resources management processes in industrial enterprises contributes to a significant reduction in administrative costs, increased accuracy of management decisions, as well as improved overall staff efficiency. This allows enterprises to adapt to rapid changes in the technological environment and maintain competitiveness in the industry.

In line with the introduction of digital technologies for the automation of human resources management processes, the next important step is the development of big data analytics (Big Data) for in-depth analysis of human resources. Since traditional methods of information processing and employee evaluation are no longer able to cope with the large volumes of data generated at enterprises, new analytical tools make it possible not only to quickly process large volumes of information, but also to identify key patterns that affect human resources management.

Big data analytics is an important element in human resources management processes at modern industrial enterprises. It allows you to collect, process and analyze huge amounts of data about employees and their activities in real time, which makes it possible to make more accurate forecasts and effectively manage personnel. This becomes possible thanks to the use of various analytical platforms, machine learning and artificial intelligence algorithms [7].

One of the main areas of use of big data analytics is the forecasting of staff turnover, which is an important aspect of personnel management. By analyzing data on the level of employee satisfaction, their social status, working conditions, productivity levels and other factors, companies can predict which employees may leave the company in the near future. This allows you to take measures in advance to retain key personnel or prepare a replacement [8].

Another important aspect is the optimization of recruitment processes. With the help of big data analytics, companies can evaluate the effectiveness of various channels for finding employees, analyze which characteristics of candidates lead to better results in work, and thus adapt the recruitment strategy to the specifics of the company's activities. This approach allows you to reduce the time and resources for recruiting personnel, making this process more accurate and predictable.

Big data analytics is also used to increase labor productivity. The collected data allows you to determine the effectiveness of each employee, track their performance in different conditions, and find patterns that can be used for further training and development of employees. This approach allows you to more accurately assess the needs for training and development of personnel, as well as adjust personnel management strategies in a timely manner. The use of such technologies also helps in optimizing personnel costs. Data analytics allows you to identify inefficiently used resources or the presence of excess employees, which helps reduce salary costs and reduces the financial burden on the company [9].

To better understand the effectiveness of using big data analytics in human resource management, we present an example of Table 2 with indicators that can be obtained through such analysis.

Using big data analytics in HR processes allows companies to improve decision-making efficiency, optimize costs and reduce risks. This approach allows not only to predict future trends in HR management, but also to ensure more effective recruitment, training and development, which in turn helps to increase the productivity and competitiveness of the enterprise.

In addition to the effective use of big data analytics, the use of artificial intelligence (AI) for HR management is no

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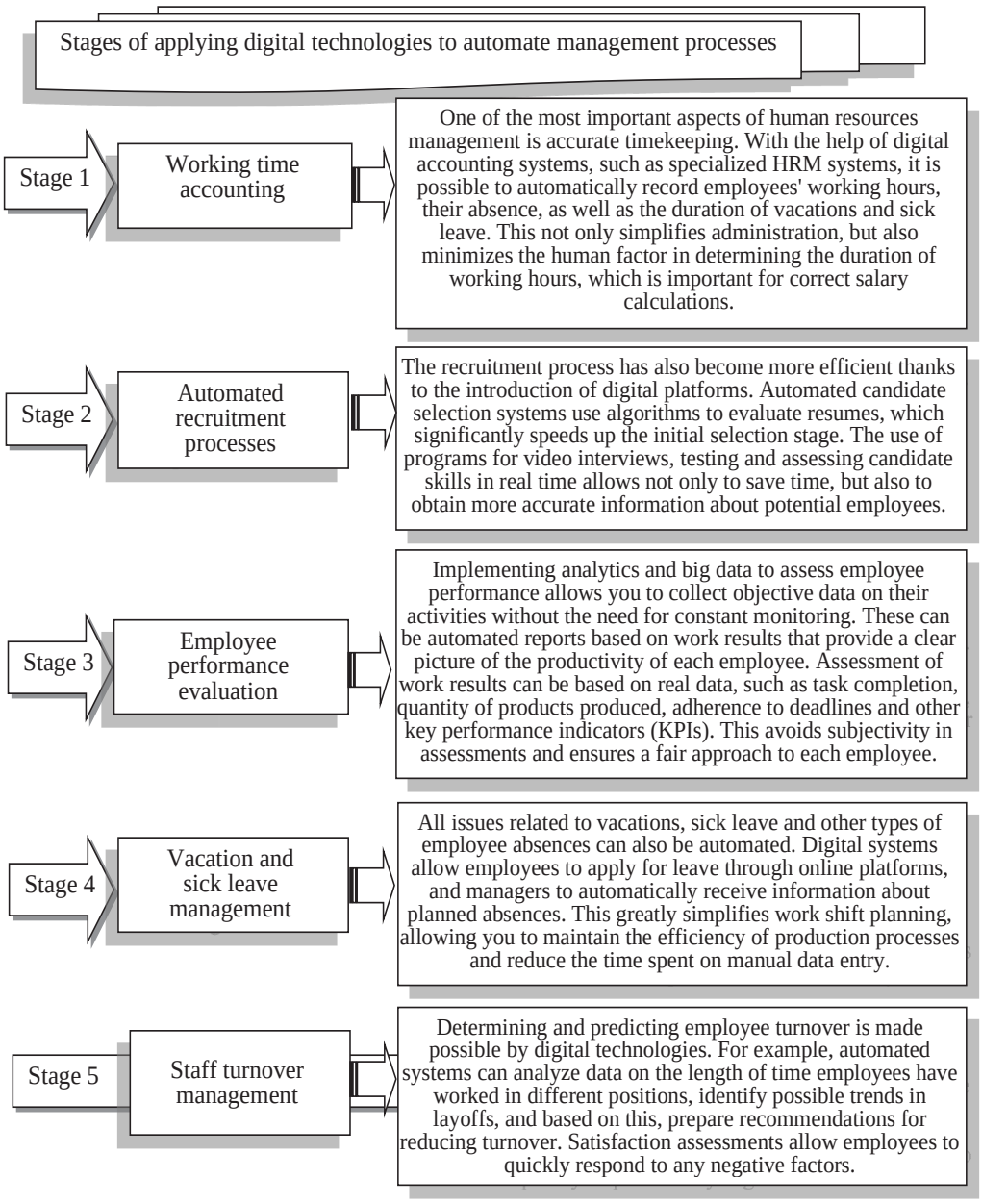


Fig. 1 – Stages of applying digital technologies to automate management processes

Table 2 – Using big data analytics for human resource management

| HR Management Process | Technologies Used | Benefits |
|---|---|---|
| Employee turnover forecasting | Big data analytics, machine learning | Reducing employee turnover, responding to problems in a timely manner |
| Recruitment | Algorithms for resume analysis, interview process automation | Quick and accurate identification of suitable candidates |
| Performance Assessment | Data Analytics, KPI, Performance Evaluation | Accurate Measurement of Employee Productivity, Objective Assessments |
| Training and development of personnel | Training platforms, adaptive learning systems | Individualized training, employee training |

less important. Artificial intelligence is a powerful tool for automating processes, making data-based decisions and creating personalized solutions for employee development. Thanks to AI algorithms, companies can significantly reduce the human factor in HR management, reduce costs and increase the accuracy of forecasts.

Artificial intelligence in HR management is used at various stages of processes, from the selection of

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candidates to assessing their performance. The use of such technologies allows to significantly optimize work processes and provide enterprises with better results due to a high level of automation and accuracy of decision-making. One of the most popular areas of use of AI is recruitment. Artificial intelligence algorithms are able to perform in-depth analysis of resumes, identifying the necessary skills and qualifications of candidates. They can also conduct preliminary screening interviews, providing an assessment according to various criteria, which reduces the time and resources spent on hiring. In addition, AI is actively used for assessment processes, such as analyzing employee productivity. For example, algorithms can analyze employee behavior, their interaction with colleagues, activity level, achieved results and many other indicators. This approach allows for a more objective and accurate assessment of employee efficiency. The use of AI also helps in automating the processes of training and personnel development. Intelligent systems can create individual development plans for each employee, analyzing their strengths and weaknesses, on the basis of which specialized trainings and courses are generated. AI is able to adapt training programs to the specific needs of the employee, which allows to significantly increase the efficiency of training [10].

Another advantage of using AI is the optimization of labor management costs. Thanks to accurate forecasts and recommendations of artificial intelligence, companies can carry out optimal staffing planning, minimizing excessive costs for redundant positions or inefficient use of resources. To illustrate the use of AI in labor management, we present a table that illustrates its main advantages and capabilities.

The use of artificial intelligence in human resource management processes significantly increases the efficiency of human resource management at industrial enterprises. AI provides a more accurate assessment of employee productivity, optimizes recruitment and helps in forecasting personnel needs. Thanks to such tools, enterprises are able to significantly reduce the costs of human resource management and improve the quality of decisions made. In the long term, this allows them to maintain competitiveness and adapt to changing labor market conditions.

Digital platforms for training and development of personnel have become an important element in the human resource management strategy at modern industrial enterprises. Growing competition and technological changes require companies to constantly improve the skills and qualifications of their employees. Given this, online learning platforms are becoming increasingly important as tools for increasing the efficiency and productivity of personnel.

One of the main advantages of digital platforms is a personalized approach to training. Traditional training methods often do not take into account the individual needs of employees, while online learning platforms allow for the creation of customized programs for each employee, taking into account their level of qualification, interests and professional goals. For example, platforms using artificial intelligence can automatically select courses and materials for the user, based on their previous results and personal preferences. This approach ensures a higher level of employee involvement in the learning process, as they receive exactly the knowledge and skills they need for further professional growth.

Another important advantage of digital platforms is the availability of training materials at any stage of work. Traditionally, employees had to undergo training at a certain stage of their career or at set deadlines. Now, thanks to platforms, employees can access training materials at any time when necessary, and depending on their current level of knowledge or development needs. This allows for more flexible training, which is especially important in conditions of rapidly changing technological requirements [8].

Digital platforms also enable monitoring of the learning process. With the help of such tools, managers can track the progress of employees, identify their strengths and weaknesses, and adjust training programs in a timely manner. This not only increases the effectiveness of training, but also makes it possible to optimize training costs, since it is possible to accurately determine which courses or programs produce the best results.

By using e-courses, video training, webinars, and interactive tools such as gamification, employees have the opportunity not only to gain theoretical knowledge, but also to immediately apply it in practice. This allows them to better adapt to new working conditions, as well as more quickly master new tools and technologies that become important for the effective performance of their tasks. Table 4 illustrates the main advantages of digital platforms for training and development of personnel in industrial enterprises.

Digital platforms for training and development of personnel at industrial enterprises offer great potential for improving the efficiency of employees. They allow to maintain a high level of qualification, quickly adapt

Table 3 – Use of artificial intelligence in labor management

| Human Resources Management Process | Technologies Used | Benefits |
|---|---|---|
| Recruitment | Algorithms for CV screening, automated interviews | Fast and accurate candidate selection, reduced selection time |
| Labor productivity assessment | AI analytics, KPI analysis, performance monitoring | Objective and personalized assessments, rapid problem detection |
| Training and development of personnel | Intelligent training platforms, personalized trainings | Individualized approach to training, advanced training |
| Staffing Planning | Staffing Forecasting, Planning Optimization | Reducing Personnel Costs, Proper Resource Allocation |

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employees to new working conditions, and also provide a personalized approach to training. This contributes to increasing labor productivity, reducing training and development costs, and improving the overall efficiency of labor resources management at enterprises.

Digital technologies in the field of labor resources management are already changing traditional methods of working with personnel, optimizing processes from recruitment to assessing their productivity. However, the rapid development of technologies opens up new horizons for further improvement of management processes. In particular, the future of labor resources management will be associated with the use of such innovations as blockchain, virtual and augmented reality, as well as adaptation to changes caused by the pandemic and global economic changes [9].

One of the most promising areas of development is the use of blockchain technologies to ensure transparency and reliability of employee data. Blockchain allows for the creation of reliable and immutable records of employees' work activities, qualifications, education and experience. This is especially important for companies operating in an international environment where it is necessary to confirm the authenticity of candidate data. In addition, blockchain can be used to automate contracts and payroll management, providing greater transparency and reducing the risk of fraud or calculation errors. These technologies allow companies to significantly improve the efficiency of human resource management, as well as ensure compliance with legal requirements. Another important innovation that can significantly change the processes of training and development of personnel is virtual (VR) and augmented reality (AR). These technologies are able to create interactive learning environments that allow employees to interact with virtual objects, simulate real-world work processes and even undergo training in conditions that are as close to real-world as possible. For example, VR can be used to train employees on specific technologies or equipment without the need for physical presence in the workplace, while AR allows providing employees with real-time information about the work being performed or navigating them in difficult environments [10].

In addition, in the post-pandemic world, where many companies have switched to remote work or hybrid models, there is a need to develop new tools for managing distributed teams. The use of technologies such as cloud platforms for collaboration, big data analytics for tracking the performance of remote workers, as well as tools for flexible project management, allows maintaining the efficiency of organizational processes even in distributed work conditions. This makes it possible to monitor employee productivity, their development and motivation, even when they work from different locations.

In the context of the development of new forms of work and adaptation to changes in the labor market, digital technologies allow for flexible management of labor resources, which contributes to a faster response to economic challenges. This also includes the introduction of electronic platforms for freelancers and temporary workers, which makes it possible to create effective models of cooperation between companies and external workers.

Table 5 presents the main prospects for the development of digital technologies in the field of labor resources management.

Rapidly evolving digital technologies offer enormous opportunities for improving workforce management. The introduction of tools such as blockchain, VR, AR, cloud platforms and big data analytics helps enterprises increase the efficiency, flexibility and transparency of their HR processes. These technologies contribute not only to improving internal processes at enterprises, but also to adapting to new working conditions that have arisen due to global changes in the world of work.

Table 4 – The impact of digital platforms on training and development of personnel

| Learning and Development Direction | Digital Platforms | Benefits |
|---|---|---|
| Personalizing training programs | AI-based platforms, online courses | Adapting training to the needs of each employee |
| Accessibility of learning | Online courses, mobile platforms | Ability to learn anytime, anywhere |
| Progress Monitoring | Data Analytics Platforms | Progress Tracking, Curriculum Adjustments |
| Interactive learning methods | Webinars, game-based learning methods | Employee engagement, improved learning |
| Reducing training costs | E-courses, webinars | Reducing costs for organizing traditional trainings |

Table 5 – Prospects for the development of digital technologies in the field of labor resources management

| The technology | Potential use | Benefits |
|---|---|---|
| Blockchain | Management of labor contracts, verification of employee qualifications | Transparency, reduction of fraud risk, automation of processes |
| Virtual Reality (VR) | Employee Training, Simulation of Work Situations | Safe Training, Realistic Replication of Work Processes |
| Augmented Reality (AR) | Increase on-site efficiency, real-time learning | Access additional information, improve work efficiency |
| Cloud Platforms | Real-time Collaboration, Communication, and Project Management | Increasing Flexibility and Efficiency in Team Management |
| Big Data Analytics | Forecasting Employee Needs, Tracking Productivity | Improving Planning, Increasing Management Efficiency |

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## Conclusions

Based on the research conducted, we can note that digital technologies have become an integral part of human resources management at industrial enterprises, significantly changing approaches to the organization and optimization of personnel processes. The introduction of innovative tools, such as HRM systems, online learning platforms, big data analytics and artificial intelligence, allows you to reduce costs, increase the efficiency of personnel management and improve decision-making. These technologies allow you to automate routine operations, objectively assess employee productivity, predict staff turnover and optimize personnel selection processes. Digitalization of personnel processes helps reduce administrative costs, increase the accuracy and efficiency of management decisions, which are key factors for ensuring the competitiveness of enterprises in a global and technologically changing environment. An important direction of development is big data analytics and artificial intelligence, which allow you to more accurately predict labor needs and effectively plan personnel management strategies.

Therefore, the effective use of digital technologies in workforce management is a powerful tool for increasing the productivity and development of enterprises, allowing them to adapt to change, improve the quality of work, and maintain their competitiveness.

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