








ORIGINAL

Professional Training in the Digital Age: The Role of Management in Shaping Technological Awareness

La formación profesional en la era digital: el papel de la dirección en la concienciación tecnológica

Olena Mykhailovska¹  , Tetiana Shestakovska¹ , Oksana Adamyk² , Nataliia Filipova³ , Anastasiia Duka⁴ , Grygoriy Starchenko^{4,5} 

¹Higher Educational Institution "University of Future Transformation". Chernihiv, Ukraine.

²Loughborough Business School, Loughborough University, Loughborough, UK.

³Scientific Department, Higher Educational Institution "University of Future Transformation". Chernihiv, Ukraine.

⁴Department of Management, Higher Educational Institution "University of Future Transformation". Chernihiv, Ukraine.

⁵Academy of Labour, Social Relations and Tourism. Kyiv, Ukraine.

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Corresponding author: Olena Mykhailovska 

ABSTRACT

Introduction: a number of initiatives are currently being actively developed to create the necessary conditions for the development of the digital economy. The purpose of this article is to determine the effectiveness of management in improving human capital competence through the development of sustainable digital skills.

Method: the study used a combination of theoretical and empirical methods, including analysis, synthesis, generalization, and theoretical modeling.

Results: the study considers the role of management in the context of digital transformation of the economy, and highlights the development of personnel in the direction of digital inclusion. It is established that the manager of the digital era should integrate tools for process automation, form a personnel reserve and effectively regulate processes in human resource management. The main advantages of implementing digital solutions are determined, including an increase in the level of staff competence and the development of inclusiveness. The essential foundations of modern digital economic development are highlighted. It is established that the active use of the digital environment allows to form individual trajectories of strategic development of companies and ensure sustainable competitiveness in market conditions. The main challenges of the studied process are identified, including insufficient digital competence of managers, uneven resource provision and lack of institutional support. The importance of digital literacy and competencies for economic growth and competitiveness of companies is substantiated. It is proved that employees with digital skills are positioned not only as effective performers, but also as catalysts for the innovative development of companies.

Conclusions: the study summarizes that the strategic role of the manager in the development of human capital is becoming crucial, as it determines the success of employees in attracting digital resources to achieve the company's key business goals.

Keywords: Digital Competence; Competitiveness; Digitalization; Manager; Digital Leadership; Staff Development; Human Capital; Information Technology.

RESUMEN

Introducción: en la actualidad se están desarrollando activamente varias iniciativas para crear las condiciones

necesarias para el desarrollo de la economía digital. El objetivo del artículo es determinar la eficacia de la gestión para mejorar la competencia del capital humano mediante el desarrollo de competencias digitales sostenibles.

Método: el estudio utilizó una combinación de métodos teóricos y empíricos, incluyendo análisis, síntesis, generalización y modelización teórica.

Resultados: el estudio considera el papel de la gestión en el contexto de la transformación digital de la economía, y destaca el desarrollo del personal en la dirección de la inclusión digital. Se establece que el directivo de la era digital debe integrar herramientas para la automatización de procesos, formar una reserva de personal y regular eficazmente los procesos en la gestión de recursos humanos. Se determinan las principales ventajas de la aplicación de soluciones digitales, entre ellas el aumento del nivel de competencia del personal y el desarrollo de la inclusión. Se destacan los fundamentos esenciales del desarrollo económico digital moderno. Se establece que el uso activo del entorno digital permite formar trayectorias individuales de desarrollo estratégico de las empresas y garantizar una competitividad sostenible en condiciones de mercado. Se identifican los principales retos del proceso estudiado, como la insuficiente competencia digital de los directivos, la provisión desigual de recursos y la falta de apoyo institucional. Se corrobora la importancia de la alfabetización y las competencias digitales para el crecimiento económico y la competitividad de las empresas. Se demuestra que los empleados con competencias digitales se posicionan no sólo como trabajadores eficaces, sino también como catalizadores del desarrollo innovador de las empresas.

Conclusiones: el estudio resume que el papel estratégico del directivo en el desarrollo del capital humano está siendo crucial, ya que determina el éxito de los empleados en la captación de recursos digitales para alcanzar los objetivos clave de negocio de la empresa.

Palabras clave: Competencia Digital; Competitividad; Digitalización; Directivo; Liderazgo Digital; Desarrollo del Personal; Capital Humano; Tecnologías de la Información.

INTRODUCTION

The active development of the information and communication environment creates favorable prerequisites for the dynamics of personnel management concepts. Digitalization is currently positioned as an objective requirement for the development of the information society, and, accordingly, the digital skills of modern companies' personnel are gaining special significance. Innovative educational solutions contribute to the optimization of the communication process, economic development, and create competitive advantages.

The prerequisites for the development of digital competence in the human capital of companies include unification of approaches to information systematization, readiness to integrate new data analysis formats, high level of motivation, personal data protection and cybersecurity, and the introduction of moral and material incentives. An effective human resource is currently positioned as one of the key resources of the state, a factor in increasing its sustainability and competitiveness, and an incentive for national stability and long-term security.

The high demands on a modern specialist are also due to the phenomena of socio-economic transformation, but the fact that an appropriate level of professional training and the formation of modern competencies remains unchanged. Currently, the greatest emphasis is placed on digital transformation within companies. The digital competence of staff often determines the level of success and flexibility of a business.⁽¹⁾ Modern managers should promote employee engagement and motivation to develop digital skills. This actualizes the issues of this study, justified by the need to improve management processes for the effective upgrade of human capital competencies of companies.

The aim of the article is to analyze the potential of management to improve human capital competence by developing sustainable digital skills.

Digital competence of human capital is essential for the successful development of companies in the digital age. It helps to increase the efficiency of management, guarantees performance and ensures the formation of sustainable competitive advantages.

In general, according to Zhou et al.⁽²⁾, Chytiri⁽³⁾ and Gadzali et al.⁽⁴⁾, digital competence encompasses an understanding of the use of modern technologies that can improve the production process in a rapidly changing information and technological space.

The issue under study has been developed in the publications of a number of scholars.^(5,6,7,8,9) The authors examine the potential of management from the perspective of developing creativity, verbal and communication skills, critical thinking, and increasing staff engagement, and explore the possibilities of forming personalized strategic development trajectories using big data analysis and artificial intelligence. Scientists have thoroughly analyzed the necessary tools, benefits, and related risks of the process, and substantiated its priority in the

crisis conditions of social development.

Some authors focus on the issues of digital leadership. In particular, Buhagiar and Anand⁽¹⁰⁾ consider leadership issues in relation to the challenges of digital technologies, while Khan et al.⁽¹¹⁾ identify the main contexts for the development of leadership: visualization, interactivity, and project orientation.

Khang et al.⁽¹²⁾ and Zhou et al.⁽²⁾ define the role of the manager as a leader in the development and implementation of an innovative model of a digital management system, including personnel management. Hrosul et al.⁽¹³⁾ emphasize the importance of digital experience and the involvement of managers in joint work to create and develop an innovative digital environment within the company.

The need to constantly update knowledge and skills in the field of digital technologies for the effective professional realization of human capital in the context of rapid technological progress is now becoming more relevant. However, despite this, management issues in the context of improving the digital competence of company personnel continue to remain open and require further research and development.

METHOD

An observational, descriptive study was carried on. The research materials were based on primary sources of information: recent publications indexed in leading scientific databases Web of Science and Scopus, as well as statistics from official sources. The research materials were industry publications, statistics, and scientific materials, mainly for the period 2020-2025. The keywords “digital competence, competitiveness, digitalization, manager, digital leadership, staff development, human capital, information technology” were used to search for information in scientometric databases.

The criteria for exclusion and inclusion of scientific works and publications were spatial and temporal indicators and the level of reliability of information. Taking into account practical realities, the size of the sample of sources was considered appropriate, ensuring sufficient scientific and statistical power.

The first stage of the work consisted of a theoretical analysis of the industry-specific scientific literature. This made it possible to identify the basic principles of human capital management in the era of digital transformation. The second stage was generalization and systematization, which allowed us to form a holistic picture of management in the field of study and to formulate the concepts of digital leadership.

The study used a combination of theoretical and empirical methods, including analysis, synthesis, generalization, and theoretical modeling. Finally, practical recommendations were developed to integrate management approaches into the human resource management system, which will increase the digital competence of companies' human capital and ensure sustainable economic growth.

The results and conclusions of the study were formed using the method of deduction and scientific abstraction. This allowed us to mentally depart from standards and consider the phenomenon under study in the context of the modern environment, which requires adaptability.

The study was conducted in accordance with the ethical standards of research in this category. This study is limited by the complexity and resource intensity of the experimental verification of the theoretical results obtained.

RESULTS

The current management environment is characterized by a number of challenges to the formation and development of human resources, including a shortage of qualified highly specialized personnel, lack of structured qualification requirements, increased competition, inefficiency of the concept of retraining, interregional disparities in innovation and remuneration, etc. Today, an important prerequisite for the effective development of human capital is the transfer of innovative technologies, which expands the potential for staff development, provides mobility and access to targeted project financing.

Targeted digital learning development programs implemented by competent personnel synergize motivational and value aspects, cognitive, reflective, and subjective activities. In view of the above, the implementation of programs for the development of digital competence of human resources is seen as the basis for the long-term economic stability of companies. In this case, the development of critical thinking and media competence, as well as the preservation of one's own identity within the framework of social belonging, are recognized as effective innovative tools.⁽¹⁴⁾

Modern Human Resources management (further - HR) systems should ensure the development of competencies that will help identify highly qualified professionals who are able to learn throughout their lives, use innovative opportunities and adapt to the dynamics of social demands. It is advisable to highlight the main trends in the development of human resources in the digital context:

- decision-making on human resource management based on big data and artificial intelligence;
- integration of sustainable development principles into human resources management;
- psychological support for employees;
- integration of digital technologies;

- development of human resource management systems HRM;
- maintaining a favorable corporate culture;
- diversification of investment sources.

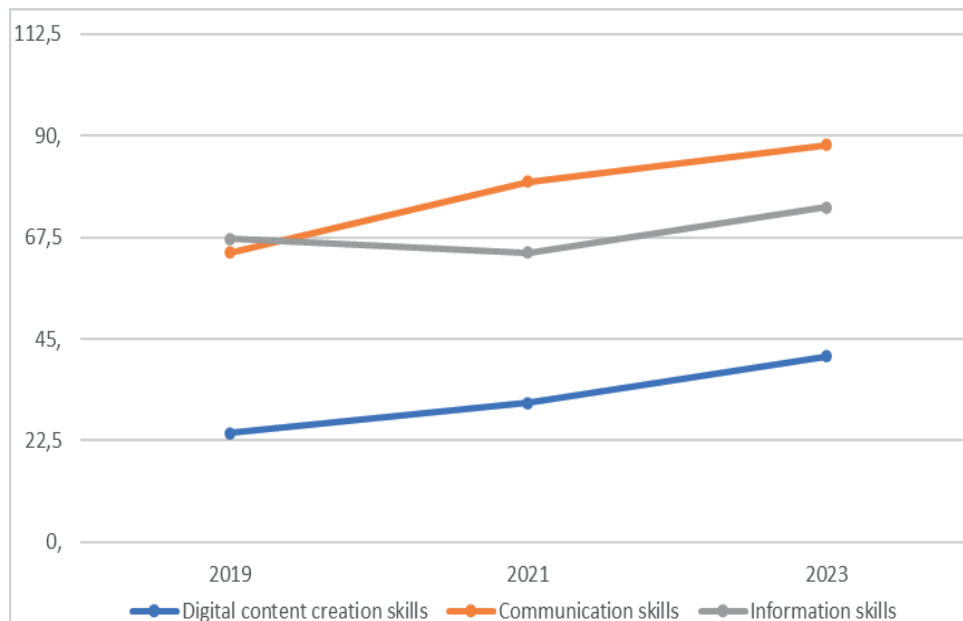
At the same time, the digital competence of a manager is positioned as a synergy of experience, motivation, knowledge, skills and value attitude to information activities, which forms the basis for effective work with information. A modern manager must have the skills to effectively use the potential of digital tools, including electronic document management, system administration services, public activity services, and social networks.

The most effective digital solutions in human capital management of modern companies are presented in table 1.

Area	Specificity	Example
Recruiting	Implementation of digital technologies for recruiting; automated resume scoring; integration of chatbots	LinkedIn
Training and professional development	Online programs for staff training, periodic training and skills upgrading	Edx.org, Udacity.com, Coursera platforms
Human capital management systems	Stimulating investments in human capital; corporate culture; digital leadership	HRM(HumanResourcesManagement)

Digital optimization of human capital of modern companies should take place in the context of integration of modern digital technologies and include the following contexts:

- upgrade of priorities and values in the direction of innovation, adaptability, efficiency, flexibility, productive cooperation, and openness in the company's activities;
- formation of target attitudes and beliefs necessary for the effective integration of digital tools in work and everyday life: adaptability and readiness for change, ability to find creative solutions, openness to new technologies of communication interaction, etc.;
- adherence to ethical norms and standards of behavior in the digital environment: introduction of the concept of ethical use of information and protection of personal data, guarantees of confidentiality, copyright protection, ethical use of artificial intelligence and a number of other aspects of digital ethics;
- establishing unified rules and procedures related to the use of digital tools: corporate information security rules, social media strategy, guarantees of personal information protection, etc.;
- transfer of new skills through continuous training, experience exchange, digital leadership, and development of digital culture as part of the company's organizational culture.



Source: Ministry of Digital Transformation⁽¹⁵⁾

Figure 1. Level of digital skills among the working population, %

According to the results of the study by the Ministry of Digital Transformation of Ukraine (2023), there is a significant dynamic of digital skills among the working population for the period of 2019-2023 (figure 1).

The key functions of digital tools are: increasing the speed of information processing; the ability to analyze large amounts of information and its statistical processing through artificial neural networks; flexible approach and adaptability; development of a teamwork system; increasing the efficiency of information and economic interaction both within companies and in the context of external relations.

Optimization of HR management in a modern company involves improving the existing system of corporate interaction, strengthening integration processes, and adequate risk assessment. The key challenges are the lack of strategic goals, low staff motivation, imperfect organizational structure of the company, insufficient resources, low awareness of digital trends, lack of managers with high level of digital competencies, and poorly developed IT infrastructure.

It is necessary to emphasize the importance of integrating innovative and information risk management approaches. A modern cybersecurity system should include the active use of digital tools for monitoring and analyzing risks, as well as preventive risk management. Information risk management activities should become a component of the management decision-making process, i.e., be positioned as an element of the management system integrated into each management process.

Among the main areas of digitalization of human capital of companies in the current conditions of socio-economic development, it is necessary to highlight:

1. Implementation of a digital model of the company's strategic development, which involves the introduction of a system of performance indicators.
2. The potential of digital information and communication tools that are integrated into production and management processes for effective intra-organizational interaction and competitiveness.
3. Digital human capital management systems, which include accumulation and analytical processing of information, implementation of corporate business applications and services, and increased staff mobility.

An integrated approach to human capital management involves the implementation of strategic digital communication solutions, which provides a number of benefits in a long-term context. These include: minimization of HR costs; automation of HR processes and successful HR management; determination of the need for targeted investment in terms of self-development; increasing the overall level of competitiveness of the enterprise; continuous self-improvement of employees; digitalization of management processes.

Obviously, digital optimization of human capital management allows automating routine processes of collecting, accumulating, processing and transmitting information and reporting. In addition, digitalization tools can improve the accuracy and speed of communication operations and facilitate corporate interaction processes.

The effectiveness of personnel management in modern companies is determined not only by the efficient implementation of knowledge, skills, abilities and competencies of employees, but also by productivity in the context of forming innovative development directions. Since the expanded capabilities of the staff contribute to the overall efficiency of the company, investments in human resources, in particular in the context of digital skills, are seen as effective long-term development strategies for modern companies.

DISCUSSION

Fenech et al.⁽¹⁶⁾ and Krysovatty et al.⁽¹⁷⁾ study the use of management capabilities to form sustainable human capital of modern companies and increase their competitiveness. According to the authors, the effectiveness of human resources depends on the complexity of the approach, implementation methods, motivation, and resource provision. The study of the possibilities of forming competitive advantages with the help of competent human capital is seen as increasingly promising, as the younger generation is endowed with the ability to accumulate and evaluate social experience and form ideals.

The main concepts of the formation and development of digital competencies of a modern employee in crisis conditions are developed in the studies of Nehrey et al.,⁽¹⁸⁾ Nicolás-Agustín et al.,⁽¹⁹⁾ Stender et al.⁽²⁰⁾ The authors analyze the possibility of digitalizing a significant share of production and management processes, the main purpose of which is to protect and optimize the use of information data. According to the authors, insufficient training of personnel for their professional implementation are the main factors limiting the realization of their potential. In view of this, considerable attention should be paid to the development of human potential, continuous improvement of its qualifications in order to meet the requirements of the digital society.

Yermachenko et al.,⁽²¹⁾ Zayed et al.⁽²²⁾ identify specific prerequisites for effective work in the digital environment, including the formation of sustainable digital skills among staff. The researchers propose to optimize the institutional framework that will help expand the functionality of educational systems in the direction of digital inclusion.

In continuation, a number of scholars^(23,23,24,25) see the formation of effective bilateral cooperation between the education sector and the economic field in the context of a common strategy for training quality human resources as a necessary requirement. The position of scientists deserves special attention, while it should be detailed and expanded in the direction of forming practical algorithms for improving the digital competencies of staff to create a sustainable society.

Despite the significant scientific developments, the problem of rethinking the functionality of human resources in the digital context requires extended scientific research. There is a need for an additional assessment of the qualitative indicators of human resource management in the context of digital changes, analysis of the relevance of existing standards, qualification requirements to ensure that human resources meet the requirements of the present.

CONCLUSIONS

The aim of the study was to determine the effectiveness of management in improving the competence of human capital through the development of sustainable digital skills. The main advantages of management digitalization were identified: transparency of management; time optimization; task automation; data accessibility; minimization of human error risk through document centralization; elimination of communication bottlenecks; improved cybersecurity; and cost reduction. The digital competence of personnel often determines the level of success and flexibility of a business. Active use of the digital environment allows companies to form individual strategic development trajectories and ensure sustainable competitiveness in the market. Prospects for further research lie in the development of human resources in the context of continuous self-improvement and lifelong learning.

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AUTHORSHIP CONTRIBUTION

Conceptualization: Olena Mykhailovska, Tetiana Shestakovska.

Data curation: Oksana Adamyk.

Formal analysis: Oksana Adamyk.

Research: Nataliia Filipova, Anastasiia Duka.

Methodology: Anastasiia Duka.

Project management: Nataliia Filipova.

Resources: Oksana Adamyk, Nataliia Filipova, Grygoriy Starchenko.

Software: Anastasiia Duka.

Supervision: Grygoriy Starchenko.

Validation: Grygoriy Starchenko.

Display: Grygoriy Starchenko.

Drafting - original draft: Olena Mykhailovska, Tetiana Shestakovska.

Writing - proofreading and editing: Olena Mykhailovska, Tetiana Shestakovska.