Digital technologies in personnel management

Oksana Makovoz

National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine,
IHI Zittau, Dresden Technical University, Dresden, Germany
oksana.makovoz@tu-dresden.de
https://orcid.org/0000-0001-8728-1500

Sergii Lysenko

National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine
Serhii.Lysenko@emmb.khpi.edu.ua
https://orcid.org/0009-0004-3720-5285

Abstract

This paper examines the pivotal role of digital technologies in the transformation of personnel management within contemporary enterprises. As businesses increasingly emphasize efficiency, adaptability, and innovation, digitalization in human resources (HR) management is becoming indispensable. The integration of cutting-edge technologies such as Artificial Intelligence (AI), Big Data, Machine Learning (ML), the Internet of Things (IoT), and 5G within HR processes stands at the forefront of this transformation, enhancing productivity and fostering sustainable organizational development.

The study focuses on several critical aspects of HR digital transformation including recruitment, employee development, performance evaluation, and engagement strategies. It systematically examines the impact of digital technologies on these HR functions and assesses how they contribute to creating a more effective work environment. The research underscores the potential of digital tools to not only streamline HR processes but also to enhance employee satisfaction and organizational efficiency.

Empirical evidence from leading companies that have successfully integrated digital HR solutions suggests significant cost reductions and improved operational efficiency. The paper analyzes these cases to identify the benefits and challenges associated with HR digitalization. It further discusses the implications of these technologies on corporate culture and the overall workforce management.

Ultimately, this article provides a comprehensive overview of the challenges and opportunities presented by HR digitalization. It offers insights into effective strategies for implementing digital transformations in HR processes, based on practical examples from industry leaders. The findings aim to assist organizations in making informed decisions about optimizing their HR operations through digital technologies, thereby enhancing their overall effectiveness and adaptability in the digital era.

Keywords: Digitalization, organizational transformation, human resources management, artificial intelligence, big data, machine learning, internet of things, employee engagement.

Introduction

The current stage of personnel management development cannot be imagined without the integration of digital technologies, which transform traditional approaches to recruitment, training, assessment, and motivation of employees. Monitoring results from Harvard Business Review highlight the economic benefit for organizations with a well-developed digital adaptation strategy, indicating significant savings and increased efficiency in software utilization (WalkMe, 2024). An important aspect is also the increase in employee awareness and satisfaction through principles of diversity, equity, inclusivity, and belonging (DEIB) (Harvard Business Review, 2023), which is made possible by transparency and open communication supported by digital means. The research by Mazurchenko A. and Maršíková K. (Mazurchenko, A., & Maršíková, K., 2019), as well as Balabanova O.N. and Balabanov I.P. (Balabanova, O.N., & Balabanov, I.P., 2020), emphasizes the theoretical understanding of the advantages and disadvantages of using digital technologies in HR. Significant contributions to the research on the impact of digital transformation on personnel management have been made by Plekhanov D., Franke N., and Netland T.H. (Plekhanov, D., Franke, H., & Netland, T. H., 2022), Kraus S. et al. (Kraus S. et al., 2022), and Martínez-Peláez R. et al. (Martínez-Peláez R. et al., 2023). These authors thoroughly examine the key concepts, challenges, and perspectives of digital transformation, including its impact on personnel management. Particular attention in contemporary research is given to analyzing the influence of artificial intelligence (AI), automation, the Internet of Things (IoT), Big Data, and other digital innovations on HR processes. These technologies open up new possibilities for optimizing HR processes, enhancing work efficiency, and talent development within organizations. An important role in the research is played by works that consider the global experience and perspectives of using digital technologies in personnel management, particularly in Ukraine and other countries. Researchers such as Rêgo B.S. et al. (Rêgo B.S. et al., 2022) analyze the peculiarities and trends of HR digitalization, highlighting both the problems and advantages of this process.

Results and discussion

Modern economic conditions are characterized by a rapid pace of digital transformation. To achieve success with a digital transformation strategy, it is recommended to start with implementation and application in personnel management processes. Personnel management is a complex systemic, methodically organized influence through interconnected organizational, economic, and social measures on the process of formation, distribution, redistribution of the enterprise's personnel, and creating conditions for the effective use of employees' qualities with the aim of ensuring efficient management and development of the enterprise (Hlushchenko L., Piliavoz T. & Koval N., 2022). Personnel management is carried out by the sequential implementation of the main functions of management. The main sub-processes of personnel management are shown in Figure 1:
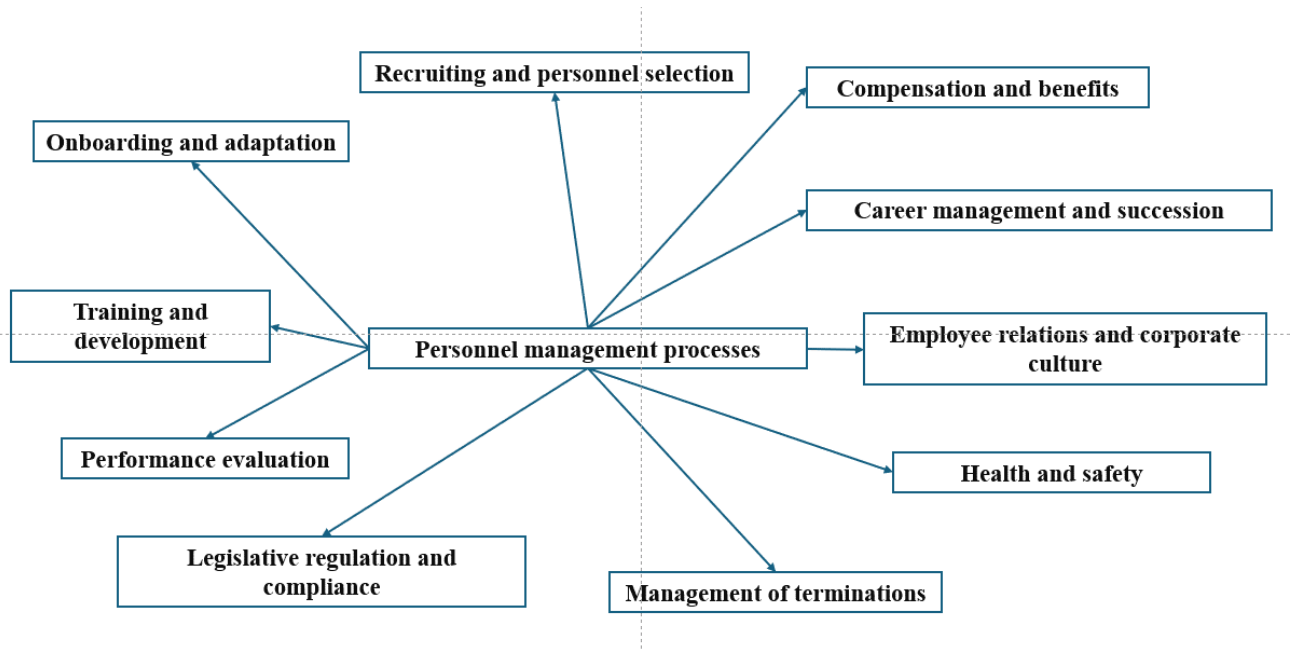
Figure 1. Main sub-processes of personnel management
Created by the author based on ((Hlushchenko L., Piliavoz T. & Koval N., 2022)

1.   Recruiting and personnel selection – the process of automated personnel selection helps ensure the identification and utilization of the best candidates in the recruiting process (Nazarova G. V., Rudenko V. O., 2020).

2.   Onboarding and adaptation – the introduction of new employees to the business and their integration into the corporate culture (Kovalenko, A. V., 2021).

3.   Training and development – staff development is one of the most important areas of enterprise activity in personnel management (Khilukha, O., 2021).

4.   Performance evaluation – regular evaluation of staff performance to determine effectiveness and training needs. The practice of evaluating the effectiveness of management and the use of personnel shows that a comprehensive set of methods and indicators allows for planning effective personnel utilization (Dzyamulich, & Urban, 2020).

5.   Compensation and benefits – development and management of systems for salaries, bonuses, and social packages. Increasing interest in work and, therefore, productivity can be achieved by introducing a system of additional incentives based on providing personal bonuses to employees (Tsymbalyuk, G. S., & Kravchuk, R. V., 2022).

6.   Career management and succession – planning the career of employees and developing leadership. Managing the business career of employees and the entire career process is a complex

and multifaceted activity. Career opportunities are formed from educational programs and consulting services that detail further career planning (Ivanova, V., & Kubitsky, S., 2023).

7. Employee relations and corporate culture – supporting a healthy work environment and positive corporate culture. Corporate social responsibility acts as a necessary guarantee of adhering to ethical norms and principles of entrepreneurship, as it allows for rationally building production relations, humanizing the production process, and optimizing the impact of morality on work results and business success (Bobko, L., Vasylyuk, I., & Boyko, O., 2020).

8. Legislative regulation and compliance – ensuring compliance with labor law. Considering current trends and future perspectives of digital development, the development of legislation concerning legal and ethical standards becomes relevant (Slobodian, N., Levchenko, Y., & Slobodian, V., 2022).

9. Health and safety – developing policies and procedures to ensure safety and health at the workplace. Risks from personnel arise always and at all stages of work. In this regard, the organization should create a flexible personnel security system capable of timely diagnosing the approach of a threat and preventing it in time (Soroka, A., 2018).

10. Management of terminations – managing the process of employees exiting the company, including termination of employment relationships and pension planning. Due to structural changes, reorganization of production, or management, a situation may arise that necessitates personnel reduction (Gavrish, A. A., Dovgan, L. E., Kreidich, I. M., & Semenchenko, N. V., 2017).

These sub-processes of personnel management form the foundation for effective HR department operations. The use of digital technologies in each of these aspects allows for the automation of many tasks, collection and analysis of data, improvement of communication, and overall enhancement of efficiency in personnel management at every sub-process. Considering the main sub-processes, the following hypotheses and objectives have been formulated to investigate the impact of digital technologies in personal management in well-known companies (Table 1.). Each of these objectives involves data collection, an analytical review of existing practices, and an evaluation of the impact of implementing digital technologies on various aspects of personnel management in companies. The research results will help companies make informed decisions regarding the optimization of their HR processes and enhance overall efficiency through digital technologies.

Table 1. Impact assessment of digital technologies in personnel management

Hypothesis (H)	Objective (O)	Description of Hypothesis	Description of Objective	Potential Fulfillment
H1	O1	H1 posits that integrating digital technology in HR leads to more efficient management by automating tasks.	O1 aims to quantify the effect of digital HR technologies on organizational productivity.	Could show how digital technology directly correlates with enhanced productivity metrics.
H1	O5	H1 suggests automation of routine tasks will enhance strategic task focus.	O5 looks into the impact of digital technology on streamlining HR processes.	Might demonstrate how automation frees up resources, allowing for better strategic HR management.
H2	O2	H2 hypothesizes that digital tools improve communication and collaboration within an organization.	O2 seeks to understand the effect of digital communication tools on employee satisfaction.	Could reveal a relationship between the use of digital communication tools and improved employee morale.
H3	O3	H3 proposes that digital recruiting platforms streamline the hiring process.	O3 explores the effectiveness of digital recruitment in attracting and selecting candidates.	Might establish the efficiency gains in recruitment timelines and quality of hires due to digital platforms.
H4	O4	H4 suggests digital technologies allow for objective employee evaluations and career planning.	O4 assesses how digital platforms can aid in staff development and training.	Could illustrate how digital evaluation tools contribute to targeted and effective employee development programs.
H5	O5	H5 asserts that RPA and ERP systems enhance HR operational efficiency.	O5 aims to investigate the impact of process automation on HR task management.	Might demonstrate cost and time savings in HR operations due to the implementation of RPA and ERP systems.

After defining hypotheses and objectives, the next step is to analyze case studies to practically assess these theoretical postulates. The case study analysis aims to illustrate and verify the stated

hypotheses through specific examples of companies that have successfully integrated digital technologies into their personnel management processes. Studying these examples will help identify critical success factors and potential risks associated with digitization in the context of HR.

Selection of companies for analysis, the following companies have been chosen, which represent different sectors of the economy and have implemented digital innovations in personnel management.

Siemens AG (Germany) – a global giant in industrial automation and electronics. Siemens uses advanced digital platforms for personnel management, including for training, performance evaluation, and recruiting, which enables the company to maintain high efficiency on a global scale:

– Cloud-based HR Solutions – Siemens utilizes cloud solutions for personnel management that standardize HR processes at a global level. Thanks to Cloud Talent Solution and Jibe, Siemens has achieved a 30% increase in conversion from search queries to job applications on its career site; it offers a more relevant experience for job seekers, reducing the load on its talent acquisition team; and supports the talent acquisition team and the broader HR department on their way to becoming providers of amazing technological solutions for employees and candidates (Google, 2024, May 27).

Google LLC (USA) – A well-known leader in the technology sector, which actively implements innovations in personnel management through the use of artificial intelligence, data analysis, and automated training systems, which helps optimize processes for selection and development of employees:

– Google People Operations – the use of data and analytics to support decisions in hiring, managing performance, and career development (Analytics Google, 2024, May 10).

– gDNA - Google's internal research to analyze work behavior and employee engagement.

Tata Consultancy Services (TCS) (India) – one of the leading IT consulting and service companies that integrates digital technologies in HR for effective management of its large international staff. TCS uses automated systems for training and developing employees:

– TCS Cognix™ – an integrated automated platform that uses advanced AI and machine learning technologies to improve work processes, including HR.

IKEA (Sweden) – an international furniture retailer that actively uses digital tools for internal communication, personnel management, and supporting corporate culture through proprietary mobile apps and platforms for employees:

– IKEA HR Digital Transformation – IKEA actively implements digital tools to simplify HR processes, including training employees and managing personnel through digital platforms.

Safaricom (Kenya) – a leading African mobile operator that implements advanced HR technologies to manage a diverse workforce, including systems for performance evaluation and e-learning:

– SAP SuccessFactors – the use of this cloud solution for talent management helps optimize processes for hiring, evaluating, and developing employees.

These companies were chosen based on their innovativeness, geographic coverage, and industry diversity. They demonstrate how digital technologies can be adapted to different conditions and needs in a global context. Using their experience in the article will provide a comprehensive understanding of the impact of digital innovations on personnel management.

The main indicators for evaluation are the overall productivity of the company, hiring speed, employee engagement levels, HR response time to employee requests, and reduction in HR operation costs.

Effective communication management not only improves operational activities but also creates the foundation for a positive and productive corporate culture. As a result, companies that focus on developing internal communication often achieve better results, have higher employee satisfaction, and a stronger team spirit.

Artificial Intelligence (AI) and machine learning have brought significant changes to many areas of activity, especially in personnel management. These technologies enable optimization of candidate selection processes, adaptation of new employees, evaluation of their performance, and forecasting their training and development needs:

– Impact on personnel selection – AI can analyze large volumes of candidate data much faster and more effectively than humans. AI-based systems use algorithms to scan resumes, assess candidates skills and experience, and identify the most promising applicants for further interviews. The Hilton company (Kurter, H. L., 2019, September 19). uses an AI-based system to conduct video interviews, where algorithms analyze body language, tone of voice, and key words. This allows for faster identification of candidates who are the best fit for the company.

– Impact on adaptation – AI can simplify and personalize the adaptation process for new employees by providing them with customized training materials and integration into the team. LinkedIn (Nasim Ahmed, Andre L. C. Barczak, Teo Susnjak et al., 2020) uses machine learning algorithms to create personalized learning plans for users based on their professional interests and development goals.

– Impact on performance evaluation – Machine learning algorithms can analyze employee performance, identifying patterns and trends that may be invisible to the human eye. This allows management to better understand the needs of their teams and adapt management strategies to increase efficiency. IBM (IBM presented its AI platform - watsonx: News: Computer Review. (2023, May 10) uses its own Watson platform to analyze work emails, meetings, and other data to assess employee contributions and identify potential leaders.

– Impact on forecasting training and development needs – AI-based systems can analyze current labor market trends, internal data on employee performance, and their career trajectories to predict future training and professional development needs. Coursera (Satisfaction guaranteed: development of customer loyalty online. Coursera, 2024, May 10). uses data on the performance and interests of its users to recommend courses and specializations that will help them develop skills important for their careers. According to LinkedIn (McCabe, B., 2024, January 8), 72% of HR professionals believe that analytics in hiring will have a significant impact on recruiting in the next 5 years. Deloitte research (2024 HR tech predictions: Gen Ai's journey from use case to ubiquity. action.deloitte.com, 2024, May 10). has shown that organizations that actively use AI-based tools for talent management are four times more likely to experience high levels of productivity and employee satisfaction.

Digital technologies have revolutionized the field of personnel management across several key areas. Here is a summary that encapsulates the integration of digital technologies in various HR processes:

– Recruiting – AI and machine learning technologies streamline the process by quickly analyzing large data volumes to select the best candidates. They enable the scanning of resumes and assessment of skills more effectively, leading to a better match for company needs.
– Training and development – digital platforms offer personalized training and career development paths. Machine learning algorithms can tailor learning materials to individual employee needs, aligning with their professional goals and interests.
– Evaluation and reporting – algorithms assess performance by identifying patterns and trends, aiding in more accurate and objective performance evaluations. This leads to more informed management decisions regarding talent and career progression.
– Process automation – AI-driven process automation, including RPA and ERP systems, reduces time spent on routine tasks. This automation extends to tracking work hours, payroll processing, and managing leave and terminations, enhancing overall HR efficiency.
– Communications management – digital tools facilitate better internal communication, fostering a positive corporate culture and improving employee engagement. Transparent and open communication channels supported by technology lead to a cohesive and productive work environment. The result of using digital personal management tools is in Table 2.

Table 2. Use of digital personnel management tools (developed by the authors)

Management aspect	Digital tools	Content activity, effect
Recruiting	Automated selection systems	Effective selection of candidates. Reduction of selection time. Attracting more candidates.
	Platforms for video interviews	Remote conducting of interviews. Recording and analysis of interviews
Training, development	LMS (Learning Management Systems)	Centralized training. Learning progress tracking
	E-learning platforms	Improvement and development of employees' skills. Attracting potential talent. Formation of personnel reserves.
	Interactive educational modules	Increasing participant engagement.
	Gamification (tools and techniques based on games)	Increasing employee motivation.
Evaluation and reporting	Software for project management	Monitoring tasks and projects.
		Evaluation of personnel productivity.
	Salary management platforms	leave tracking and communication channels that allow HR to easily process government paperwork
	Analytical tools	Collect performance data.
		Analytics for decision making
Process automation	Robotic Data Processing (RPA)	Automation of routine tasks. Reduction of data processing costs
	ERP systems	Integration of business processes. Management of the organization's resources
Communications management	Digital communication platforms	Improvement of internal communication. Quick exchange of information
	Electronic signature	Saving time, paper and other resources.

Conclusion

The article concludes by highlighting the transformative effects of digital technologies in the field of personnel management. It establishes that integrating technologies such as AI, Big Data, and machine learning into HR processes leads to significant improvements in operational efficiency, employee engagement, and overall productivity of organizations.

The successful cases from leading companies like Siemens AG, Google LLC, Tata Consultancy Services (TCS), IKEA, and Safaricom, which have integrated digital solutions in their HR departments, provide empirical evidence supporting the adoption of these technologies. The analysis shows that these companies have achieved cost reductions, expedited hiring processes, and enhanced employee satisfaction through digital means. The situation regarding the use of digital tools and technologies is different. On the contrary, they are constantly improved and regularly modified. In the course of transformation, digital tools are permanently integrated into the current work of IT companies. Moreover, the article underlines the strategic role of digitalization in fostering an inclusive and dynamic corporate culture, emphasizing transparency and open communication. It argues that effective communication management, supported by digital tools, not only improves daily operations but also lays the foundation for a positive and productive work environment.

In conclusion, the article suggests that organizations that adopt and effectively implement digital HR technologies can expect a high return on investment through increased adaptability, strategic workforce development, and a robust competitive edge in the digital era. The research ultimately serves as a guide for organizations looking to optimize their HR operations with digital technologies, advocating for a data-driven and employee-centric approach to HR management.

Acknowledgements

References

Analytics Google (2024, May 10). Google. URL:
    https://marketingplatform.google.com/about/analytics/

Balabanova, O.N., & Balabanov, I.P. (2020). The Use of Digital Technology in Personnel
    Management (HRM). https://doi.org/10.2991/aebmr.k.200312.402

Bobko, L., Vasylyuk, I., & Boyko, O. (2020). Corporate Social Responsibility as a component
    of the organization corporate culture. Young Scientist, 4(80).
    https://doi.org/10.32839/2304-5809/2020-4-80-61

Gavrish, A. A., Dovgan, L. E., Kreidich, I. M., & Semenchenko, N. V. (2017). Personnel
    management technologies.

Google. (2024, May 27). Siemens Case study, google cloud.

Hlushchenko Larisa, Piliavoz Tetiana & Koval Natalia (2022). Personnel management in the
    modern structure of enterprise management. Economy and society, (35). DOI:
    https://doi.org/10.32782/2524-0072/2022-35-41

2024 HR tech predictions: Gen Ai's journey from use case to ubiquity. action.deloitte.com.
    (2024, May 10). https://action.deloitte.com/insight/3768/2024-hr-tech-predictions-gen-
    ais-journey-from-use-case-to-ubiquity

IBM presented its AI platform - watsonx: News: Computer Review. (2023, May 10)
    https://ko.com.ua/ibm_predstavila_novu_platformu_watsonx_dlya_ai_144069https://ko.c
    om.ua/ibm_predstavila_novu_platformu_watsonx_dlya_ai_144069

Ivanova, V., & Kubitsky, S. (2023). Measures to improve the business career management
    system at the enterprise. Materials of ICPC conferences, (07.07.2023; Ternopil, Ukraine),
    48-52. https://archive.mcnd.org.ua/index.php/conference-proceeding/article/view/651

Jeremie Brecheisen. Research: Where Employees Think Companies' DEIB Efforts Are Failing
    (2024, May 10). Harvard Business Review. 2023. URL: https://hbr.org/2023/03/research-
    where-employees-think-companies-deib-efforts-are-failing?autocomplete=true

Khilukha, O. (2021). The effect of training on employee performance. Scientific Opinion:
    Economics and Management, (4(74)). https://doi.org/10.32836/2521-666x/2021-74-8
    Dzyamulich, & Urban. (2020). 1. Assessment of efficiency of enterprise personnel
    management in conditions of sustainable development. Economic Sciences. Series
    "Regional Economy," 1(17(67)), 82–88. https://doi.org/10.36910/2707-6296-2020-
    17(67)-9

Kovalenko, A. V. (2021). Digital tools for adapting staff to a hybrid employment format.
    https://jvestnik-sss.donnu.edu.ua/article/view/11279

Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2022). Digital
    transformation in business and management research: An overview of the current status
    quo. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Kurter, H. L. (2019, September 19). How Hilton reduced their time to hire from 43 days down
    to 5. Forbes. https://www.forbes.com/sites/heidilynnekurter/2019/09/19/how-hilton-
    reduced-their-time-to-hire-from-43-days-down-to-5/?sh=665be4096759

Martínez-Peláez, R., Ochoa-Brust, A., Rivera, S., Félix, V. G., Ostos, R., Brito, H., Félix, R. A.,
    & Mena, L. J. (2023). Role of Digital Transformation for Achieving Sustainability:

Mediated Role of Stakeholders, Key Capabilities, and Technology. https://doi.org/10.3390/su151411221

Mazurchenko, A., & Maršíková, K. (2019). Digitally-Powered Human Resource Management: Skills and Roles in the Digital Era. Acta Informatica Pragensia, 8(2), 72-87. https://doi: 10.18267/j.aip.125

McCabe, B. (2024, January 8). Top HR trends & predictions in IOT and AI for 2024. LinkedIn. https://www.linkedin.com/pulse/top-hr-trends-predictions-iot-ai-2024-bill-mccabe-une5c

Nasim Ahmed, Andre L. C. Barczak, Teo Susnjak et al. A Comprehensive Performance Analysis of Apache Hadoop and Apache Spark for Large Scale Data Sets Using. Research Square. (2020, August 17). http://dx.doi.org/10.21203/rs.3.rs-43526/v1

Nazarova G. V., Rudenko V. O. (2020). Use of digitalization tools in recruitment of enterprise personnel. Aktualni problemi upravlinnya sotsialno-ekonomichnimi sistemami : materiali VI mizhnar. nauk.-prakt. internet-konf. (m. Lutsk, December,11, 2020 r.). Lutsk, 2020. S. 246 – 248.

Plekhanov, D., Franke, H., & Netland, T. H. (2022). Digital transformation: A review and research agenda. https://doi.org/10.1016/j.emj.2022.09.007

Rêgo, B. S., Jayantilal, S., Ferreira, J. J., & Carayannis, E. G. (2022). Digital Transformation and Strategic Management: a Systematic Review of the Literature. https://doi.org/10.1007/s13132-021-00853-3

Satisfaction guaranteed: development of customer loyalty online. Coursera. (2024, May 10). https://www.coursera.org/learn/satisfaction-guaranteed-ua

Slobodian, N., Levchenko, Y., & Slobodian, V. (2022). Legal regulation of the implementation of innovative strategies at the Enterprise. Ukrainian Journal of Applied Economics and Technology, 7(3), 114–121. https://doi.org/10.36887/2415-8453-2022-3-16

Soroka, A. (2018). Personnel security providing as a function of personnel management. Socio-Economic Research Bulletin, 0(4(68)), 53–63. https://doi.org/10.33987/vsed.4(68).2018.53-63

The State of Digital Adoption 2024 (2024, May 10). WalkMe. https://www.walkme.com/the-state-of-digital-adoption-2024/

Tsymbalyuk, G. S., & Kravchuk, R. V. (2022). Remuneration as an element of material motivation of employees. Scientific Works of the Interregional Academy of Personnel Management. Economic Sciences, (2 (65)), 54–58. https://doi.org/10.32689/2523-4536/65-6