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Ternopil Ivan Puluj National Technical University

Faculty of Computer Information System and Software Engineering
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ASSIGNMENT
for QUALIFYING PAPER

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5. List of graphic material (with exact number of required drawings, slides)
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ANNOTATION

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Keywords: change management system, change management system algorithm, educational process, information system, higher education institution, digital management, IT security.

The qualification work is devoted to the problem of introducing information systems to support the management of changes in the educational process of a higher education institution.

The theoretical and methodological foundations of change management in the context of digitalization of the educational process have been investigated. The main classical approaches to the theory of change are revealed. Models of K. Levin, L. Greiner, J. Kotter and I. Adizes are adapted to the needs of the university management system. The essence and principles of digital management are defined, a comparative characteristic of the traditional and digitalized education system is given. The concept of digital change management has been developed, based on the principles of flexibility to the challenges and needs of society, inclusiveness, democracy, transparency and security.

In the practical part of the qualification work, the information system of change management in a higher educational institution is developed, its three-level architecture, logical matrix of the management system, functioning algorithms, information and technological support are described, and the results of approbation are presented.

The issues of labor protection and psychophysiological safety of IT employees in the context of dynamic changes and social challenges are considered separately.

The results of the qualification research are of theoretical and practical significance for modern education managers, scientific and pedagogical teams and developers of educational information systems. Since they contribute to the formation of a modern digital culture of the university's educational process management system.

The object of the research is the system of management of changes in the educational process of a higher education institution.

The subject is information and technological support of the change management system in the context of digitalization of the educational process of the university.

TABLE OF CONTENTS

INTRODUCTION……...7

1. FUNDAMENTALS OF CHANGE MANAGEMENT IN THE CONTEXT OF DIGITALIZATION OF HIGHER EDUCATION……9
    - 1.1. Theory of change management in organizational processes……...9
    - 1.2. The concept and essence of change management in the educational process……...13
    - 1.3. Digitalization of the educational process as the basis for its modernization……17
    - 1.4. Experience of digital transformations in the management system of an educational institution……..19
    - 1.5. Conclusion to the first section……...22
2. IMPLEMENTATION AND SUPPORT OF INFORMATION TECHNOLOGY IN THE MANAGEMENT SYSTEM……..23
    - 2.1. The concept of digital management of higher education institution23
    - 2.2. Principles of digitalization of the system of management of changes in the educational process of the university……..27
    - 2.3. The main directions of digitalization of the educational process of the university……..30
    - 2.4. Management of the process of digitalization of the educational process in the context of changes……..32
    - 2.5. Conclusion to the second section…….....33
3. DEVELOPMENT OF THE IMPLEMENTATION AND INFORMATION SYSTEM OF CHANGE MANAGEMENT……34
    - 3.1. Setting the task and outlining the requirements for the model……34
    - 3.2. Architecture and structure of the change management information system……...37

3.3. Algorithm for the functioning of the change management information system……41
3.4. Information and technical support of the change management system of higher education institution……..44
3.5. Testing and evaluation of the effectiveness of the change management system……46
3.6. Conclusions to the third section……...48
4. OCCUPATIONAL HEALTH AND SAFETY OF WORKERS IN EMERGENCY SITUATIONS IN CHANGING CONDITIONS……...50
4.1. Analysis of working conditions of IT-employees…….50
4.2. The impact of computer equipment on human health……...54
4.3. Organization of safety when working with IT equipment……56
4.4. Staff actions in the event of emergencies in the it sphere…….58
4.5. Conclusions to the fourth section……..59
CONCLUSIONS……...60
REFERENCES……..63
ANNEXES……69

INTRODUCTION

Relevance of the topic. In today's changing conditions of globalization and digital transformation, education is undergoing constant changes, which requires constant adaptation and modernization of management processes to the digitalization of social processes. The effectiveness of the university's functioning directly depends on the ability of the head to implement and support changes, to ensure flexibility and transparency of decision-making.

Traditional management models often do not correspond to the digitalization of society, as they do not involve the use of digital tools to support classical functions. In this context, the problem of developing an information system for managing changes in the educational process of a higher education institution, which supports the integrity, transparency and flexibility of managerial decisions, is urgent.

The problem of supporting and implementing changes is of particular importance during the modernization of universities and their integration into a single European space.

Purpose and objectives of the study. The purpose of the qualification work is reflected in the development of a conceptual model of digital support of the change management system in the educational process of a higher education institution.

To achieve this goal, the following research tasks are defined:

1) to analyze theoretical approaches to the concept and models of change management in the educational process;

2) to determine the role of digitalization as a key aspect of the modernization of the educational process of the university;

3) to determine the principles and main vectors of digital transformation of the change management system in a higher education institution;

4) to consider the structural and functional model of the information system for supporting digital change management;

5) to develop an algorithm for the information system of change management and its architecture, to determine information and technical support;

6) to test the effectiveness of the system implementation and assess its effectiveness in influencing the quality of the educational process.

Object of research: system of management of changes in the educational process of a higher education institution.

Subject of research: information and technological support of the system of management of changes in the educational process of a higher education institution.

The scientific novelty of the qualification work lies in the development of a holistic model of the information system for managing changes in the educational process of a higher education institution. For the first time, a logical matrix of interaction of a digital system and its functions that ensure the integration of classical management functions has been proposed. The use of a three-tier architecture (UI – BLL – DAL) to provide effective digital support for changes and management decision-making has been substantiated.

The practical significance of the results obtained lies in the possibility of introducing an information system for managing changes in the educational process in universities. Its use provides automation of management functions. The proposed information system can be adapted for use in any type of educational institution in order to modernize it and ensure the sustainable development of the organization.

Approbation of the results of the master's thesis. The main results of the research were discussed at the IV International Conference of Young Scientists and Applicants for Higher Education "Philosophical Dimensions of Technology", November 26, 2025, TNTU, Ternopil. The topic of the report is "Digital transformation of the management system of higher education in the context of humanization of society".

1 FUNDAMENTALS OF CHANGE MANAGEMENT IN THE CONTEXT OF DIGITALIZATION OF HIGHER EDUCATION

1.1 Theory of change management in organizational processes

In conditions of uncertainty and rapid globalization of society, theorists and practitioners are paying increasing attention to the theory of introducing and supporting changes in the management system of organizations of any type. Since ancient times, philosophers have sought to understand the essence of changes and determine their impact on human life. The concept of "change" can be interpreted in different ways. For example, as a process of changing state or the continuous progress of any system.

The concept of change in management theory has various explanations, in particular, as:

- the general transition of something or phase to another state [28];
- position of a person and his perception of understanding, opinion of the individual for further giving any phenomenon a new meaning [4];
- development from the current to the desired state [15];
- endless process, restructuring and adaptation [12].

However, we are most impressed by changes – these are new stages in progressive development or regression that change the structure and content of a certain object of management, which is generally reflected in the general qualities of a certain state or process of functioning of the object [44]. This concept can reflect a dialectical connection with development, evolution, transformation, leap, revolution, etc.

The problem of change management is sufficiently substantiated and has been studied by many scientists and top world organizations. Scientists consider the concept of change management in different ways, according to the needs of application:

- the science-informed practice of managing planned organisational change [34];

- a systematic and structured process of developing and implementing strategies and interventions for organizations transitioning from a current state to a desired state [40];

- strategy that helps employees accept new organisational developments [29];

- the process by which an organisation gets to its future state, its vision [22].

Change management theory began its development with classical models of change implementation in the 1950s. However, its emergence was preceded by scientific management theory, in particular the scientific achievements of F. Taylor, who pioneered the approach to rationalization of labour and organization [22].

In addition, the theory of change has developed in the context of scholars' close attention to behavioral social approaches. Its roots we can find in psychology, systems theory, and group dynamics research.

For example, K. Lewin explored the concept of «force-field analysis», which became the basis for a psychological approach to understanding change processes and subsequently influenced modern change management models. Comparing an organization to ice, he described the process of change through three consecutive stages [44]:

- unfreezing – overcoming resistance;
- change – introducing models of structures;
- refreezing – consolidating practices for system stability.

The next stage in the development of the theory of change was Greiner's Model of Organizational Growth, which covers several stages of development: creativity, direction, delegation, coordination, cooperation and unification, each of which ends with a certain "growth crisis" (Fig. 1.1.).

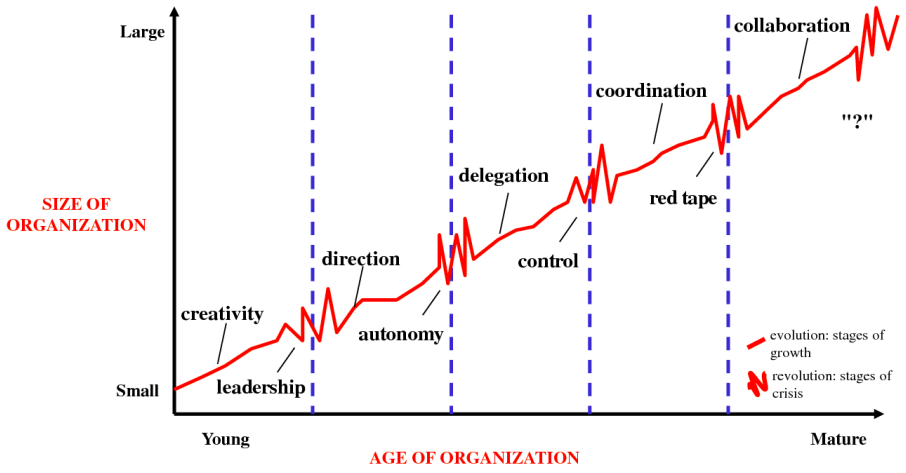

Figure1.1 – Greiner's Model of Organizational Growth [14]

In this context, it is worth integrating the concept of «development» into «evolution» as a long period of harmonious growth of the organization with the minimization of risks and threats. The concept of «crisis» should be equated with revolutionary aspects defined by a period of organizational upheavals, upheavals and transformations of values, vision of corporate culture [14].

Further fundamental research and practices of implementing changes are associated with the scientific achievement of J. Kotter. His model of change involves a blanket algorithm of actions. Kotter's 8-Step Change Model involves a long-term process of implementing change, emphasizing the importance of creating a sense of urgency; the presence of a leadership coalition; collective strategic vision; propaganda of new ideas; elimination of risks and threats; generation of quick solutions; consolidation of the results of innovation activity; fundamental support for changes in organizational culture. In addition, the author emphasizes that trying to skip any stage will create the illusion of changes and will not give the desired result [20].

The above-mentioned practices of introducing innovations create a triad of basic models of change, which laid the foundation for the further development of the theory and practice of change management.

In addition, scientists pay attention to the evolution of managerial approaches, emphasizing that organizational development is a dynamic process that is closely related to the life cycle of an organization. In this context, a special place is occupied by the theory of I. Adizes, which reveals the patterns of formation, growth, stabilization and decline of organizations, as well as identifies typical managerial challenges inherent in each stage of their development (Fig.1.2) [2].

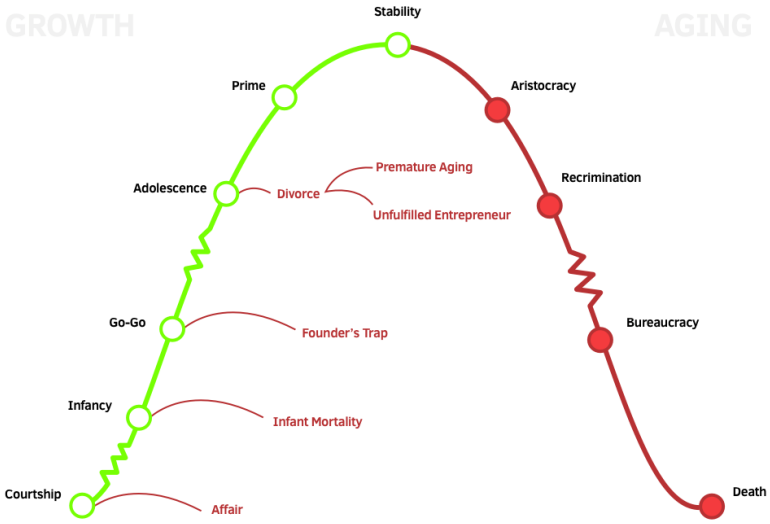

Figure1.2. Corporate Lyfe circle Organization [2]

It is worth noting that each subsequent stage of the organization's life requires new management methods and prefers a situational approach, because each subsequent change requires flexible adaptive solutions [46].

Change management is defined as a continuous purposeful process of all organizational units using the latest information and communication technologies and management models, in order to promote rapid adaptation and transformation in a dynamic environment [34].

The theoretical basis of change management in the context of business operations is based on the classification of changes, management functions and principles, mechanisms for motivating teams and overcoming resistance, as well as technologies for implementing and supporting innovations in higher education

institutions. Obviously, the effectiveness of any management approach increases in an information-rich environment when appropriate change management models are used.

Since the end of the twentieth century, organizational change management has been gradually undergoing digital transformation. In this context, the development of information technologies has led to the emergence of new business methodologies in the face of changes: Business Process Reengineering, Lean Management, Agile, etc [43]. They focus on quick response, minimizing team resistance, and digital support for business processes.

Summarizing the above, it can be argued that modern approaches to change management were formed on a combination of classical models of transformation processes and concepts of organizational dynamics. They can provide a methodological basis for understanding the nature of changes, their stages and success factors. At the same time, global variability, digitalization and complexity of socio-economic systems necessitate the search for more flexible and humanistically oriented approaches that can ensure sustainable results of transformations.

1.2 The concept and essence of change management in the educational process

It is undeniable that the field of education is currently one of the most conserved organizations of society. Based on the experience that has been formed over thousands of years, education remains resistant to change, and the teams of higher education institutions show a high level of resistance to the introduction of innovations. The task of a modern university involves the education and formation of the future human generation ready for the challenges of our time, highly competent and ready for life in a multicultural environment. However, preaching the ideas of a digitalized society and the evolutionary development of the individual, universities continue to adhere to classical management standards,

traditional methods and forms of interaction with students. Technocracy, bureaucracy and hierarchical approach are the basic basis for the functioning of universities.

In such conditions, an obvious paradox arises: the university must train agents of change, while remaining an institution that does not accept changes. It is this contradiction that turns out to be a key barrier to the development of higher education and one of the main reasons for the lag of university practices from the dynamics of social processes. A way out of this vicious circle is possible only if we move from an inertial model of functioning to a model of purposeful and systematic change management [24].

We are convinced that changes in the educational process of a higher education institution are any transformations of the content or characteristics of the educational process in order to improve its quality, improvement under the influence of legislative managerial actions or initiative of subjects. They can occur at any level of the organization's functioning under the influence of the external or internal environment. They can be classified into four levels: philosophical – to search for analogies, to identify contradictions between different philosophical concepts; physical – to classify them according to various criteria; epistemological – to be analyzed in the process of cognition; psychological – to react and adapt or reject them. The above factors demonstrate the multidisciplinarity and multi-vector understanding of this concept [29].

Changes in the educational process are reflected in the following objects: annual update of educational and work programs of the university; work plans; increased attention to new forms of education, harmonious integration of the content of academic disciplines (binary, multidisciplinary, case, STEM practices); popularization of new methods of dialogical interaction in the educational process; polarizances of the field of advanced training of scientific and pedagogical teams; institutional offline training of teachers; transformation of organizational business management concepts into the practice of higher education institution

management (change support practices Agile, Kanban, Scrum, Kaiser, ADKAR, RAEI, etc.) [45].

The innovative vector of development of modern education is carried out through the introduction of changes in the educational process of each educational institution, which requires active development in the theoretical and practical aspects of such a direction as change management.

We consider the management of changes in the educational process of a general secondary education institution from the point of view of purposeful and coordinated work of all subjects of the educational process based on the use of the latest technologies and management models in order to find quick ways to adapt to changes in the dynamic external environment.

The practice of higher education institution functioning, from our point of view, proves the need for the following principles for managing changes in the educational process. mmotivational behaviour is important for the manager to highlight the benefits that teams of scientific and pedagogical workers will receive from innovations:

- tolerant management expresses positive attitude towards each participant in the educational process, regardless of his participation in changes;
- collective consent can be like mandatory open involvement of stable leaders in change;
- the prevalence of perspective over rationality supports changes that are aimed at the student have a short-term effect, but with regular implementation can lead to the strategic development of higher education institution;
- fairness in assessing the contribution of each is important for the manager to recognize the personal contribution of each transformation in the educational process;
- credit of trust to the initiators means that the initiators of changes are responsible for the decisions made on changes.

The process of implementing changes in higher education institutions can be a long-term process and require additional costs, in particular intellectual

resources. It is worth paying attention to the use of a change management algorithm, which reflects the process of structuring and sequence of actions by the head of the university. Each stage is implemented through a certain number of appropriate steps. The sequence of steps and their content can change in accordance with the purpose of management, the complexity of changes, the volume of possible risks, the level of perception and coordination of them in the team.

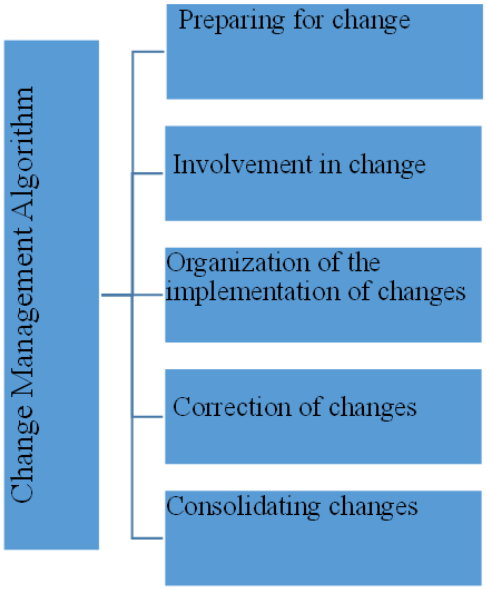

Figure 1.3 – Algorithm for Change Management in Higher Education Institution [43]

Therefore, the practice of change management in order to optimize the educational processes of the university is the basis for their further strategic development. Transformation of the management system, rethinking the importance of the essence of a person in the educational process, the use of motivational aspects will contribute to satisfying the educational needs of the younger generation.

1.3 Digitalization of the educational process as the basis for its modernization

Digitalization of education in today's globalized society is a priority for practitioners in the field of management of educational institutions. After all, information technologies make it possible to increase the efficiency of the educational process, optimize resource costs and ensure the full integration of the student into the educational environment.

Digitalization of the educational process involves the systematic introduction of digital technologies into all components of the organization's functioning. The primary priority of digitalization is to increase the level of adaptability to change and flexible management decision-making [47].

In modern conditions of transformations and uncertainty, digitalization is a key aspect of the evolutionary modernization of the educational process of the university, as it transforms the content, forms and methods of teaching and adapts the management system of the educational institution to the needs and demands of society (Table 1.1).

Table 1.1 – The essence of digital transformation of education

№	Classical education system	Digitalized education system
1.	Collective, traditional for all	Personalized and adaptable to each student's needs
2.	Off-line training	Distance learning or in a mixed format
3.	Closed system	Reflects the transparency of managerial decision-making
4.	Linear access to information	Nonlinear access to information

The use of information technologies will allow you to transfer the educational process to a virtual environment and make it convenient and accessible

to each participant in the educational process. Gadgets, personal computers, tablets, the Internet are not only leisure tools, but also tools for sustainable personal development.

At the same time, the digital transformation of education is associated with negative aspects and challenges in the educational environment, which can cause a unique school to the scientific community. It forms new approaches to the management of educational institutions, requires the development of new competencies among scientific and pedagogical teams, etc.

Thus, we can identify threats in the context of digitalization:

- digital inequality – not all students can have high-quality access to the Internet, a modern laptop or smartphone, although formally everyone is in the same conditions;
- total dependence on technology and the Internet – lack of proper mobile coverage, problems with electricity or a breakdown of the gadget leads to a stop in the educational process;
- emotional and physical trauma – prolonged exposure to monitoring or screen exposure leads to health problems and emotional exhaustion;
- lack of motivation – online learning can reduce the level of self-motivation of a student and cause a feeling of alienation from the educational process;
- problems with academic integrity – the online educational environment creates an opportunity for manipulation, copying and unreliability of the results of the student's work;
- protection of personal information – each online platform used by students in the educational process stores large assets of personal information that can be lost during a cyberattack.

Despite the obvious benefits, digitalization has a number of risks: health, equality, motivation, access, safety. Therefore, digital technologies, in the context of modernization of the educational process, should complement, and not

completely replace the live interaction between participants in the educational process.

1.4 Experience of digital transformations in the management system of an educational institution

The digitalization of education opens up new opportunities for the effective development of society and the involvement of the community in the education of a new generation that is ready to live and interact in a multicultural environment. The transformation of the management system reflects the development of a new philosophy based on such principles as: flexibility, adaptability, openness to change.

It covers all aspects of the functioning of the higher education institution, starting from the daily, routine actions of the administrator to planning the strategic development of the university.

It should be noted that modern digital technologies free up significant resource potential for improving the quality of education and its personalization. In particular, European practice shows the expediency of using digital tools in higher education institutions.

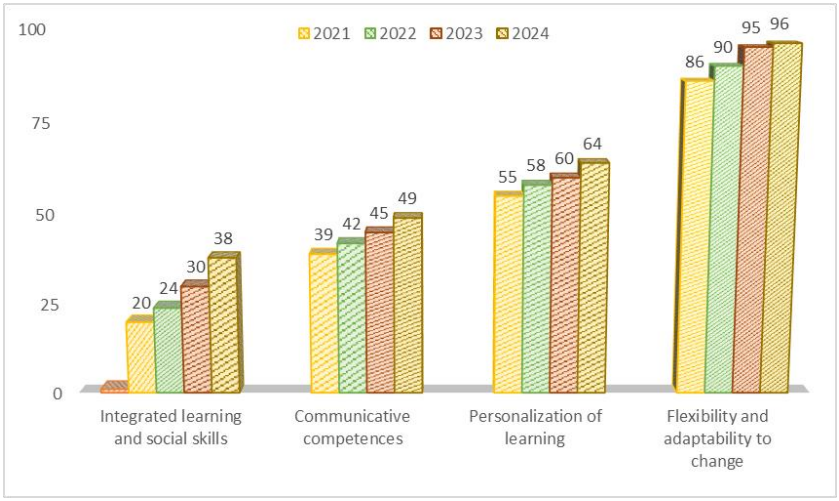

Figure 1.4 – Results of the use of ICT in EU universities, 2021-2024, % efficiency [10]

As shown in Fig.1.4, in top European universities, much attention of managers and administrators is paid to the problem of adaptability, flexibility and personalization of student learning as key areas of digitalization of the educational process. This allows you to achieve general satisfaction with communication and relationships in the educational field, ensures the development of positive social identity and intergroup tolerance, and in the context of personal development, satisfies the need for self-actualization, increases motivation and engagement (European Agency for Special Needs and Inclusive Education) [9].

Modern solutions in the context of change management and digitalization include the use of online platforms and digital libraries in the educational processes of European universities, personalization of education, active involvement of learning management systems (LMS), interactive technologies and video conferencing systems, integration of software for electronic document management. In particular, special attention is paid to the impact of artificial intelligence in the quality of the organization's functioning, the possibility of expanding the use of cloud technologies, deepening the intercultural aspects of document and information communications, and strengthening cybersecurity. Scientists also pay attention to the settlement of ethical issues, disinformation and academic integrity [45].

Based on the Organisation for Economic Cooperation and Development (OECD) report, we can consider real examples of the digital transformation of education in many countries [26;27]:

- partial digitalization of student assessment using a federated online platform (Austria);
- implementation of a program that provides digital technologies for everyone (Denmark);
- mandatory annual training of scientific and pedagogical staff with deepening of computer literacy, Strategy for 2021-2035 + Digital Agenda 2030 (Estonia);

- the government's great emphasis on providing all participants in the educational process with digital means of communication, the transition to a full digital transformation of the educational process (Finland);

- national course of digital transformation of the educational process, the presence of highly developed LMS/services (Edunet), the total involvement of digital technologies in the management system and limiting the influence of the human factor (South Korea);

- Digitalisation Strategy 2021, which enabled large-scale personalisation of learning (Netherlands);

- partial national strategy for the use of the state platform MexicoX (Mexico).

Most countries have effective digital infrastructure in the education sector. However, it should be noted that interoperability is still quite weak and depends on the region and the economic situation in the country. Governments of many countries focus on the problem of access of every citizen to the digital environment of an educational institution.

1.5 Conclusion to the first section

Change management in higher education institution in the context of digitalization of the educational process is the primary task of modern managers. It guarantees a flexible movement of educational institutions from traditional forms of management, meeting the academic needs of students to innovative approaches that harmoniously combine adaptability and digitalization.

A brief theoretical analysis emphasizes that the effective implementation of organizational changes occurs on the basis of a triad of management models (K. Levin, J. Cotter, L. Greiner). In the context of the introduction of changes, the model of the organizational cycle of the life of the enterprise by I. Adizes acquires special importance, which requires specific actions at each stage of development.

Digitalization, which is the basis for the modernization of the educational process, is focused primarily on flexibility, adaptability of the university management system and sending attention to everyone involved in the educational process.

Changes in the educational process are multi-vector: from philosophical concepts of transformations and transformations to practical actions aimed at improving educational programs and management systems in the higher education institution.

Digitalization of education is the basis for the modernization of managerial and pedagogical processes, as it allows you to optimize communication, automate routine operations and personalize learning. However, the total digitalization of the educational process leads to a number of risks for its effective functioning.

International experience, in particular the practices of the EU countries, South Korea, Estonia, Finland and Mexico (according to OECD, 2023), shows that successful digital transformation is possible only if there is a national strategy, proper digital infrastructure, the development of staff competencies and inclusion policies.

The harmonious combination of effective change management models and the effective use of digital technologies in the higer rducation institution management system leads to the sustainable development of the university.

2 IMPLEMENTATION AND SUPPORT OF INFORMATION TECHNOLOGY IN THE MANAGEMENT SYSTEM

2.1 The concept of digital management of higher education institution

In December 2006, the European Union noted that digital competence is one of the eight key skills in society, which is also confirmed in the Recommendations of the European Parliament and of the Council of 18 December 2006 (2006/962/EU) [11]. This document increases the attention of scientists and managers to the importance of developing the digital environment for the professional development of the individual in the XXI century.

This competence permeates all spheres of society: law, economics, medicine, and in particular education. The sphere of governance, as the basis for the development of the state, needs immediate digitalization, which will contribute to its integration into society, ensuring transparency and openness of information.

The introduction of digital technologies that can provide adequate support for the main areas of managerial, educational and scientific activities of universities is currently carried out by connecting to Microsoft 365 and Google Workspace for Education cloud services [10]. However, their capabilities are only partially used, which may limit the effectiveness of the digital transformation of the educational process and the management system of the educational institution as a whole.

In particular, in conditions of uncertainty, the flow of dynamic changes and the rapid growth of user needs, there is a need to rethink the essence of these approaches to the integration of these services, to increase the level of digital literacy of managers and scientific and pedagogical teams. In this context, the attention of society to the creation of a single universal digital ecosystem for the development of the university is growing.

Digitalization of the educational process provides support for hybrid forms of learning, ensures the development of the student's individual educational

trajectory, provides transparency to the management system and authenticity of research [47].

Researches show us that the system and technical support of modern universities is characterized by technological lag and needs to be urgently addressed. In particular, the problems are associated with the improper implementation of innovative telecommunication systems and data transmission networks with limited bandwidth and poor quality of communication. It is worth noting that the volume of services provided to participants in the educational process remains insignificant. Limiting the resource capabilities of servers reduces the efficiency of information interaction [10].

The information and network infrastructure of modern higher education institutions needs comprehensive modernization for the strategic development of universities in accordance with the fundamental principles of change management.

Recent research from PROCURRI confirms the fact that the most common operating environment in many organizations of the world is still Windows 7. This fact limits integration into modern cloud services and up-to-date computer networks. The organizers of the monitoring studies indicated that the updated software to Windows 10 and Windows 11 needs improvement (Table 2.1) [32].

Table 2.1 – Percentage Share of Modern Operating Systems Use in Organizations in 2025 [40]

№	Operating system	Market share (%)
1.	Windows 11	43,22%
2.	Windows 10	53,19%
3.	Windows 7	22, 48%

The results show that the low level of use of modern software hinders the digitalization of management processes and the adoption and support of innovative management IT solutions in the face of change.

The material and technical support of the structural divisions of universities remains at a low level: there is a lack of modern office digital equipment, corporate work tools, cloud services, electronic document management systems, in most cases only corporate mail is used. The lack of an iterative digital ecosystem slows down the process of implementation and support for changes in universities, and the lack of proper information creates resistance among scientific and pedagogical teams to innovations, which reduces the transparency of the management system.

As for educational and scientific activities, distance and hybrid learning technologies currently do not provide an adequate level of quality in the provision of educational services. For example, at the University of Educational Management (Ukraine), the capabilities of the learning management system (LMS), in particular Google Classroom, Moodle and other platforms that meet international e-learning standards, are unfortunately partially used. At the same time, the Mobi School system is successfully functioning in postgraduate education and advanced training, and the BigBlueButton service is actively used to support educational, scientific and managerial activities, demonstrating the potential for scaling digital solutions at the university [47].

To increase the efficiency of digital transformation of the management system of a higher education institution and the quality of educational services, it is advisable to develop a concept of change management in the digital environment, which would include:

- analysis of the readiness of the educational institution for digital transformation;
- monitoring the current state of the institution's digital infrastructure management in the context of changes;
- determining the level of formation of digital competencies of the administration and scientific and pedagogical staff;
- identification of barriers and threats to the implementation of digital innovations in higher education institution;

- development of a strategy for the digital transformation of the educational process and the university management system;

- formation of goals and priorities for the development of the digital environment of the change management system at the university;

- coordination of the strategy for the development of an educational institution with digital transformation and a collective vision of change;

- development of mechanisms and algorithms for digital transformation of the change management system in order to effectively implement innovations and reduce the resistance of teams to innovations;

- implementation of electronic management and training systems (LMS, EPR. CRM, etc.);

- conducting courses to increase the level of digital literacy among students and scientific and pedagogical teams;

- constant monitoring of the effectiveness of the implementation of digital changes and their support in the educational process;

- analysis and monitoring of results and making adjustments to the management system of an educational institution in the context of changes;

- availability of continuous feedback from users of digital services for continuous improvement and support of changes;

- analysis and monitoring of results and making adjustments to the management system of an educational institution in the context of changes;

- availability of continuous feedback from users of digital services for continuous improvement and support of changes;

Therefore, the network infrastructure of the university needs comprehensive modernization and strategic development in accordance with the principles of digital transformation and change management. The network structure of a higher education institution should develop as an integral, integrated system that meets the requirements of a modern globalized society.

2.2 Principles of digitalization of the system of management of changes in the educational process of the university

Digitalization of management processes is an integral basis for managing changes in the face of uncertainty and transformation of social processes. Their implementation involves rethinking the essence of the educational process, scientific research, flexibility of the management system, etc.

Their implementation involves rethinking the essence of the educational process, scientific research, flexibility of the management system, etc.

Considering the concept of organizational changes in the economic sphere, G. Neilson, A. Tipping, J.Krings, D. Aguirre emphasize the importance of taking into account the human factor, leaders-managers are obliged to independently demonstrate their commitment to change, it is important to involve all structures of the organization in change, form a collective vision of change and the responsibility of everyone for the effectiveness of changes [24] .

The integration of information technologies to strengthen the essence and effectiveness of changes requires additional norms and rules. European Commission (2021) propose to consider a number of principles for the digitalization of management processes, among which we highlight user orientation; data-driven decision-making; integration and interoperability of systems; security and confidentiality of information; flexibility; innovation and sustainable development; Inclusion and equality [10].

These principles can be the basic guidelines for the formation of a unique digital culture of management of educational institutions. We propose to generalize these two approaches and integrate them into unified principles of digital management of changes in the educational process in an educational institution. Each of the principles should reflect the purpose of the university's functioning and contribute to meeting the academic needs of society. Emphasizing the transience of changes and environmental challenges, generally accepted norms of the functioning of the information environment become the fundamental basis of the

change management system at the university. Undoubtedly, the proposed principles can be deepened in accordance with the needs and specifics of the organization's functioning, threats and challenges of the environment, trends in the field of education, etc. (Fig.1.2).

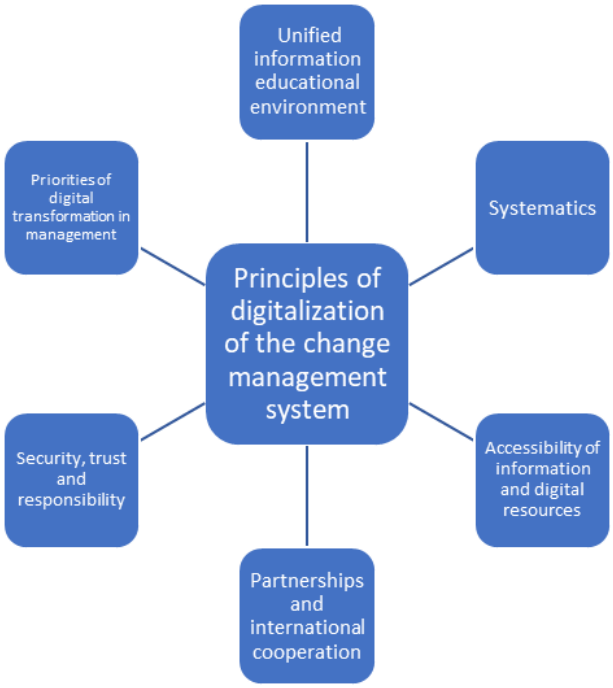

Figure1.2 – Principles of digitization of the change management system in the educational process of the university

Adherence to the basic principles is a key condition for the implementation of changes based on managerial decision-making that provides digital technologies in the educational process and make them more important for satisfaction pedagogical and student’s stuff.

All principles should be considered in the context of change management in educational process at university, which involves planning, organizing, controlling, adapting and monitoring digital transformation processes. To visualize and deepen the essence of the principles of digitalization of the management system, we expand possibilities of change management of educational process and propose to consider Table 2.2 with examples.

Table 2.2 – The use of system support in the principles of digitalization of the university's change management system

№	Principle	System support
1.	User orientation	LMS-платформи
2.	Data-driven solutions	Analytical panels, DigData
3.	Data integration and compatibility	Single database, API
4.	Security	Cyber protection system
5.	Flexibility and inclusivity	Responsive interfaces
6.	Partnership	Open Educational Resources (OER)

The principle of accessibility to information technology. Digitalization of the management system should provide for equal opportunities for each participant in the educational process to access educational information resources and knowledge. This may include the development of an inclusive digital environment adapted to the conditions of the university's functioning and the needs of society. In this context, this approach will help reduce resistance to innovation, the formation of a digital culture and the involvement of everyone in management processes.

The principle of consistency and consistency of the implementation of digital systems. Digitalization of the management system of the educational process involves an integrated approach of initiatives, important decisions aimed at transforming educational, scientific, and managerial communication. From this point of view, change management involves the coordination of actions and decisions at all levels of the functioning of the educational institution. Consistency ensures control and coordination of the process of changes and their coordination with the values of the organizational culture of the university.

The principle of maintaining a unified information environment of the university. Digitalization should contribute to the formation of a safe educational environment that integrates information systems and management platforms.

The principle of partnership and cooperation. Digitalization of the educational process of the university, in addition to the educational process, should contribute to the development of network interaction between the universities of the country and other countries. Change management involves the exchange of knowledge, practices, involvement in international activities, which contributes to the competitiveness of education in the service market.

The principle of security and trust. Digitalization should be enhanced by creating an atmosphere of trust based on the transparency of management processes, protection of personal information, and cyber protection in the educational process of universities. In conditions of uncertainty, security is not only a technological, but also a social aspect that causes teams to be ready for information and digital transformations.

The principle of priority in management. Digitalization of the educational process is a key aspect of the strategic planning of the university's development, which covers the performance of all managerial functions: organization, planning, coordination, adjustment and control.

The priority of digitalization of the change management system ensures the stability of transformation, transforms the university into an organization that learns, develops, and adapts to environmental conditions.

2.3 The main directions of digitalization of the educational process of the university

In the digitalization of the educational process of the university, it is worth highlighting four vectors for the implementation of changes in accordance with the purpose, objectives and structural features of the university. In particular, it is worth emphasizing the following aspects of the introduction of information technologies: management system; educational activities; scientific activity; involvement of stakeholders and the community in the functioning of the university.

Digitalization of the change management system provides strategic planning for the development of the university, assessing the quality of implementation of information initiatives. These factors will contribute to the strengthening of educational and marketing services of the university. Managers should focus on the phased introduction of electronic document circulation and create conditions for remote work of each participant in the educational process. Management processes should be aimed at monitoring educational trends and determining the conditions for adaptation of higher education institutions to changes.

Digitalization of educational activities at the university reflects different types and levels of the subject-subject industry of information technologies for the global involvement of students and scientific and pedagogical teams in digital interaction in the educational process. This vector of transformation provides for the development of educational-scientific, educational-professional programs and advanced training programs in information and digital technologies in education for the training of specialists receiving higher education. The administration of the educational institution needs to study the best practices, develop educational and methodological support for the educational process, taking into account modern trends in the development of digital technologies, in particular: artificial intelligence, e-learning, mobility and mobile learning, blockchain and cryptocurrencies, cloud and fog computing, augmented, virtual and mixed reality, chatbots and virtual assistants, Internet of Things, robotics, data protection and countering cybercrime, etc. It is worth emphasizing that these actions will contribute to the popularization of STEM and STEAM education and the creation of electronic portfolios of scientific and pedagogical workers [46, 47].

Digitalization of scientific activities of the university. One of the tasks of modern educational management is the integration of education into a single European space. The fundamental task in this context is to connect the university to a single European cloud of open science, which will enhance the authenticity of scientific research results. Digitalization of communication links with university stakeholders. The priority tasks are:

involvement of stakeholders in cooperation in the development of educational programs;

implementation of such training programs that would contribute to the development of digital competence of people of any age;

implementation of such training programs that would contribute to the development of digital competence of people of any age/

The identified vectors deepen the essence of change management in the educational process and ensure effective digitalization of the educational process.

2.4 Management of the process of digitalization of the educational process in the context of changes

We consider the management of digitalization of the educational process as a purposeful and coordinated activity of the university administration aimed at introducing digital technologies into all areas of the university. Its purpose is to increase the efficiency of the institution's functioning and meet the educational needs of society.

The input prerequisites for the implementation of the digitalization of the management system can be the initiative of the management, representatives of faculties, teams with the work of projects, or the strategic need of the university to develop the concept of a digital university.

At the initial stage, it is worth:

- to conduct a SWOT analysis of the level of digitalization of the university's educational process and develop a strategy for implementing changes;
- to introduce the issues of digital transformation and digital development into the directions, tasks and plans of activities of structural divisions of the educational institution;
- to outline the needs and algorithms of organizational, methodological and scientific-methodological support for the digitalization of the educational

process, taking into account the technical and intellectual resource of the organization;

- to optimize the functions of the educational and methodological center of information and digital systems in order to provide high-quality technical and infrastructural support for the digitalization process and its IT outsourcing;
- to develop mechanisms for integrating data and technologies into all areas of the university's activities in the context of changes and user needs: educational, scientific, managerial and international activities;
- to develop a pilot version of the implementation of digital management in an educational institution;
- subject to positive approbation of the digitalization process, focus on its large-scale implementation and training personnel for the implementation of digital management activities in the institution;
- if necessary, make adjustments to the plans for digitalization and optimization of the educational process.

It is such coordinated actions that lead to minimizing threats and risks in the system of managing changes in the educational process of a modern university.

2.5 Conclusion to the second section

The second section outlines the basic aspects of the Concept of Digital Change Management in the Educational Process of a Higher Education Institution. It is proposed to consider the digitalization of the educational process in the context of the following aspects: management system; educational activities; scientific activity; involvement of stakeholders in the development of the university. A number of principles of digital transformation of the management system of the educational process have been singled out: accessibility to information technology; consistency and consistency of the implementation of digital systems; maintaining a unified information environment of the university; partnership and cooperation; security and trust; priority in management.

3 DEVELOPMENTS OF THE IMPLEMENTATION AND INFORMATION SYSTEM OF CHANGE MANAGEMENT

3.1 Setting the task and outlining the requirements for the model

In the context of globalization of society, the education sector of the XXI century functions in the conditions of dynamic changes. The constant updating of the regulatory framework, the digitalization of the educational process and the strengthening of society's demand for a highly qualified specialist leads to the reboot and digitization of the theory of change management in the educational process.

At the same time, the research of many scientists testifies to the fragmentation of information support for managerial and organizational processes. The traditional approach to supporting organizational change has its aspects:

- does not provide for the introduction of automated tools for monitoring the implementation of strategically important tasks;
- characterized by a low level of use of analytical systems in decision-making;
- imperfect communication channels between all participants in the changes, which do not provide for the presence of feedback;
- the lack of a single digital database of the university on the history of changes: implemented projects;
- the lack of a single digital database of the university on the history of changes: implemented projects;

It is in this context that there is a need to create such an information system for change management, which would guarantee digital support in the performance of administrative functions by managers: change planning; organization of the process of introducing innovations; coordination of actions of change agents and their teams; regulation of the process of changes and the implementation of tasks; control over obtaining real results; managerial decision-making.

Management of the educational process requires a systematic approach, up-to-date analytical tools and prompt feedback. Traditional paper tools and media do not provide consistent planning of the project of changes and appropriate coordination actions, and the results of implementation cannot be objective [46]. Data interpretation is carried out in accordance with the subject's personal beliefs or the level of formation of his professional and analytical thinking.

The purpose of the practical part of the study is to develop a model of information systems that support the effective implementation of changes in a higher education institution. The basic task of the above model is centralized planning, control, data analysis, reporting on the quality of implemented changes and their threats at all levels of the university: from the administration of the institution to educational departments.

For the systematic implementation of changes in the conditions of IT decision-making and the relationships between the main components of the digital management model in the educational process, it is advisable to present them on the basis of a logical matrix-square. This approach will allow you to identify the key elements of the system, identify the subjects of change support, outline their functions, as well as visualize the functional and technical requirements of the model.

We are convinced that the management matrix demonstrates structured interaction between all categories of participants in the educational process of the university, the functionality of the digital change management system, technological aspects of tasks and requirements.

The author's system proposed by us is aimed at the formation of a transparent logical model of support for each subject in the digital educational space, a clear definition of tasks and ways to implement them. It can further deepen the essence of digital organizational culture at the university. This model of the system reflects a harmonious combination of digital landmarks, values and structured algorithms of actions.

Let's consider the logical matrix of change management in the educational process Fig. 3.1.

❖ **USERS-SUBJECTS OF THE EDUCATIONAL PROCESS**	❖ **SYSTEM FUNCTIONS**
✓ University Administration ✓ Deans of faculties ✓ Heads of departments ✓ Scientific and pedagogical staff ✓ IT staff	✓ Change planning ✓ Registration of changes ✓ Control of the implementation of specific tasks ✓ Analytics and monitoring of the digital educational environment ✓ Generation of reports
❖ **FUNCTIONAL REQUIREMENTS**	❖ **TECHNICAL REQUIREMENTS**
✓ Multi-level roles ✓ Planning and digital control ✓ Knowledge Base / Change Stories ✓ Automatic messages ✓ Generation of reports	✓ Web interfaces in the educational process of the university ✓ Client-server architecture in the digital environment ✓ PostgreSQL, DB ✓ Protection and backup of information ✓ Integration into university systems (LMS, ERP, CRM)

Figure 3.1 – Logical matrix model of the change management system in the educational process of the university

The presented Logical matrix model of the change management system in the educational process of the university provides a generalized display of the basic components or parameters of the system and determines its conceptual logic. This

allows you to organize the relationship between all elements into a single structural model.

Such a visual representation of the model reinforces the methodological basis for the implementation of changes, innovations and project implementation. These facts demonstrate the sequence of building an information system and strengthen the understanding of their essence in digital change management in the educational process of the university. In further steps, these elements can be detailed and integrated into the overall architectural and functional digital concept of the change management system.

3.2 Architecture and structure of the change management information system

The effectiveness of digital support of management processes for the implementation of changes in the universality depends on the correct construction of the architecture of the information system. This should ensure the transparency of available information data, accessibility in use, reliability of storage of information flows, scaling and integration into other information services of the educational institution.

The architecture of information systems, as a rule, is based on modern methodological approaches from the field of software engineering and information model management.

According to the developments in the field of modern engineering, the architecture of information systems should provide for a clear delineation of all functional components, ensure scalability, guarantee data security and provide for further development of the system without changing the basic mechanisms [31, 37].

M. Fowler and A. Hussain notes that architectural solutions for web systems should provide deep interaction between the user interface, the business-logic

module, and the information flow of data [13, 16]. This ensures the introduction of a modular approach and standardization of information processing mechanisms.

To model the data layer, it is important to pay attention to the use of PostgreSQL principles, which offer a relational storage structure, provide continuous support for transactions, strengthen security features, and optimize queries in the load system [30].

It is worth paying attention to the fact that BI-approaches can provide data integration, visualization and reporting for managerial decision-making, in particular in the context of changes [32].

As part of our of scientific research, we propose to consider a three-level architecture. In the information systems of change management in the educational process of the university, it outlines such levels as:

- User Interface (UI) – the level of close interaction with the user;
- Business Logic Layer (BLL) – the level of data processing and the implementation of change management algorithms;
- Data Access Layer (DAL) – level of data storage and access to information systems.

In the context of dynamic changes and constant updates of information flows, this will allow IT managers to differentiate functional loads, strengthen stability and adaptability to new conditions of systems [31].

We are convinced that such a three-level architecture provides conditions for the implementation of a large number of changes, increases their efficiency. This ensures control and scalability of transformation processes in a higher education institution. With a clear division of the system, there will be a development of each component, which will introduce new functions and update those that are there without loss or delay.

This approach in digital change management gives managers a number of opportunities:

- support and implementation of several changes at the same time;

- ensuring the implementation of various scenarios or vectors of digitalization of the university's educational process;

- flexibility and quick adaptation of the whole system to the challenges and innovations in the activities of the educational institution;

- scale analysis, monitoring and communication channel tools;

- integrate a variety of analytical modules, chatbots, LMS platforms, CRM solutions.

This architecture ensures the separation of change management logic from data engines and user interface.

The architecture is presented and described in accordance with the international standard that outlines the principles of structured presentation of software systems, their components and interconnections, as well as discloses the requirements for documentation and interaction interfaces [10].

The next stage of the practical part of our study is the detailing of its internal structure. This is reflected in the selection of basic modules that implement the functionality of each level (Fig. 3.2).

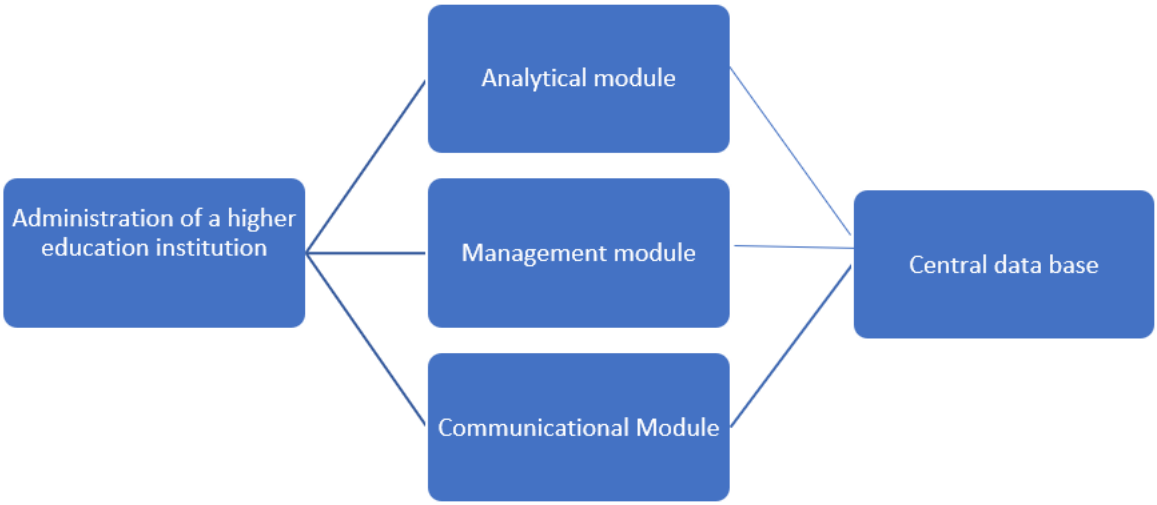

Figure 3.2 – Structural and logical model of the change management information system

According to the figure, the system has a modular structure, which provides comprehensive support in the managerial, analytical and communication processes of the digital environment of a higher education institution. Each module performs its functions aimed at improving the quality of planning, collective interaction and implementation of tasks in the educational process of the university.

Let's briefly consider each of them:

- **the management module** provides for planning, coordination and control over the implementation and implementation of educational changes. Changes can be initiated by the management, community, scientific and pedagogical staff, student community, public demands, conditions of uncertainty, university policy or updating state regulations. This module makes it possible to create new projects and form change teams, define algorithms for innovation, and outline logistics for successful actions in real time;

- **the analytical module** makes it possible to quickly collect information, process it, and visualize data in the context of change dynamics. Based on key performance indicators, graphs, analytical reports, references, information generalizations, etc., are developed. This module helps the heads of the educational institution to assess the effectiveness of the implementation and support of changes, as well as contributes to the rapid identification of threats in the educational process for quick management decision-making;

- **the communication module** implements digital interaction between participants in the educational process (administration, teachers, students, parents, employers and the community). It provides quick transmission of messages, decisions, news in real time regarding the implementation of the change project.

Thus, the modular approach gives flexibility and independence to functional blocks, simplifies the processes of updating data and quickly informing teams about the implementation of change projects.

3.3 Algorithm for the functioning of the change management information system

The developed information system of change management in the educational process of the university functions according to a clearly defined sequence of actions, which provides a specific cycle, a stage of change management. This process usually involves actions from initiation to monitoring the survival of changes and their results.

In his research, D.E. Knuth considers an algorithm, in the field of software, as a finite sequence of well-defined instructions that are designed to perform a specific task or solve a certain class of problems [7].

The change management algorithm, O. Horishna, considers both structuring and sequences of actions, which should be considered from five stages. Each stage is implemented through a certain number of appropriate steps. The sequence of steps and their content can change in accordance with the purpose of management, the complexity of changes, the volume of possible risks, the level of perception and coordination of them in the team [45].

The proposed information system for managing changes in the educational process of the university is implemented on the basis of certain outlined steps of actions that ensure the effective implementation of changes and user interaction at the appropriate levels of architecture (Fig. 3.3).

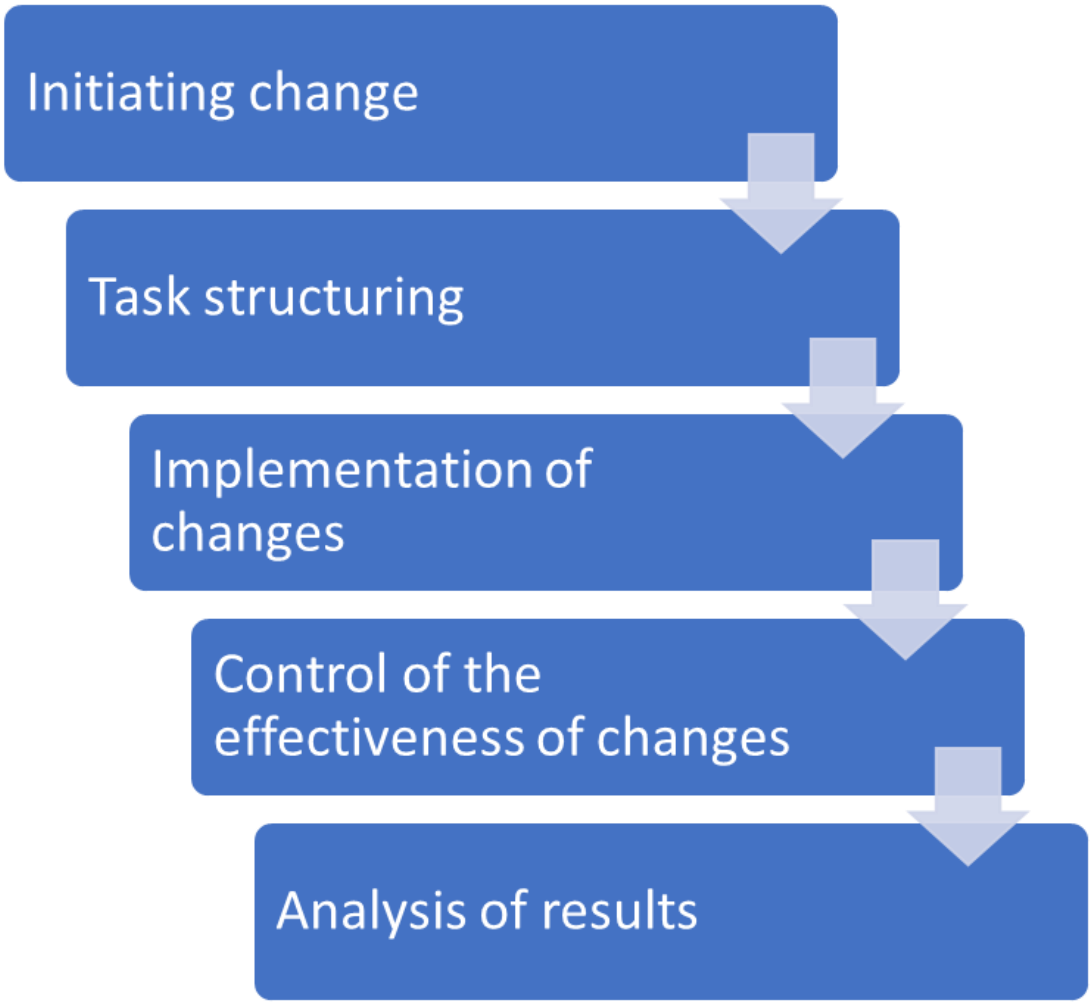

Figure 3.3 – Algorithm for the functioning of the change management information system

Let's take a closer look at each stage of the algorithm of changes.

Initiating changes. Preparation for changes in the educational process begins with an analysis of the current state of the educational environment with the possible involvement of an external expert. Based on the available results of the analysis, the idea of changes is formed: the search for those innovations that are required by all participants in the educational process and the production of a final vision of the implemented changes.

Task structuring. The involvement of teachers in changes begins with the popularization of changes: familiarization of the staff with new trends in the development of the educational process; creation of a change board at the university, formation of a history of changes; dissemination of information about

expected changes; the use of PR technologies to realize the urgency and need for change. Awareness of changes affects the ability of the teaching staff to rethink their activities. This step is crucial for the introduction of innovation at the university.

The implementation of changes in the educational process is associated with the discussion of the concept of changes, drawing up a plan and choosing tactics for their implementation. A change implementation plan contains a clearly formulated goal, a collective vision of change, objectives, goals, means, tools for change and a predictable description of the final result. The implementation of changes in the educational process is impossible without awareness and forecasting of risks, search for ways of influence to neutralize their consequences, assessment of possible losses and threats. At this stage, it is worth implementing risk management mechanisms. It is important to identify and identify possible obstacles in the change process in time in order to respond to them immediately.

Control of the effectiveness of changes. The next stage makes it possible to effectively influence, if necessary, the processes of implementing changes based on monitoring and digital control. It is important for the heads of higher education institutions to monitor the vaccination and track the progress of changes.

Analysis of the results of changes. If successfully implemented changes have increased the efficiency of the functioning of an educational institution, they become habitual in the daily practice of a teacher. Changes are cyclical: qualitative current changes affect the introduction of new changes in the future, which determines the development of the university and the competitiveness of the institution in the market of educational services. The institutionalization of changes is clearly reflected in the history of changes and is based on the adaptation processes carried out by the manager at the university.

In the process of implementing changes, factors may arise that will negatively affect the quality of meeting the needs of students, under such conditions, changes should be revised or returned to the beginning of the change management algorithm.

In the context of digitalization, the change management algorithm of educational process in the higher educational institution should be implemented on the basis of software in accordance with the specifics of the tasks for expanding possibilities and user`s support at university (Table 3.1.).

Table 3.1 – Change Management System Algorithm Software

Stage	Software	Purpose
Initiating changes	Django Framework	Creating Data Forms, Attracting Users
Task structuring.	Trello	Task scheduling
Implementation of changes	Microsoft Teams	Data exchange
Control of the effectiveness	Microsoft Power BI	Interactive display of key indicators
Analysis of the results	Python library ReportLab	PDF formats from the database

Information support covers a set of data, knowledge bases, regulations, methodological materials. The information support includes databases on the history of changes, projects, executors, deadlines, indicators, reference books, etc.

3.4 Information and technical support of the change management system of higher education institution

The effectiveness of the change management information system in the educational process of a digitalized university is possible only in the context of the use of appropriate information, software and hardware. These aspects enhance the stability of the entire system, ease of use and data processing.

Information support includes a set of data, knowledge bases, reference materials, regulations and statutes of the university, methodological developments

of the scientific and pedagogical staff used in the management of the educational process in the context of dynamic changes and transformations in society [34].

The composition of information support includes the following components:

- databases on implemented changes and their impact on the educational environment, innovations implemented at the university, management projects, teams and change agents, deadlines and deadlines for the implementation of initiatives;
- job descriptions of those involved in the changes, practical manuals and reference books for users of the system, staffing, roles of change implementers;
- metadata on training courses and educational programs, innovative programs for advanced training and motivation of participants in the educational process;
- state legislation in the field of higher education, regulatory provisions, internal orders of the head regulating the activities of the university and aspects of the implementation of changes;
- analytical references and reports, results of monitoring studies certifying the effectiveness of changes are formed in the digital management system of the university.

Such information content of the digital environment outlined by us creates conditions for the analysis and accounting of educational transformations.

The software part of the change management system in the educational process is built on transparent and flexible technologies. This allows for scalability and integration with existing university information resources.

Basic components of the change management system software in the educational process of the university:

- **Beck-end:** Django framework for implementing business logic;
- **Front-end:** HTML, CSS, JavaScript technologies for creating UI
- **Database:** PostgreSQL – as the main system of change management in the educational process of the university;

- **Data analytics platforms:** PowerBI, Google Data Studio for quick reporting with transparent data display;
- **Communication platforms**: integration with corporate digital mail, instant messengers, відео зв'язку (Zoom, Google Team, BigBlueBatton) and LMS platforms (Atutor, Moodle, Google Class) [36].

The constant use of the above technologies guarantees the high efficiency and productivity of the change management system in the digital environment of a modern university.

3.5 Testing and evaluation of the effectiveness of the change management system

Testing and evaluation of the effectiveness of the change management system allows you to determine the level of achievement of the initial vision of the results of changes and the level of their further development in a higher education institution.

We consider a number of stages of testing the change management system in the educational process according to the following criteria and performance indicators:

- unit testing;
- integration testing;
- evaluation of system performance;
- convenience and accessibility in use.

Based on the generalized data of modern IT specialists and scientists of leading companies in the field of information systems efficiency, we consider a range of indicators (Elone & McLean, 2003; Laudon & Laudon, 2020; UNESCO, 2023), allowing for a comprehensive assessment of the effectiveness of the developed system (Table 3.2) [8, 21, 40].

Table 3.2 – System Performance Indicators. Developed from the source [40]

№	**Criteria for the effectiveness of the system**	**Showman**	**Expected result**
1.	Functional	Number of automated processes	Increased 80%
2.	Technological	Request execution time	Decreased by 30%
3.	Information	Completeness of the database	95%
4.	Organizational	Duration of management decision-making	Reduced by 61%
5.	Social	User satisfaction	86%

Within the framework of the practical experiment, we conducted a micro study on the effectiveness of the proposed system in the conditions of change. Therefore, in order to overcome difficulties and solve problems in the field of change management in the educational process, it is necessary to develop a structural-functional, theoretically grounded and experimentally tested model of the digital management system, which would allow the heads of educational institutions to work in the appropriate algorithm; to carry out various preventive measures in order to predict risks, use mechanisms of resistance to changes and predict the further development of the management system of the educational institution.

Here are the results of the pilot implementation of the change management system at the Department of Information Activities and Social Sciences, TNTU (Fig. 3.4).

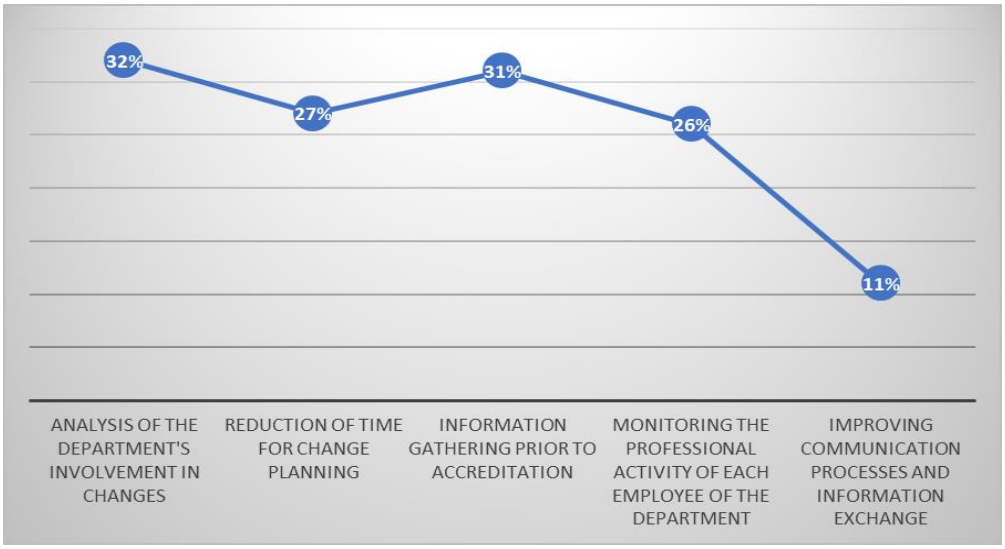

Figure3.4 – Results of the pilot implementation of the change management system

The results of the practical implementation of the change management system reflect its effectiveness in the educational process TNTU. The introduction of a change management system in the university guarantees: improving the quality of educational initiatives, reducing the resistance of scientific and pedagogical staff to innovations through communication channels, decision-making by the manager based on data, automation of the circulation document, accountability of results, openness of the educational institution to the community, increasing the level of digital literacy of all participants in the educational process.

3.6 Conclusions to the third section

The third section demonstrates the practical digital implementation of the concept of change management of the university. A system structure has been developed that provides for a three-tier architecture (UI-BLL-DAL). A number of principles for building a management system have been proposed. An algorithm of actions has been developed, which provides for five stages of digital implementation of changes. An assessment of the efficiency of the system was carried out.

The results showed that the implementation of a change management system contributes to the digitalization of the educational process and the effective implementation of innovations.

The information system created by us can be used as a basic model for deepening the essence of digital management in higher education institutions.

4 OCCUPATIONAL HEALTH AND SAFETY OF WORKERS IN EMERGENCY SITUATIONS IN CHANGING CONDITIONS

4.1 Analysis of working conditions of IT employees

There is no doubt that young specialists who are just starting their work in the IT field highlight a number of advantages of employment in this field, namely:

- a flexible schedule and the ability to work remotely, which allows maintaining a harmonious balance between the personal and professional life of the employee;
- a high level of provision of the employee's social package, which includes paid annual leave and leave based on temporary work capacity, medical insurance;
- competitive salary and reward money for the successful implementation of digital projects;
- continuous training and internship, which can guarantee further career and professional development of the employee and involvement in the implementation of new projects;
- a sense of belonging to the community of IT workers, which is characterized by a special organizational culture aimed at strengthening the role of collective values and the role of the team in the IT project [9].

However, it is worth noting that in the modern conditions of challenges, economic crises, globalization and transformations of society, negative trends in the IT sphere are also observed. In particular, due to the high demand for digitization processes and requests for innovative IT products, competition in the labor market is increasing, and the dynamics of changes and needs lead to the need for constant updating of competencies and the ability to act in anticipation of customer requests. Irregular schedules, a large number of deadlines, continuous search for new projects leads to professional burnout and loss of motivation. The remote form of work causes irregular working days, lack of live communication

with colleagues, which subsequently causes a feeling of loneliness, depression, etc., and sometimes can cause apathy, change of reality and distortion of a person's life orientations.

In recent years, as a result of Covid-19, scientists from the field of health care have observed a negative trend of increasing levels of professional stress and burnout among IT specialists. The results of the study are recorded in a number of international surveys of 2021-2024, which confirm the facts of overload, stress and psychological pressure on employees. Analysis of statistical data from leading organizations (Tech Productivity, Stack Overflow, JetBrains) makes it possible to trace the growing trend of emotional exhaustion and identify factors that increase the risks of professional burnout among IT professionals in a global context (Fig. 4.1) [5, 18, 19, 38].

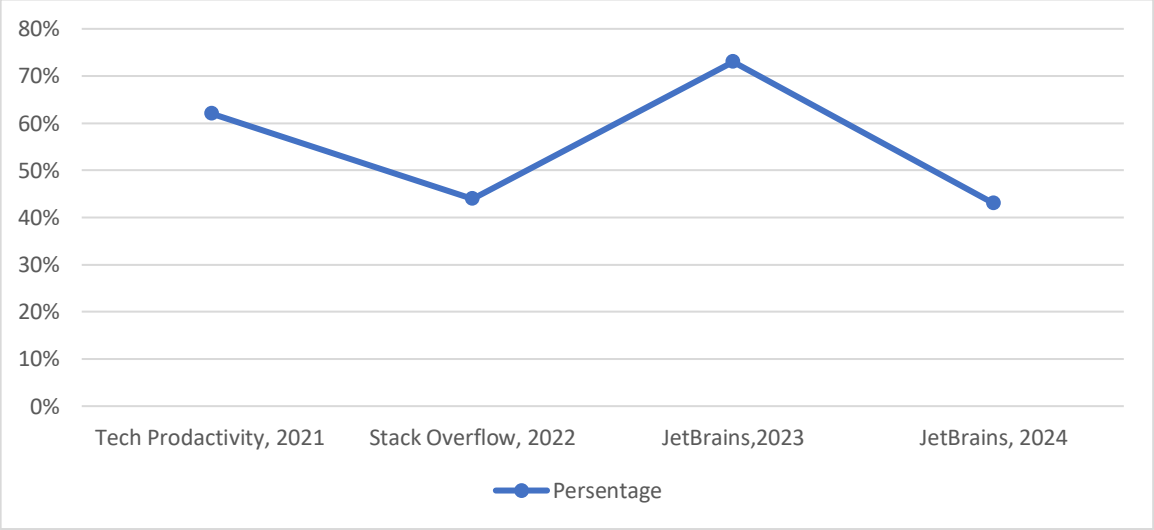

Figure 4.1 – Indicators of the stress level of IT specialists in 2021-2024 [5, 18, 19, 38]

The results show negative trends and emphasize that burnout has become a permanent trend in the IT sphere and requires a management response. Risks can be reduced only through better work organization, team support and a balanced work environment.

One of the most recent studies conducted by ISACA was aimed at identifying threats and precautions in the field of digital technologies. It is worth paying attention to the fact that, in addition to receiving stable rewards, employees pay attention to their emotional overload (Fig. 4.2) [17].

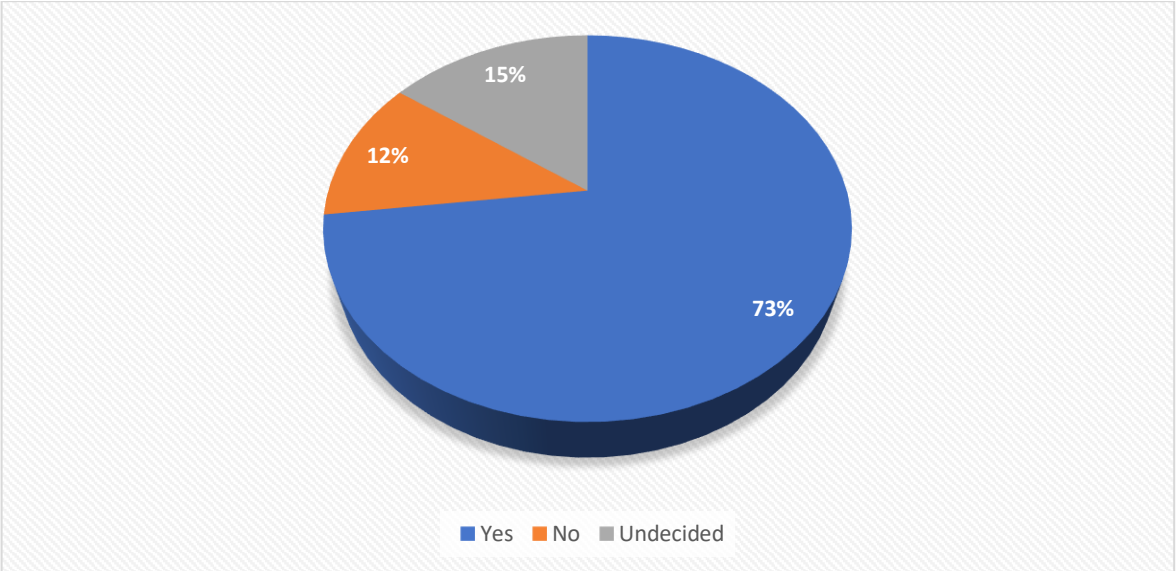

Figure 4.2 – Experienced stress of European IT workers

We believe that the resulting performance indicators pose a threat to the mental health and well-being of European IT professionals.

The right daily routine, healthy diet, daily physical activity will ensure the physical fitness of the team. For example, you can consider the Google team, which takes care of their health without interrupting their place of work, because there is a doctor's office in each building, there are also areas for self-reflection and meditation. Many, including youth companies and those with experience too, are worried about the emotional microclimate and the fusion of a single team. Managers regularly invite trainers to enhance emotional activity, courses on social intelligence problems. Also, in recent years, emotional well-being practices from the countries of the East have been inflated with insane popularity.

Scientists who conducted research at ISACA aimed to understand how various difficulties, among which the lack of qualified personnel, the growing intensity of projects and constant technological pressure affect the psychological

state of employees from IT teams and the productivity of their work, draw attention to a number of problems and challenges (Fig. 4.3).

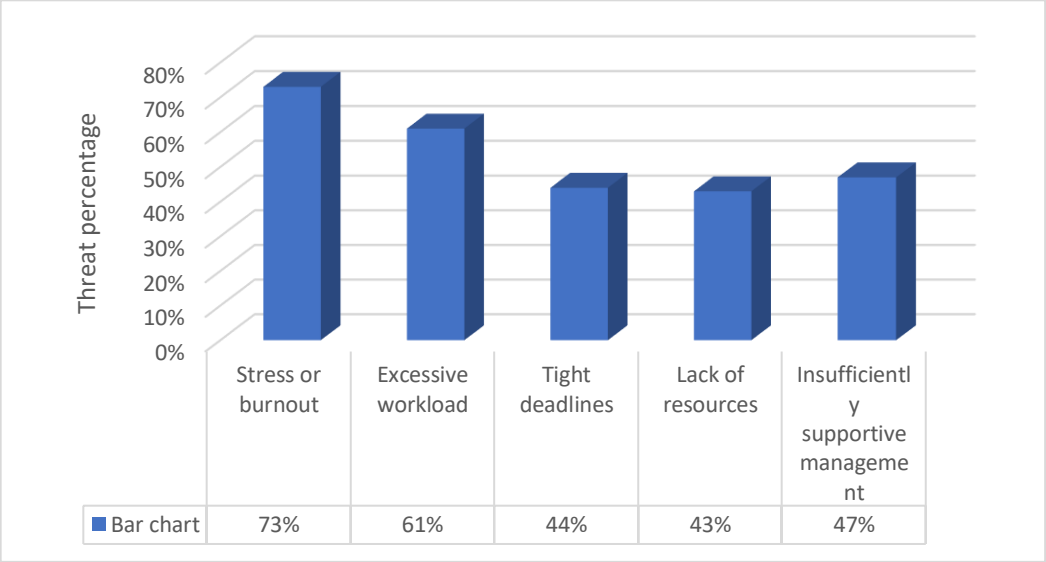

Figure 4.3 – Indicators of negative phenomena in the IT sphere based on the results of the ISACA study [17]

Figure 4.3 shows the results of a survey of IT specialists regarding the key factors that negatively affect their psychological state and professional well-being. The most threatening aspect was stress and professional burnout, which was indicated by 73% of respondents. This indicates the systemic nature of overwork and emotional exhaustion in the IT sphere, particularly related to the remote form of work. In second place in terms of importance is excessive work overload and lack of mentoring support (61%), which, in combination with hard deadlines (44%), forms chronic overwork and constant time pressure. A lack of resources (43%) also plays an important role, due to which specialists are forced to perform more work without adequate technical support. Another common factor is an insufficiently supportive management style (47%), which indicates a lack of effective communication, up-to-date information, psychological motivation, mentoring and management decisions aimed at preserving the well-being of employees [17].

Taken together, these data demonstrate that the main threats to the professional health of IT specialists are not related to technical working conditions, but to organizational and managerial factors that increase stress and increase the risk of professional burnout and cause staff turnover.

Therefore, the analysis of the working conditions of IT specialists shows a combination of significant advantages and certain risks. Positive aspects include a flexible schedule, a high level of pay and wide opportunities for professional development, which increase motivation and job satisfaction. At the same time, overtiredness, excessive computer time and the risks of emotional burnout negatively affect the well-being of employees, which emphasizes the need for a better balance between work and personal life.

4.2 The impact of computer equipment on human health

Trends in change, globalization, and digitalization of social processes in the context of the active introduction of nanotechnologies are drawing the attention of the scientific community to the impact of excessive use of computer equipment on human health, in particular on IT specialists.

In addition to psycho-emotional states directly caused by the abuse of digital technologies, studies conducted in recent years have consistently drawn attention to physical health problems caused by the specifics of the work of IT specialists.

Department of Health emphasize that prolonged screen time leads to digital asthenopia: overload, constant migraines, increased pressure, irritation of the eye membrane, and decreased vision (Better Health Channel,2025) [6].

One of the problems associated with digital technology abuse, according to researchers, is repetitive strain injury (RSI). The results show that 94.3% of respondents suffered from pain in one or more parts of the body. 86.8% of respondents regularly suffered from eye strain, 63.9% suffered from lower back pain, 67.4% from wrist pain, 64.7% from finger pain, while the least suffered from foot pain, to which only 19% responded positively. There are significant

relationships between the duration of computer use, the type of chair, the type and size of monitor used, and the incidence of RSI [10].

In the same way, they emphasize the detrimental impact of the activities of specialists on the musculoskeletal aspects of human life.

In addition, studies conducted by BMP Public health indicate negative trends in the abuse of a sedentary lifestyle by programmers.

Scientists have concluded that spending more than 6 hours in front of a screen leads to neck problems and increased blood pressure in 88% of workers Representatives of The American Health Association also sound the alarm, emphasizing that prolonged exposure to monitoring causes the development of hypertension, causes insulin dependence, and increases the risk of developing cardiovascular diseases in the younger generation (Scottish Sun,2025) [35].

To deepen your understanding of the impact of digital technologies and the specifics of the work of workers in the field of computer science and software engineering, we suggest considering Table 4.1, which was developed based on the above-mentioned studies.

Table 4.1 – The impact of computer equipment on human health [6, 25, 41]

№	Health aspects	Research results	Researchers	Year
1.	Visual load	Prolonged work at screens causes digital asthenopia, dry eyes, and headaches	National Center for Biotechnology Information	2025
2.	Psycho-emotional disorders	Excessive screen time increases anxiety, the risk of depression, disrupts a person's emotional stability, and causes sleep problems.	World Health Organization	2024
3.	Musculoske	Muscular dystrophy, spinal	Adebayo, T., &	2013

	letal system	curvature, neck pain, stoop, arthritis	Olatunji, D.	
4.	Sedentary lifestyle	Prolonged time in front of a monitor leads to obesity, muscular dystrophy	BMC Public Health	2025
5.	Increased cardiovascular risks	More than 4 hours a day in front of screens increases the risk of hypertension and heart disease	American Heart Association	2025

However, it is worth paying attention to the research of American scientists, who concluded that regular use of digital devices reduces the risk of cognitive impairment by 42% in older people, if the use is active and socially interactive [25].

Therefore, irregular working hours, physical and emotional overload, and pressure on employees are signal factors for reviewing the organizational activities of businesses and increasing attention to the human personality in the corporate culture of the digital environment.

4.3 Organization of safety when working with IT equipment

The organization of the work process in the field of information and communication technologies and software from managers requires a comprehensive approach, which includes: safety in the workplace; prevention of physiological and psycho-social aspects; safety culture; management of compliance and possible risks; technological support.

Let's consider each aspect in more detail.

Working with IT equipment carries the threat of injury to human health, and therefore it is necessary to check and improve the ergonomics of workplaces:

- correct placement of the monitor at eye level or slightly lower at a distance of 50-70 cm from the employee;

- it is important to place the keyboard and mouse in such a way that the wrist is not injured;
- the chair should provide not only the possibility of height adjustment, but also provide support for the spine.

Implementation of a permanent procedure for monitoring the workload of employees:

- monitor continuous work at the computer, and every 60 minutes take a break for 5 minutes of physical activity for regular breaks, exercises to relax the neck, shoulders, hands, eyes, to reduce the risk of musculoskeletal and visual stress;
- enter restrictions on sitting time;
- support the working/monitoring time policy for each employee, paying attention to psychological and emotional aspects stress, burnout, prolonged sitting and insufficient rest;
- maintain systems that ensure continuous control of equipment use, limit risks (e.g. software or hardware for entry/exit control, seat reservations, sanitary regulations, etc.).

The world's leading companies in the development of digital technologies create their own unique culture of communication and employee support. In this context, it is important to pay attention to: establishment of information channels that would allow regular information about threats to human health and safety. Based on feedback, managers can receive suggestions for improving the place and working conditions of employees. An important component for stimulating emotional stability in the team can be regular seminars, trainings, meditation events for relaxation and development of self-control and reflection skills of employees.

4.4 Staff actions in the event of emergencies in the it sphere

Situations with a daily emphasis on uncertainty, threats, in particular, related to armed conflicts, cyber-attacks and unauthorized power outages have become companions of every sphere of society's life. In the field of IT, these aspects can lead to large expenses and destabilization of the work process. That is why we offer a list of actions for personnel in emergency situations, because we understand that any unforeseen event can lead to: fabrication and leakage of data; compromising user accounts; damage to information and digital equipment; destruction of carriers, threat to the life of employees due to technical reasons such as fire, electrical damage, etc.

We offer a short algorithm of actions of IT workers after an incident:

- assess the real threat level;
- notify the administrator and head of the emergency service in the organization;
- disconnect the infected device from the network;
- block access to suspicious or affected accounts;
- how to quickly transfer the system to a safe mode of operation;
- record the evidence of the incident and do not delete the collected information until the end of the official investigation;
- conduct a thorough analysis of the causes of the emergency;
- update anti-virus databases and conduct thorough training with employees of the unit.

In this context, it is worth paying attention to regular preventive measures, which may include data backup, the use of UPS, limiting the access of employees according to their level of qualification and professional duties. Only a competent approach to managing the organization can level the risks associated with unpredictable threats and prevent unwanted losses among financial, technical and intellectual resources.

4.5 Conclusion for the fourth section

The analysis shows that although working conditions in the IT sector offer significant advantages, they also pose threats to human life and health. Excessive workload, lack of physical activity, prolonged work at a computer, and stress factors cause professional burnout, vision problems, musculoskeletal disorders, and mental health issues. Creating a safe working environment and personal space, introducing a corporate culture of caring for people, and developing self-regulation skills are key to the stability and productivity of IT teams.

In the context of current trends in society, the modern information technology industry needs to implement humanistic principles and a people-centered approach in its organizational culture. Employees, as human beings, should not only be key figures in the digital process, but also its fundamental value. It is through the combination of digital innovation and the implementation of policies of care and support for human resources that the sustainable development of the IT sector is defined.

The humanization aspect of supporting team or stuff is manifested in increasing the availability of education, the development of an inclusive environment, facilitating communication and taking into account the individual needs of every user or client in digital environment.

CONCLUSIONS

The qualification work is devoted to a comprehensive study of the theoretical and practical basis for managing changes in the educational process of higher education institutions in the context of digital transformation and the introduction of information systems that ensure digital decision-making.

The study made it possible to outline a number of patterns of change management and determine the role of digitalization in the flexibility of decision-making and create a model of the digital change management system at the university.

In the first section of the qualification work of the educational level "Master":

the theoretical basis of the theory of change is generalized; it has been established that in a higher education institution, changes are a purposeful process of adaptation, transformation of the education system to the needs of society; the key theories of change management, which became the foundation of the author's approach to the implementation of changes and their support in the educational process, are analyzed;

It has been proved that in modern conditions, the effectiveness of change management depends on the level of digitalization of the university and the digital maturity of the subjects of the educational process.

It is substantiated that the digital environment of the university should develop as an integral system in which administrative activities are carried out through unified digital communication channels and analytical systems for making flexible decisions.

Based on international experience (EU countries, Finland, Mexico, Estonia), it has been proven that successful digital transformation is possible under the condition of a national, state strategy for the development of education and ensuring a sufficient level of relevant competencies of the scientific and pedagogical staff and adherence to the policy of inclusiveness. The introduction of

digital platforms, cloud technologies and LMS systems will help increase the transparency and accountability of management processes at the university.

In the second section of the qualification work, the concept of digital change management is substantiated, which are grouped on the principles of: user orientation; analytical; integration; adaptability and partnership. These key aspects form an open and safe university culture, in which technological solutions are combined with humanistic guidelines.

In the third section, an information system for supporting change management in higher education has been developed, which integrates classical management functions.

A logical matrix of interaction between users of the system has been created, which provides for functional and technical modules.

The use of a three-level architectural system is substantiated: UA – BLL – DAL. This ensures scalability, protection and integration into other information resources of the educational institution.

Algorithms for the functioning of the system are developed and software is described: Django Framework, Power BI, Trello, PostgerSQL, ReportLab.

It has been proven that the system allows you to automate all management processes, generate analytical reports and make decisions based on real numbers.

The results of the experimental implementation of the system testified to the fact of a significant increase in the efficiency of management processes. This shows that digital support for the change management system minimizes resistance, increases transparency, and deepens the essence of team interaction.

The fourth section analyzes the working conditions of IT employees and identifies a number of risks: professional burnout, emotional overload, health disorders associated with the prolonged use of digital equipment.

Recommendations are offered for organizing a safe and comfortable workplace for an IT employee, strengthening the digital corporate culture of caring for people, optimizing working hours, forming self-regulation skills and integrating physical activity into the work process.

The developed model of the information system for managing changes in the educational process has practical significance and scientific novelty. It describes a systemic vision of digital change management at the university. This model can be used as a prototype for creating corporate information systems at the university. The results of the research can be used in the process of strategic planning of the digital development of educational institutions.

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Annexes

Certificate

for participation

in IV International Conference of Young Scholars and Higher Education Applicants

PHILOSOPHICAL DIMENSIONS OF TECHNOLOGY

(12 hours - 0,4 ECTS)

Emmanuel DA-SILVA

Prof. Pavlo Maruschak
DEPUTY CHAIR OF THE PROGRAMME COMMITTEE

Prof. Andrii Kryskov
CHAIR OF THE ORGANISING COMMITTEE

Certificate №03569


Тернопільський національний технічний університет імені Івана Пулюя
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ЗМІСТ

СЕКЦІЯ 1. ФІЛОСОФСЬКЕ ОСМИСЛЕННЯ ФЕНОМЕНУ ТЕХНІКИ 6

Марія Батурко 6
Тернопільський національний технічний університет імені Івана Пулюя,Україна
ВІД «ТЕХНЕ» ДО ТЕХНОЛОГІЙ: ЕВОЛЮЦІЯ ПОНЯТТЯ «ФІЛОСОФІЯ ТЕХНІКИ»

Олег Герман, канд. істор. наук, доц., заслужений діяч мистецтв України 8
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ВІРТУАЛІЗАЦІЯ РЕАЛЬНОСТІ ТА ЗАЦИФРУВАННЯ ПОЧУТТІВ

Іван Мартюк 10
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ТЕХНОЛОГІЧНИЙ ДЕТЕРМІНІЗМ

Катерина Марущак 12
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ФІЛОСОФІЯ ШТУЧНОГО ІНТЕЛЕКТУ: КОМП'ЮТАЦІОНАЛІЗМ ТА КОНЕКТИВІЗМ

Вікторія Павлина 13
Науковий керівник: Наталія Габрусєва, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ТЕХНОГЕННА ЦИВІЛІЗАЦІЯ: НАУКА, ТЕХНОЛОГІЯ ТА ДУХОВНІСТЬ У СВІТЛІ ІДЕЙ ОСВАЛЬДА ШПЕНГЛЕРА

Тетяна Подсаднюк 15
Науковий керівник: Оксана Горішна, доктор філософії
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ЦИВІЛІЗАЦІЯ ТА ТЕХНІКА

СЕКЦІЯ 2. ІСТОРІЯ НАУКИ І ТЕХНІКИ 16

Ліда Крижанівська; Марта Похонська; Оксана Потіха, к.іст.н., доц. 16
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ВНЕСОК ЖІНОК-ВЧЕНИХ У РОЗВИТОК НАУКИ І ТЕХНІКИ В УКРАЇНІ РАДЯНСЬКОЇ ДОБИ

СЕКЦІЯ 3. СОЦІАЛЬНІ АСПЕКТИ ТЕХНІКИ ТА ТЕХНОЛОГІЇ 19

Damian Badzmirowski, M.A. in Psychology, M.Sc. in Psychotraumatology 19
Centrum Badań Rynkowych i Społecznych, Poland
Piotr Kardasz, Prof., Dr hab.
University College of Professional Education (WSKZ), Poland
HIGH SELF-ESTEEM AS A DRIVER OF JOB-SEEKING BEHAVIOR DURING THE EMPLOYEE NOTICE PERIOD

Oksana Horishna, Ph.D.; Pavlo Yakymuk 22
Scientific supervisor: Bohdan Andrushkiv, Prof.
Ternopil Ivan Puluj National Technical University, Ukraine
HUMANISM, INFORMATION SOCIETY AND DIGITAL CULTURE: OPPORTUNITIES AND THREATS

Paulina Kolisnichenko, Ph.D. of Economic Sciences, Vice Rector for International Cooperation; Polina Homon 24
WSHIU Academy of Applied Sciences, Poznan, Poland
ECONOMIC SUSTAINABILITY OF SMALL BUSINESS IN EU COUNTRIES AGAINST CONSTANT DESTABILIZING FACTORS

Євгеній Будевич, Богдан Калинюк, Микола Понуркевич 26
Науковий керівник: Євгенія Яворська, канд. техн. наук, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ІНТЕЛЕКТУАЛЬНІ БІОМЕДИЧНІ ТЕХНОЛОГІЇ ЯК ЕТИЧНИЙ ВИКЛИК СУЧАСНОЇ МЕДИЦИНИ

Аліна Воробець 27
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ВІД ІННОВАЦІЙ МАЙБУТНЬОГО ДО ЗАГРОЗ СУЧАСНОСТІ: АМБІВАЛЕНТНА РОЛЬ ШТУЧНОГО ІНТЕЛЕКТУ

Руслан Галушка 29
Науковий керівник: Леся Алексієвець, д-р істор. наук, проф.
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна
ДІДЖИТАЛІЗАЦІЯ АРХІВІВ ЯК ЧИННИК РОЗВИТКУ ГЕНЕАЛОГІЧНИХ ДОСЛІДЖЕНЬ В УКРАЇНІ

Юрій Гумен, канд. істор. наук, доц.; Єлизавета Заяць 31

Тернопільський національний технічний університет імені Івана Пулюя, Україна
СУЧАСНІ ТЕХНОЛОГІЇ ПІДБОРУ ПЕРСОНАЛУ
Христина Дармопук 33
Науковий керівник: Наталія Габруєва, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ФІЛОСОФІЯ ТВОРЧОСТІ В УМОВАХ РОЗВИТКУ ШТУЧНОГО ІНТЕЛЕКТУ
Дарина Дембовська; Тетяна Коберська, канд. філос. наук, доц. 36
Національний університет водного господарства та природокористування, Україна
ІНСТРУМЕНТАРІЙ ПОЗИТИВНОЇ ПСИХОТЕРАПІЇ ЯК ТЕХНОЛОГІЯ СМИСЛОТВОРЕННЯ
Даниїл Істомін; Василь Павлович 38
Науковий керівник: Наталія Габруєва, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ТЕХНОЛОГІЧНІ ІННОВАЦІЇ Й ЕТИЧНА ВІДПОВІДАЛЬНІСТЬ: ВИКЛИКИ ЕРИ АНДРОЇДІВ
Микола Мартиць 42
Науковий керівник: Оксана Горішна, доктор філософії
Тернопільський національний технічний університет імені Івана Пулюя
Scientific supervisor: Oksana Horishna, Ph.D
Олег Марцишко 44
Науковий керівник: Наталія Габруєва, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ГЕЙМІФІКАЦІЯ СУСПІЛЬНОГО ЖИТТЯ: ФІЛОСОФСЬКО-ПСИХОЛОГІЧНИЙ АНАЛІЗ МАНІПУЛЯТИВНИХ МЕХАНІЗМІВ
Неля Мотрук 46
Тернопільський національний технічний університет імені Івана Пулюя, Україна
НАУКОВО-ТЕХНІЧНИЙ ПРОГРЕС ТА МОРАЛЬ
Марія Паламар 50
Науковий керівник: Наталія Габруєва, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ШТУЧНИЙ ІНТЕЛЕКТ В ЖИТТІ ЛЮДИНИ, ПЕРЕВАГИ ТА НЕДОЛІКИ

СЕКЦІЯ 4. НАУКОВО-ТЕХНІЧНИЙ ПРОГРЕС: ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ 52

Magdalena Gorska, Founder; Oleksandr Sylkin, PhD in Management 52
WSHIU Academy of Applied Sciences, Poznan, Poland
KEY FEATURES OF ENERGY RESOURCE MANAGEMENT AT THE COUNTRY LEVEL IN EU
Oleh Marushchak 54
Politechnika Wrocławska, Polska
PERSPEKTYWNE ROZWÓJ I KIERUNKI WYKORZYSTANIA EGZOSZKIELETÓW
Huzaifa Sadi Yakasai; Dr. Fakhrun Jamal; Bello Musa Bello; Tijjani Adam Ahmad 56
Scientific supervisor: Dr. Fakhrun Jamal, Assistant professor at cse department mmu mullana Haryana
Shobhit University, India
BROWSER-BASED CLOUD STORAGE FORENSICS ON GOOGLE DRIVE ARTIFACTS IN FIREFOX
Bello Bello Musa; Dr. Fakhrun Jamal; Huzaifa Sadi Yakasai 65
Scientific supervisor: Dr. Fakhrun Jamal, Assistant professor at cse department mmu mullana Haryana
Shobhit University, India
THE ROLE OF CYBER FORENSICS IN ENHANCING POLICE INVESTIGATION
Тетяна Діділівська 72
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ШТУЧНИЙ ІНТЕЛЕКТ: МОЖЛИВОСТІ, РИЗИКИ ТА ЕТИЧНІ ВИКЛИКИ
Роман Золотий, канд. техн. наук, доц.; Юрій Поливаний; Ігор Харів; Євген Сорба 74
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ВИКОРИСТАННЯ ГВИНТОВОГО ПРИВОДУ ДЛЯ 3Д ДРУКУ МАТЕРІАЛІВ З ГРАНУЛ
Віталій Кушнір 75
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ФІЛОСОФІЯ ЗБРОЇ
Владислав Остапович 77
Науковий керівник: Оксана Сарнавська, канд.філос. наук, доц.
Національний університет водного господарства та природокористування, Україна

ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ У СУЧАСНОМУ ГРАФІЧНОМУ ДИЗАЙНІ: ВИКЛИКИ, ЗАСТОРОГИ ТА МОЖЛИВОСТІ
Еліанна Приймачук 79
Тернопільський національний технічний університет імені Івана Пулюя, Україна
НАУКОВО-ТЕХНІЧНИЙ ПРОГРЕС В ЕНЕРГЕТИЦІ: ІСТОРІЯ, ВИКЛИКИ ТА ПЕРСПЕКТИВИ РОЗВИТКУ
Юрій Роговой 82
Тернопільський національний технічний університет імені Івана Пулюя, Україна
AI: КОРИСТЬ ДЛЯ ЛЮДСТВА, ЧИ ПАСТКА?
Андрій Савчин 83
Віденський Університет, Австрія
Соломія Федорів
Науковий керівник: Тамара Чоп, асистент
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ОРИГІНАЛЬНІСТЬ У ДОБУ ШІ: МЕЖІ АВТОРСТВА ТА СПІВТВОРЧОСТІ З АЛГОРИТМАМИ
Роман Трут 85
Науковий керівник: Габрусєва Наталія, доктор філософії, доц.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
РОЗВИТОК ШТУЧНОГО ІНТЕЛЕКТУ В КОНТЕКСТІ НАУКОВО-ТЕХНІЧНОГО ПРОГРЕСУ
Ігор Чихіра, канд. техн. наук, доц.; Юрій Микитів; Назар Худецький; Владислав Яцюк 88
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ДОСЛІДЖЕННЯ СТРАТЕГІЇ РЕГУЛЮВАННЯ ТЕМПЕРАТУРИ ПРИ РОБОТІ СКЛАДСЬКИХ СИСТЕМ
Юрій Юрик 90
Науковий керівник: Ігор Вітик, канд. юрид. наук.
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ДО ПИТАННЯ ПОВЕРНЕННЯ ТЕРИТОРІЙ ЗАЙНЯТИХ ПІД СМІТТЄЗВАЛИЩА В ЕКОНОМІЧНУ ЕКСПЛУАТАЦІЮ ДЕРЖАВИ

СЕКЦІЯ 5. ПРИКЛАДНІ ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ **94**

Pawel Iljaszewicz 94
Wyższa Szkoła Kształcenia Zawodowego, Wrocław, Poland
APPLIED INFORMATION TECHNOLOGIES IN MODERN COMPUTER NETWORKS: FOUNDATIONAL FRAMEWORK AND EMERGING PARADIGMS
Ірма Білошицька 101
Науковий керівник: Оксана Сарнавська, канд.філос. наук, доц.
Національний університет водного господарства та природокористування, Україна
ДОСЯГЕННЯ НЕЙРОЕСТЕТИКИ У СФЕРІ ДИЗАЙНУ
Олег Волошин 103
Науковий керівник: Дмитро Медлатий, канд. техн. наук, доц.
Хмельницький національний університет, Україна
ВЕБ-ОРІЄНТОВАНА ІНФОРМАЦІЙНА СИСТЕМА БІБЛІОТЕКИ
Олександр Голотенко, канд. техн. наук, доц.; Віктор Бойчун; Іван-Мар'ян Смолій; Олександр Колесник 105
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ЗАСТОСУВАННЯ ІНТЕРНЕТУ РЕЧЕЙ ДЛЯ ОПТИМІЗАЦІЇ ЛОГІСТИЧНИХ ПРОЦЕСІВ ПРИ СКЛАДУВАННІ ПРОДУКЦІЇ
Аліна Захарчишина 107
Науковий керівник: Оксана Сарнавська, канд.філос.наук, доц.
Національний університет водного господарства та природокористування, Україна
ВЗАЄМОЗВ'ЯЗОК НЕЙРОМЕРЕЖ І ГРАФІЧНОГО ДИЗАЙНУ
Христина Лампіка 109
Науковий керівник: Оксана Сарнавська, канд.філос. наук, доц.
Національний університет водного господарства та природокористування, Україна
ГРАФІЧНИЙ ДИЗАЙН: ПОЄДНАННЯ ТВОРЧОСТІ ТА СУЧАСНИХ ТЕХНОЛОГІЙ
Роман Недашківський 110
Науковий керівник: Дмитро Медлатий, канд. техн. наук, доц.
Хмельницький національний університет, Україна
ФОРУМ-ОРІЄНТОВАНА ІНФОРМАЦІЙНА СИСТЕМА З ВИКОРИСТАННЯ ПСИХІАТРИЧНИХ ПРЕПАРАТІВ
Олександр Смолій; Андрій Микитишин, канд. техн. наук, доц.; Ростислав Королюк 113
Тернопільський національний технічний університет імені Івана Пулюя, Україна

ФІЛОСОФІЯ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ: ВПРОВАДЖЕННЯ ПРИНЦИПІВ ІНДУСТРІЇ 4.0/5.0 У ХАРЧОВОМУ ВИРОБНИЦТВІ
Ярослав Степанчук 114
Науковий керівник: Дмитро Медзатий, канд. техн. наук, доц.
Хмельницький національний університет, Україна
МОБІЛЬНО-ОРІЄНТОВАНА ІНФОРМАЦІЙНА СИСТЕМА ДЛЯ ВИЗНАЧЕННЯ ПСИХІЧНОГО СТАНУ ПАЦІЄНТА
Олексій Шинкарук 117
Науковий керівник: Дмитро Медзатий, канд. техн. наук, доц.
Хмельницький національний університет, Україна
ІНФОРМАЦІЙНА ВЕБ-СИСТЕМА ДЛЯ ЕФЕКТИВНОГО РОЗПОДІЛУ АУДИТОРІЙ З УРАХУВАННЯМ ОСОБЛИВОСТЕЙ ОСВІТНІХ КОМПОНЕНТІВ ТА ПАРАМЕТРІВ ДОСТУПНОСТІ

СЕКЦІЯ 6. ФІЛОСОФІЯ ІНЖЕНЕРНОГО МИСЛЕННЯ 119

Олег Гавришюк 119
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна
ЧИННИКИ ФОРМУВАННЯ ПРОФЕСІЙНОЇ ВІДПОВІДАЛЬНОСТІ ЗДОБУВАЧІВ ВИЩОЇ ОСВІТИ ІТ-ПРОФІЛЮ
Богдан Лаврин 121
Науковий керівник: Оксана Горішна, доктор філософії
Тернопільський національний технічний університет імені Івана Пулюя, Україна

СЕКЦІЯ 7. ЦИФРОВІЗАЦІЯ ОСВІТИ: ЗАГРОЗИ ТА МОЖЛИВОСТІ 122

Emmanuel Da-silva 122
Scientific supervisor: Oksana Horishna, Ph.D
Ternopil Ivan Puluj National Technical University, Ukraine
DIGITAL TRANSFORMATION OF THE MANAGEMENT SYSTEM OF HIGHER EDUCATION IN THE CONTEXT OF HUMANIZATION OF SOCIETY
Мар'ян Канчуга, ст. викладач 124
Національна академія сухопутних військ імені гетьмана Петра Сагайдачного, Україна
ЦИФРОВІЗАЦІЯ ПІДГОТОВКИ МАЙБУТНІХ ОФІЦЕРІВ ЗСУ ДО ІНШОМОВНОЇ КОМУНІКАЦІЇ
Арсеній Статок 126
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ШТУЧНИЙ ІНТЕЛЕКТ У ЦИФРОВІЙ ОСВІТІ: ПОТЕНЦІАЛ, ОБМЕЖЕННЯ ТА ЛЮДСЬКИЙ ФАКТОР
Андрій Тимчук 128
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна
ЦИФРОВІЗАЦІЯ ПІДГОТОВКИ МАЙБУТНІХ ПЕДАГОГІВ ПРОФЕСІЙНОГО НАВЧАННЯ ЯК ІННОВАЦІЙНА СТРАТЕГІЯ ФОРМУВАННЯ ГРАФІЧНОЇ ГРАМОТНОСТІ
Ігор Чикало 130
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна
АВТОНОМНІ ЛОКАЛЬНІ СЕРВЕРИ ЯК ЗАСІБ ПРЕВЕНЦІЇ І ПОДОЛАННЯ ОСВІТНІХ ВТРАТ
Анастасія Шведик 132
Науковий керівник: Леся Алексієвець, д-р істор. наук, проф.
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна
ІСТОРИЧНА ОСВІТА В ЕПОХУ ЦИФРОВІЗАЦІЇ: ТРАНСФОРМАЦІЯ СПРИЙНЯТТЯ МИНУЛОГО

СЕКЦІЯ 8. ТЕХНІКА В УМОВАХ ВІЙНИ: УКРАЇНСЬКИЙ КОНТЕКСТ 135

Piotr Kardasz, Prof., Dr hab. 135
University College of Professional Education (WSKZ), Poland
Piotr Jednaszewski PhD, EdD
St Mary`s Institute Ltd., Dublin, Ireland
COMMUNICATION IN THE AGE OF DIGITAL CONFLICT: PEACE EDUCATION FACING THE PHILOSOPHICAL AND SOCIAL CHALLENGES OF TECHNOLOGICAL PROGRESS
Юрій Дудун 142
Галицький фаховий коледж імені В'ячеслава Чорновола, Україна
Оксана Потіха, канд. істор.наук, доц. 142
Тернопільський національний технічний університет імені Івана Пулюя, Україна
ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ВІЙСЬКОВОГО ВИРОБНИЦТВА ШЛЯХОМ ВПРОВАДЖЕННЯ РОБОТИЗОВАНИХ СИСТЕМ
Мар'яна Курило 145

нові системи, механізми, програмне забезпечення та інфраструктуру, що формують основу сучасного світу. Завдяки їхній праці з'являються енергетично ефективні технології, системи автоматизації, засоби комунікації та безпечні конструкції. Беззаперечно, що технічні рішення тісно пов'язані з потребами суспільства, тому інженерію як галузь знань розглядаємо не лише і як утилітарний інструмент, і як соціокультурний феномен [1].

Інженерна діяльність є рушійною силою інновацій, адже саме інженери перетворюють наукові відкриття на практичні рішення. У час глобалізації та цифрової трансформації вони виступають посередниками між наукою, бізнесом і суспільством, забезпечуючи впровадження стійких технологій для покращення якості життя людини. Інженерна діяльність, у наш час, відображає не лише технологічні аспекти, а й культуротворчу силу, адже вона втілює креативність думок та поглядів, інтелект і цінності епохи.

Сучасний інженер має бути не лише технічним фахівцем, стратегом, гуманістом який здатен оцінювати екологічні, соціальні та етичні наслідки своєї роботи і їх вплив на навколишнє середовище. Він працює в умовах глобальної взаємодії, інтегруючи знання з фізики, IT, економіки, екології та соціальних наук. Від його рішень залежить безпека, екологічна рівновага, якість життя суспільства. Формування критичного мислення, екологічної свідомості та комунікативних навичок забезпечує стійкий розвиток і людяність технічної діяльності. Професійна етика інженера є важливим чинником гуманізації технічного прогресу. Вона визначає траєкторії розвитку енергетики, транспорту, IT, медицини, забезпечує баланс між технологічним поступом і збереженням природи. Важливою стає міждисциплінарність: поєднання технічних знань із економікою, менеджментом, екологією, соціологією та інформаційними технологіями.

Отже, в умовах всьогодення професія інженера – це не лише про технічну спеціальність, але і гуманізм, людиноцетричність, як ключ до сталого розвитку та майбутнього глобалізованого суспільства знань.

У майбутньому професія інженера стає ще більш міждисциплінарною та глобальною. Інженери працюватимуть із штучним інтелектом, робототехнікою та «зеленими» технологіями, поєднуючи технічні знання з екологічною та соціальною відповідальністю. Зростатиме роль інженера як творця сталого та безпечного майбутнього, здатного враховувати потреби суспільства й планети. Професія вимагатиме постійного навчання, критичного мислення та гуманістичного підходу до технологічного прогресу. Таким чином, інженер XXI століття стає не лише технічним фахівцем, а й архітектором цивілізаційного розвитку.

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Секція 7. ЦИФРОВІЗАЦІЯ ОСВІТИ: ЗАГРОЗИ ТА МОЖЛИВОСТІ

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DIGITAL TRANSFORMATION OF THE MANAGEMENT SYSTEM OF HIGHER EDUCATION IN THE CONTEXT OF HUMANIZATION OF SOCIETY

Abstract.*The article deals with the digital transformation of the management system of higher education institutions in the conditions of humanization of society. Attention is emphasized on the*

impact of digital technologies on improving management efficiency, quality of education and personalization of the educational process. It is shown that digitalization is an important factor in university adaptation to the challenges of globalization, military and economic crises.

Keywords: *digitalization, education management, humanization university.*

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ЦИФРОВА ТРАНСФОРМАЦІЯ СИСТЕМИ УПРАВЛІННЯ ВИЩОЮ ОСВІТОЮ В КОНТЕКСТІ ГУМАНІЗАЦІЇ СУСПІЛЬСТВА

In today, the Ukrainian education system is undergoing significant transformations caused by globalization, development of information and communication technologies, increasing requirements for mobility and personalization of education, as well as the need to respond rapidly to social and economic changes that are related to military processes and economic crisis. These processes have led to the fact that universities are forced to adapt their management systems by introducing digital technologies to improve the efficiency and quality of learning.

Digital tools allow you to automate administrative processes, improve communication between students and staff, personalize the educational process and provide a more humane, personality-oriented approach to education (Horishna, 2025). In addition, Digital Education Policies – strategic framework, developed by governments and educational institutions, determine the integration of technologies into educational systems, ensure accessibility, equality and quality of education, form digital competencies inclusive digital educational environment.

This approach is also supported international, as Digital Education Action Plan (2021–2027) shows the European Commission, which establishes a joint vision and 14 specific actions for the development of high quality, inclusive and affordable digital education in Europe. The plan emphasizes the need for cooperation at the EU level and support of teachers, students, politicians, academic institutions and researchers at national, European and international levels (European Commission, 2025).

Examples of digital programs and platforms used in higher education institutions:

– Moodle and Canvas- Learning Management Systems (LMS), which allow teachers to create online courses, publish learning materials, organize students' testing and control. They also make it possible to track students' progress, keep electronic journals and provide interactive interaction through forums and chats;

– Microsoft Teams and ZOOM – platforms for online meetings and video conferencing, allowing lectures and seminars in real time, organizing group work and discussion, exchange files and communicating both inside the group and between different units of the university;

– Atutor (TNTU) is a university local platform that integrates distance learning functions and students' online support. It allows teachers to place learning materials, test, monitor students' performance, and students – to receive advice and educational support in a convenient digital environment;

– 1C: management of the educational institution – software for the automation of administrative and financial processes of the university. This includes keeping students' accounting, class schedule, salary, financial transactions and reporting, which greatly simplifies management functions and increases the efficiency of the administration;

– Power Bi and Tableau are modern tools for analytics and data visualization. At the university they are used to analyze educational and administrative indicators, to prepare reports, to identify trends and problems in the educational process, which allows management to make sound management decisions;

– Google Workspace for Education – a cloud package of services that includes Gmail, Google Drive, Google Docs, Google Sheets, Google Meet and other tools. It provides joint work on documents, organization of video conferencing, storage and exchange of information, which greatly facilitates communication between students and teachers, and promotes distance learning.

The humanization aspect of digital transformation is manifested in increasing the availability of education, the development of an inclusive environment, facilitating communication and taking into account the individual needs of students and teachers. Further scientific search can focus on evaluating the effectiveness of digital platforms, the impact of digitalization on the humanization of education, the socio-psychological consequences of distance learning, the use of analysts for management decisions, comparative studies between universities and the implementation of innovative adaptive and interactive teaching methods.

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ЦИФРОВІЗАЦІЯ ПІДГОТОВКИ МАЙБУТНІХ ОФІЦЕРІВ ЗСУ ДО ІНШОМОВНОЇ КОМУНІКАЦІЇ

Анотація. *У статті обґрунтовано актуальність цифровізації іншомовної підготовки майбутніх офіцерів ЗСУ в умовах трансформації сектору безпеки й оборони та зростання вимог до міжнародної військової комунікації. Цифровізація іншомовної підготовки майбутніх офіцерів ЗСУ забезпечує підвищення ефективності навчання, розвиток професійної мобільності, оперативність комунікації в міжнародному військовому середовищі та збільшує здатність військовослужбовців діяти в умовах глобалізованого інформаційного простору. Це є фундаментальною умовою підготовки сучасних офіцерів, здатних виконувати службові обов'язки на рівні вимог НАТО та ефективно взаємодіяти у багатонаціональних підрозділах.*

Ключові слова: *іншомовна підготовка, майбутні офіцери, цифровізація, цифрові освітні технології, міжкультурна комунікація.*

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DIGITALIZATION OF THE TRAINING OF FUTURE OFFICERS OF THE ARMED FORCES OF UKRAINE FOR FOREIGN-LANGUAGE COMMUNICATION

Нині компетентнісна парадигма освіти є базисом стандартів вищої освіти. Протягом останнього десятиліття природа професійної діяльності істотно змінилася, що виявилося в динаміці обміну інформації в суспільстві. Саме тому науковий світ визначає вектор трансформації освіти в цифрову сферу, вирівнюючи технологічний базис і співвідношення між гуманітарним і технічним навчанням, розвиваючи персоналізовану компетентнісну парадигму. У результаті інноваційний розвиток сучасного світу, темпи оновлення та обміну знань спричинюють в умовах цифровізації розмивання кордонів сфер професійної діяльності у цивільному та військовому співтоваристві. Тому цифрова трансформація активно формує