



**EXPLORING
THE DIGITAL LANDSCAPE:
INTERDISCIPLINARY PERSPECTIVES**



EXPLORING THE DIGITAL LANDSCAPE: INTERDISCIPLINARY PERSPECTIVES

Monograph

*Edited by Olha Blaha
and Iryna Ostopolets*

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The University of Technology in Katowice Press
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tel. (32) 202 50 34; fax: (32) 252 28 75
email: kontakt@wydawnictwo.wst.pl
www.wst.pl, www.wydawnictwo.wst.pl

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PREFACE

The digital transformation of modern society brings with it many challenges and opportunities that require attention and analysis by scholars and practitioners. In this context, the monograph on Digital Economy and the Information Society is an important addition to the modern scientific discourse. In a world where technologies are rapidly evolving and the impact of digital innovations is felt in all spheres of life, it is important to have a deep understanding of these processes and their possible consequences. The monograph provides an opportunity to explore in depth various aspects of digital transformation, ranging from an interdisciplinary view of digitalisation to innovative approaches in digital healthcare and rehabilitation. Thus, this collective work opens up wide horizons for understanding current trends in the digital economy and information society and is a valuable source of knowledge for both scholars studying these issues and practitioners seeking to understand and implement digital innovations in applied activities.

The monographic study presents the results of scientific developments of the team of authors, which consider various aspects and directions of the use of information and innovative technologies in the modern economy. Among these areas are an interdisciplinary approach to digital transformation and management, strategies for the development of education in the digital age, innovations in management and economics on the digital frontier, innovative methods in digital healthcare and rehabilitation, as well as the use of artificial intelligence and innovative approaches in the modern digital society.

The first part of the monograph addresses issues related to an interdisciplinary view of modern digitalisation and management. The authors offer an interesting and in-depth analysis of current trends in digitalisation and their impact on governance. Particular attention is paid to the digitalisation and management of the modern educational process, software for managing the electronic workload of a household, optimisation of the stages of management decision-making to minimise the impact of uncertainty, analysis of the essence and strategic importance, forecasting the formation of innovative and entrepreneurial competence in future education managers, and information technology as a driver of tourism business development.

The issues covered explore this management process and development strategy from different disciplinary perspectives, which allows for a more complete understanding of the digital economy.

The second part of the monograph is devoted to the development of education in the digital age, in which the authors offer innovative ideas and strategies for using digital technologies in modern education. They thoroughly examine the impact of digital transformation on educational processes and propose effective methods for its implementation. This section focuses on issues related to the competence-based approach to the development of digital information security skills in the educational environment, the transformation of the education system in preparation for the digital era, the psychological characteristics of adaptation of Ukrainian adolescents to the conditions of studying at a foreign school, the development of soft skills of students, psychological factors of procrastination in students, and the formation of environmental competence of a future teacher of labour training in a higher pedagogical school. In other words, this section raises topical issues related to the formation of an educational environment that plays an important role in preparing modern youth for life in the era of rapid technological change and globalisation.

The third part of the monograph, "Navigating the Digital Frontier: Innovations in Management and the Economy," reflects an innovative approach to management in the digital economy. In other words, this chapter demonstrates how modern technologies can be successfully used to improve the efficiency of management processes and stimulate economic growth. This section focuses on the restructuring of the management infrastructure at the digital financial border, the use of digital technologies to manage the environmental safety of the waste management process during emergencies, the smart concept of regional spatial development policy in the context of digitalisation, the study of the dynamic growth of the startup ecosystem: the experience of developed economies, the peculiarities of using Amazon web services as digital tools for modern business, and the management of banking business in the context of digital transformation. Thus, this part of the study provides an in-depth and comprehensive overview of the various aspects of digital transformation and its impact on various spheres of life and activity.

In the part "Innovative approaches in digital healthcare and rehabilitation", the authors implement digital solutions to improve the quality of medical services and patient support. Attention is paid to the ways of digitalisation in medical applications, methodological principles of forming the information and digital culture of future specialists in the field of physical culture and sports, the use of art therapy with the help of video information in the rehabilitation of post-stroke patients, the peculiarities of physical therapy for people with post-traumatic gonarthrosis in the post-acute rehabilitation period, the peculiarities of setting SMART goals in working with military personnel with visual injuries, the use of virtual technologies in the preparation of medical.

In the final part, "Artificial Intelligence and Innovative Educational Approaches in the Digital Society," the authors propose innovative approaches to the use of artificial intelligence in curricula and learning environments. The peculiarities of using artificial intelligence in the processes of training and assessment of web programmers in IT companies, the impact of artificial intelligence on the digitalisation of society, trends in the use of artificial intelligence in higher education institutions, methodological approaches to the formation of information security in the context of information warfare, training of primary education students to form information security of primary school students in the context of information warfare, the use of unmanned aerial vehicles by fire and rescue services, etc. are studied in detail. In this section, the authors focus on various aspects of the use of artificial intelligence in the processes of education, assessment of web programmers, digitalisation of society and information security in the context of information warfare.

The monograph is a valuable contribution to the study of modern aspects of the digital economy and information society. The authors examine key topics in detail and offer interesting ideas and solutions. The work will be useful for scholars, practitioners and students interested in the development of the digital sphere.

Editorial Board

5.6. Ecological safety of transport as a component of national security of Ukraine during armed aggression and as a prerequisite for a «green» transition during post-war reconstruction

Introduction

Vehicles are an integral and essential component of the economic activity of modern urban systems. The economic, anthropogenic, and ecological components of its safety depend on the quantitative and qualitative composition of the fleet of vehicles of the urban system equipped with reciprocating internal combustion engines (RICE), both on a regional scale and on the scale of the entire country, thus it is already about the issue of ensuring a certain level of national security in both peacetime and the times of war (Vambol, 2015; Vambol, 2017a; Vambol, 2018).

The analysis of the materials of publications and reports of the sections of the World Congresses of the Society of Automotive Engineers of the USA (SAE), which are devoted to the issues of ensuring a certain level of ecological safety (ES) of the process of exploitation of RICE, for the period from 1991 to 2020, shows that at this time (the last 30 years) the following trends were observed in the area of the mentioned issue (Vambol, 2015):

- dieselization of the global and domestic vehicle fleet;
- coverage of environmental standards of new types of vehicles, and with them also their RICE;
- introduction of environmental standards in countries of the world where such standards did not exist yet;
- the transition from normalization of exhaust gas (EG) opacity to normalization of the mass emission of particulate matters (PM) in EG flow;
- focusing attention on the fractional composition of PM as a legally regulated pollutant in the composition of the EG flow by mass, by the area of the active surface, and by count (by the number of individual particles);
- emphasis on the chemical composition and internal structure of PM;

- transition from the technology of simple filtration of EG and their catalytic oxidation to the use of complex toxicity reduction systems;
- the desire for modularity and compactness of EG toxicity reduction systems and their executive devices;
- solving the problem of cold start of RICE, large and small breathing of fuel reservoirs, blowing of crankcase gases;
- improvement of ceramic materials for the substrate of catalytic converters and particulate matter filters (DPF);
- transition from all-ceramic filter elements to structures with a cellular structure with gas-permeable walls of the channels blocked in a checkerboard pattern;
- in-depth study of the catalytic properties of platinum group metals and their combinations;
- search, research and implementation in the production of materials for filter elements, alternative to ceramic ones: fibrous, fillings, coils, woven and non-woven steel meshes, membranes;
- development and application of various options for the implementation of a complex approach to reducing the toxicity of EG, which involves the improvement of not only the system of their purification, but also the systems involved in the organization of the working process of RICE, as well as improving the quality of motor fuels and oils;
- development and implementation of measures to bring the toxicity indicators of vehicles in exploitation to the level of the newly introduced norms;
- integration of the RICE EG toxicity reduction system into the electronic control system of RICE or vehicle;
- mathematical modeling of the mechanisms of formation of toxic components of EG, in particular PM, in the working process of RICE;
- mathematical modeling of the processes that take place in EG during their movement through the exhaust tract of the RICE;
- mathematical modeling of the processes that occur during the regeneration of the I and II types in the DPF.

Thus, the scientific complexity of the approaches to the implementation of the above trends and the range of scientific and technical problems in the environmental issues of vehicles and RICE, which are part of them, indicates that this issue is extremely relevant in countries with developed engine and automobile manufacturing.

The main trend can be considered a consistent decrease in the mass emission of PM with the RICE EG flow, which is caused by a significant strengthening of the legally established requirements for power plants (PP).

In connection with the above, *the purpose of the study* can be formulated as determination of aspects of assessment and provision of the necessary level of ES of exploitation of transport, in particular units of fire and emergency rescue vehicles, as a component of Ukraine's national security in times of armed aggression and as a prerequisite for a «green» transition in times of post-war reconstruction.

The object of the study is ES of the exploitation of transport, in particular units of fire and emergency rescue vehicles, as a component of the national security of Ukraine.

The subject of the study is the aspects of assessment and provision of the necessary level of indicators of the object of the study in times of armed aggression and as a prerequisite for a «green» transition in times of post-war reconstruction.

To achieve the purpose of the study, the following *research tasks* must be accomplished.

1. To analyze the structure of the vehicle fleet of Ukraine.
2. To determine the range of main problems of ensuring the implementation of legislatively established norms of ES of FERV with RICE in Ukraine.
3. To clarify the classification of EB factors, the source of which is RICE.
4. To analyze the influence of RICE fuel consumption on the ES indicators of the process of their exploitation.

The structure of the fleet of motor vehicles of Ukraine.

As of 2024, the structure of the vehicles park of Ukraine is dominated by the objects that have been exploited for a long time, i.e., that have reached a high degree of moral and physical wear and tear, but, despite everything, cannot be decommissioned for various reasons – these are agricultural and military machinery, FEVR, construction and road machines, as well as locomotive, ship and small aviation RICE (Vambol, 2015).

The average life of a car in the countries of the European Union is 8 years, in Ukraine this indicator for domestic vehicles brands is at the level of 14-16 years, and for foreign cars – 10-12 years. As of 2024, the car fleet of Ukraine consisted of the following segments: up to 5 years – 22%, 6-8 years – 10%, over 9 years – 68%, which is explained by the fact that for more than 2 years of active hostilities on the territory of our country, a lot of various equipment has been imported (Vambol, 2015). At the same time, the Ukrainian car market is far from being saturated. On average, the rate of motorization in Ukraine is 130 cars per 1,000 inhabitants (in the countries of the European Union, it is 400-600 cars per 1,000 inhabitants). As of 2024, the size of the car fleet of Ukraine was about 6 million motor vehicles (Vambol, 2015). The average service life of a motor vehicle unit in the Ukrainian fleet as of 01. 01. 2001 was 17.1 years, as of 01. 01. 2006 – 18.5 years (historical maximum), as of 01. 01. 2015 – 18.2 years (Vambol, 2015).

It is common knowledge that the technical level of RICE in exploitation corresponded to the level of development of the sub-industry at the time of release, but does not meet modern requirements for fuel efficiency, cost of maintenance and repair, reliability. It is impossible to achieve a radical increase in these characteristics through modernization.

However, the requirements for ES indicators are irrelevant to the period of exploitation of vehicle with such RICE, they are allowed to operate only with the introduction of economic sanctions for their owners – fines, increased taxes and fees, non-granting of benefits and preferences, partial or complete ban

on the exploitation of motor vehicles. This leads to the need to develop methods of bringing the ES indicators of the RICE of earlier years of production to the requirements of modern standards.

In the structure of our country's vehicle fleet, there is a fairly large number of foreign-made vehicles, which, according to the documentation, are equipped with regular systems for reducing EG toxicity, but in practice many of them no longer have such systems. This happens due to the very expensive repair of such systems, which are prone to the negative impact of HV, which were formed from low-quality fuels, and which are also prone to thermal destruction. Two more reasons for this phenomenon are the lack of state supervision over the implementation of legally established norms of toxicity of EG and the lack of qualified personnel in the staff of official representative offices of foreign brands.

Usually, after the failure of such a system, it is completely dismantled from the vehicle board together with pressure and temperature sensors of EG, oxygen in EG and replaced with a section of the pipeline and a so-called emulator of the operation of the EG cleaning system (with reconfiguration of the electronic control unit (ECU)). The emulator generates signals from the sensors of the exhaust system of the RICE in their physical absence according to the program embedded in it and submits them to the ECU of the RICE or vehicle. At the same time, the ECU for vehicle models, which differ only in the presence of an EG cleaning system, have a different architecture and are not interchangeable. The costs of physical and software removal of the DPF are \$400-700 depending on the separation of the DPF housing and the possibility of separating the filter element from it. It is difficult to reliably and accurately estimate the number of vehicles equipped with emulators (Vambol, 2015).

The main problems of ensuring the implementation of the legally established norms of ES of vehicles with RICE in Ukraine

As indicated above, in the territories of Ukraine and the countries of the European Union, there are legally established norms of ES level indicators of vehicles, FERV and special equipment equipped with diesel RICE (Vambol, 2015;

Vambol, 2017a; Vambol, 2018). These are UNECE Regulations No. 49 (for vehicles) and No. 96 (for special equipment) of EURO III, IV, V and VI levels, respectively (Regulation № 49, 2011, Regulation № 96, 2015). These documents provide the maximum allowable values of the mass emission of standardized pollutants in EG flow of diesel RICE, testing methods, a list and parameters of test cycle regimes, the type and characteristics of measuring equipment.

However, it is currently not possible to monitor compliance with the requirements of these standards for both new units of cars, FERV and special equipment, as well as for such facilities that are in exploitation. Accordingly, it is practically impossible to apply appropriate sanctions to car owners whose vehicles and special equipment do not meet these standards, as well as to remove such objects from exploitation. This condition is caused by the following reasons (Vambol, 2015):

1. Cancellation of annual mandatory technical inspections of vehicles and special equipment in the departments of the National Police of the Ministry of Internal Affairs of Ukraine. Radical reform of the structure of the Ministry of Internal Affairs of Ukraine, disbandment of the State Traffic Inspection.

2. Abolition of the procedure for checking the toxicity indicators of vehicles and special equipment at stationary traffic police stations, as well as control of the mass of cargo of large-tonnage transport.

3. Absence of mandatory certification studies of vehicles units and special equipment imported into the territory of Ukraine or following its territory in transit at customs entry points.

4. Lack of certified modern means of research and control of toxicity indicators of RICE EG flow of such equipment in sufficient quantity both on the market and in laboratories of scientific institutions and higher educational institutions.

5. Lack of actual quality control of fuel and lubricants produced at domestic oil refineries or imported from abroad and sold by networks of gas stations.

6. Absence of state incentives to comply with such norms: provision of tax benefits, discounts on parking and fuel, simplified documentation procedures, etc.

7. Absence of a state order to produce social advertising products, which clarifies and popularizes this issue and affects the level of civic consciousness of car owners, the culture of exploitation, etc.

8. Lack of offers on the market of certified systems and separate units for reducing the toxicity of RICE EG flow and special domestically produced equipment of appropriate quality and low cost.

9. Absence of a state order for the development by domestic scientists and the introduction into production at domestic industrial enterprises of systems for the purification of RICE EG flow, means of research and control of the quantitative and qualitative composition of EG, methods and stands for testing vehicles and their RICE.

10. Absence of a legal ban on the use of so-called emulators of the operation of RICE EG cleaning systems, which programmatically simulate their presence in the event of their faulty operation or absence.

11. The economic and political situation in Ukraine since the end of 2013, especially from February 24, 2022, and until now has relegated the issue of ES of the transport exploitation process to secondary positions.

12. The legislative uncertainty of the status of the so-called «blahas», that is, vehicles that are in active exploitation on the territory of Ukraine and the actual owners of which are citizens of Ukraine, but according to documents and state license plates, these vehicles are under the jurisdiction of other countries, in particular the countries of the European Union, and their owners are foreigners.

So, as it follows from the above, a legal conflict has occurred in our country – the presence of legally established norms, on the one hand, and the absence of real levers of influence – on the other, which are used by car owners and operating organizations, maliciously not complying with the above-mentioned norms.

The main ways to improve such situation are those that naturally follow from the formulation of the above problems. The prerequisites for solving some of them are laid in the work of domestic scientists. Some of the studies ended with the creation of appropriate devices, i.e. «in metal». So, in particular, in the previous

works of the author of this study, the following were considered: the problem of creating modern measuring equipment for determining the parameters of EG toxicity; the problem of neutralization of products of incomplete combustion of fuel in EG by a catalytic neutralizer; the problem of cleaning EG from PM by DPF with liquid working body; the problem of cleaning EG from PM by DPF with a filling made of natural sorbents (Vambol, 2015; Vambol, 2017a; Vambol, 2018; Kondratenko, 2015; Vambol, 2017b).

However, problems related to the creation of appropriate legal support can be solved exclusively at the legislative level.

Improved classification of ES factors, the source of which is vehicles with RICE

The author proposed a classification of ES factors (Vambol, 2015), the source of which is vehicles with RICE, however, in view of the results of further research (Vambol, 2017a, Vambol, 2018), its structure was expanded, clarified and ordered according to the theory of hierarchical structures and the principle of decimal division. The improved classification of ES factors, the source of which is vehicles with RICE, is presented in Table 1.

In this classifier:

- positions A.a.1.1, A.a.1.2, B.c (highlighted in green color) – EHF taken into account by the original mathematical apparatus of the complex fuel-ecological criterion of Prof. Igor Parsadanov K_{fe} (Parsadanov, 2003);

- positions A.a.2.1–A.a.2.3, A.a.3.1–A.a.3.3, B.a.1, B.a.2 (highlighted in gray color) – EHF that appear in the process of accident-free exploitation of the RICE and can be taken into account by the improved mathematical apparatus of the K_{fe} criterion;

- positions A.b.1.1, A.b.1.2, A.b.2.1, A.b.2.2, A.b.3.1, A.b.3.2, B.a.3, B.b.1–B.b.3, C.a–C.c (highlighted in orange color) – factors that do not manifest themselves in the process of accident-free exploitation of RICE and cannot be taken into account by the original and improved mathematical apparatus of the K_{fe} criterion, to take them into account should be developed another criteria-based mathematical apparatus.

*Table 1. Hierarchical classifier of EHF,
the source of which is RICE as part of the PP*

Classification code	FACTOR OF ECOLOGICAL HAZARD	Current status
A	POLLUTANTS	2 out of 14
<i>A.a</i>	<i>Gaseous and aerosol substances-pollutants</i>	<i>2 out of 8</i>
<i>A.a.1</i>	<i>Legislative regulated directly</i>	<i>2 of 2</i>
<i>A.a.1.1</i>	Emission of products of incomplete combustion of motor fuel in the flow of EG aerosol (C _n H _m , CO, PM)	Yes
<i>A.a.1.2</i>	Emission of products of complete combustion of motor fuel, in the flow of EG aerosol (NO _x)	Yes
<i>A.a.2</i>	<i>Legislative regulated indirectly</i>	<i>0 out of 3</i>
<i>A.a.2.1</i>	Emission of sulfur oxides in the EG aerosol flow (SO _x)	No
<i>A.a.2.2</i>	Emission of surfactants and heavy metal compounds in the flow of EG aerosol (benz(a)pyrene, PAH, TES)	No
<i>A.a.2.3</i>	Emission of greenhouse gases in the EG aerosol flow (CO ₂ , H ₂ O, CH ₄ , NO _x)	No
<i>A.a.3</i>	<i>Legislative not regulated</i>	<i>0 out of 3</i>
<i>A.a.3.1</i>	Emission of motor fuel and oil vapors caused by large and small reservoir breathing phenomena	No
<i>A.a.3.2</i>	Emission of an aerosol of crankcase gases	No
<i>A.a.3.3</i>	Increase in humidity of atmospheric air (H ₂ O)	No
<i>A.b</i>	<i>Liquid pollutants</i>	<i>0 out of 6</i>
<i>A.b.1</i>	<i>Flammable and explosive</i>	<i>0 out of 2</i>
<i>A.b.1.1</i>	Pollution of NE with motor fuel	No
<i>A.b.1.2</i>	Pollution of NE with motor oil	No
<i>A.b.2</i>	<i>Non-flammable</i>	<i>0 out of 2</i>
<i>A.b.2.1</i>	Pollution of NE with coolant	No
<i>A.b.2.2</i>	Pollution of NE with brake fluid	No
<i>A.b.3</i>	<i>Consistent</i>	<i>0 out of 2</i>
<i>A.b.3.1</i>	Pollution of NE with consistent lubricants	No
<i>A.b.3.2</i>	Pollution of NE with preservation liquids	No
B	HARMFUL INFLUENCE FACTORS	1 out of 6
<i>B.a</i>	<i>Energy pollution of NPS</i>	<i>0 out of 3</i>
<i>B.a.1</i>	Pollution of NE by noise and vibration	No
<i>B.a.2</i>	Pollution of NE by heat	No
<i>B.a.3</i>	Pollution of NE by electromagnetic fields	No
<i>B.b</i>	<i>Information pollution of NPS</i>	<i>0 out of 3</i>
<i>B.b.1</i>	Pollution of NE with false information	No
<i>B.b.2</i>	Pollution of NE with informational noise	No
<i>B.b.3</i>	Pollution of NE by disturbing factors	No
<i>B.c</i>	<i>Consumption of a non-renewable source of energy</i>	<i>yes, 1 out of 1</i>
C	WASTE (SOLID POLLUTANTS)	0 out of 3
<i>C.a</i>	Pollution of NE with alloys of ferrous and non-ferrous metals	No
<i>C.b</i>	Pollution of NE with polymer and composite materials	No
<i>C.c</i>	Pollution of NE with glass and ceramic substances	No

(Source: Vambol, 2017a)

Analysis of the influence of RICE fuel consumption on ES factors of the vehicle exploitation process

Although engine fuel consumption is not considered an ES factor, its value has a significant impact on the entire known spectrum of such factors.

The analysis of the specialized scientific and technical literature revealed that the fuel consumption of RICE both in the form of the average operational value of the mass hourly fuel consumption G_{fme} (in kg/h) (has an extensive effect) and in the form of the average operational value of the specific effective mass hourly consumption of fuel g_{eme} (in kg/(kW·h)) (has an intensive effect), unambiguously characterizes all aspects of the ES level of the process of exploitation of vehicle with RICE.

Other conditions described above being equal, this effect manifests itself as follows.

The results of the analysis, above all, make it possible to supplement and clarify the classification of types of pollution of environment from RICE as part of vehicle, presented in the monograph (Vambol, 2015) (see Table 1) and distributed in the case of accident-free exploitation.

1. Motor fuel of petroleum origin is a non-renewable source of energy. Therefore, the lower the value of G_{fme} and g_{eme} , the higher the level of ES of the evaluated process on a global scale (Vambol, 2015; Vambol, 2017a; Vambol, 2018; Parsadanov, 2003).

2. The source of some types of legally regulated pollutants in the flow of EG, products of incomplete combustion, namely unburned gaseous hydrocarbons of motor fuel and oil C_nH_m , carbon monoxide CO, particulate matter PM, are exothermic oxidation-reduction reactions of fuel combustion carried out in conditions of distant from ideal. Therefore, the more complete these reactions are (which means lower values of G_{fme} and g_{eme}), the higher the level of ES of the evaluated process (Vambol, 2015; Vambol, 2017a; Vambol, 2018; Parsadanov, 2003).

3. Motor fuel contains atomic and bound sulfur, the amount of which is limited by relevant regulatory documents (GOST 4840:2007, 2007). This means that

the mass hourly emission of sulfur oxides SO_x in the EG flow is also a regulated pollutant, albeit indirectly. Therefore, the smaller the value of G_{fme} , the lower the amount of emission of this pollutant, and the higher the level of ES of the evaluated process (Vambol, 2015; Vambol, 2017a; Vambol, 2018; Parsadanov, 2003). The value of g_{eme} affects the ratio between SO_x and other sulfur compounds in the EG flow, shifting the balance towards SO_x .

4. The traditional design of the RICE with a crank-connecting mechanism is a powerful source of noise and vibrations (factors of external imbalance) (Vambol, 2015), the intensity of which is higher, the greater the indicator power produced by the RICE in the operating regime. Both of these ES factors are inherently dissipative processes. Therefore, the smaller the value of G_{fme} and g_{eme} , the higher the level of ES of the evaluated process.

5. Any RICE is a thermal machine, and all the energy released during the process of combustion of motor fuel in the combustion chamber in the working process during operation is one way or another ultimately transformed into thermal energy and transferred to the environment and is part of its thermal pollution (Vambol, 2015). The chemical energy potentially contained in the consumed motor fuel can be divided into non-obtained (due to imperfection of the working process), mechanical losses (due to imperfection of the design of the RICE and the need to ensure the implementation of the working process) and useful (transferred to the consumer). The consumer spends the effective power received from the RICE to overcome dissipative forces (mainly frictional forces), as well as during the performance of the functions for which it is intended (for example, the implementation of mechanical work), as to overcome the imperfection of its design. The ratio between the first two and the third components of the energy balance is characterized by the value of g_{eme} , the ratio between the first and the second – indicators of EG toxicity, and the values of G_{fme} characterize the absolute value of thermal pollution of the environment. However, effective power is first spent on doing useful work and only then inevitably turns into heat. Therefore, the smaller the value of G_{fme} and g_{eme} , the higher the level of ES of the evaluated process.

6. Motor fuel subjected to catalytic reforming in the manufacturing process contains indirectly regulated potentially harmful components, namely: polycyclic aromatic hydrocarbons (PAHs) (for example, benzo(a)pyrene) and additives with heavy metal compounds (for example, tetraethyl lead, completely prohibited by modern regulatory documents) (Vambol, 2015; Parsadanov, 2003). Also, the consumption of motor oil for soot, which also contains compounds of heavy metals, is correlated with the mass hourly consumption of fuel. This is because the engine oil enters the combustion chamber of the RICE, and for some types of RICE it is a component of the motor fuel, as in RICE with crank-chamber blowdown. Therefore, the lower and smaller the values of G_{fme} and g_{eme} are, the lower is the value of the mass hourly emission of unburned surfactants in the EG flow, and therefore the higher is the ES level of the evaluated process (Vambol, 2015). No correlation has been found between the emission values of heavy metal compounds and other indirectly standardized pollutants in EG and g_{eme} values.

7. Motor fuel and oil contain nitrogen-containing additives, which in the process of combustion together with air nitrogen form nitrogen oxides NO_x , which are also legally regulated pollutants (Vambol, 2015; Vambol, 2017a; Vambol, 2018; Parsadanov, 2003). The better organized the working process of the diesel engine, the higher the temperature in the combustion chamber and, accordingly, the higher the mass hourly emission of NO_x in the EG flow (the value of this value does not reach zero even with a significant deterioration or disruption of the RICE working process). Therefore, the smaller the value of G_{fme} and the larger the value of g_{eme} , the higher the level of ES of the evaluated process.

8. The products of complete combustion of motor fuel include water H_2O and carbon dioxide CO_2 . The second of these substances is a product of exothermic redox reactions, which is a greenhouse gas and contributes to global warming on Earth. CO_2 emissions in a certain country should not exceed the quota established by the Kyoto Protocol (Kyoto protocol, 1998). This means that CO_2 is also a legally regulated pollutant, albeit indirectly. Therefore, the more and more efficiently motor

fuel is burned in the RICE combustion chamber, the smaller the G_{fme} and g_{eme} values are, and the higher the ES level of the evaluated process.

9. It is common knowledge that any vehicles that consume liquid motor fuel pollutes the environment with vapors of this fuel due to the phenomenon of large and small breathing of the reservoirs. This is how the type of ES factors of the process of accident-free exploitation of the PP with RICE manifests itself, such as contamination of the environment with liquid pollutants (Vambol, 2015). The greater the amount of fuel consumed by the RICE and the less efficient its combustion is, the larger the fuel reservoirs are equipped with the PP, and the more often the complete depletion of fuel from the reservoirs and, accordingly, the complete refueling of the reservoirs, which extensively increases the effect of large breathing of the reservoirs. Under the same conditions, with a large amplitude of air temperature changes, the environment also observes an intensification of the effect of small respiration of the reservoirs during the day. Therefore, the smaller the value of G_{fme} and g_{eme} , the higher the level of ES of the evaluated process.

10. During the operation of the RICE, the so-called crankcase gases are released, which consist of motor fuel and oil vapors, small drops of unburned liquid fuel, fresh charge air, EG components, which enter the RICE crankcase, where the engine oil is stored through the gaps in the cylinder-piston group, as well as drops of motor oil mist, which formed as a result of the process of sprinkling cylinder-piston group lubrication (Vambol, 2015). Crankcase gases create excess pressure in the internal cavities of the crankcase and the pallet of the RICE and are therefore periodically discharged into the environment. Aerosols of crankcase gases, namely motor oil mist droplets, are cleaned from the dispersed phase by the RICE blowing system. The dispersion medium of the aerosol of crankcase gases, namely the mixture of the gases listed above, in RICE without a pollutant neutralization system in the EG flow is also not cleaned of its harmful components. Therefore, the smaller the value of G_{fme} and g_{eme} (in units of RICE that have not yet reached the limit state due to physical wear), the higher the level of ES of the evaluated process.

11. The operation of RICE of modern constructions is controlled by an electronic automatic control system, which consists of a source of electrical energy (generator and battery), sensors, an ECU, executive devices, and wires. Some types of RICE have an ignition system that consists of high and low voltage electrical circuits. Both systems are sources of powerful electromagnetic pollution of the environment. The higher the value of G_{fme} , the more intensively these systems work and the lower the value of g_{eme} , the more efficiently these systems work. Therefore, the higher the G_{fme} value and the lower the g_{eme} value, the higher the ES level of the evaluated process.

12. The systems described above are powerful sources of information pollution of the environment, especially when using wireless interfaces for data transmission, such as GPS, Wi-Fi, Bluetooth, IRDA – false information, information noise, disturbing factors. The higher the value of G_{fme} , the more intensively these systems work and the lower the value of g_{eme} , the more efficiently these systems work. Therefore, the higher the G_{fme} value and the lower the g_{eme} value, the higher the ES level of the evaluated process.

13. The more intensively the RICE works, the more it consumes motor fuel per unit of time G_{fme} , and accordingly, the faster it exhausts its physical resources – alloys of ferrous and non-ferrous metals, polymers and rubber, ceramics, and glass. The more efficiently it uses the g_{eme} fuel it consumes, the less often it needs maintenance and repairs, given that a failure event is a random occurrence. In the case of reaching the limit technical condition of the RICE, it needs capital repair or disposal, which is accompanied by contamination of the environment with solid pollutants (waste), i.e. parts. Therefore, the lower the value of G_{fme} and g_{eme} , the higher the level of ES of the evaluated process.

14. The above-mentioned equally applies to the pollution of environment by RICE with liquid pollutants, namely by waste technical fluids – motor fuel and lubricants; cooling, washing and braking fluids, consistent and preservative greases. Therefore, the lower the value of G_{fme} and g_{eme} is, the higher is the level of ES of the evaluated process.

15. The product of complete combustion of motor fuel is the vapor of dihydrogen monoxide H_2O , which enters the environment with the EG flow and condenses at the appropriate temperatures. At the same time, this substance is not harmful or dangerous. However, first of all, it contributes to the increase of air humidity, corrosion of products made of ferrous metal alloys and the formation of acid rain, reacting with such components of EG as nitrogen oxides NO_x and sulfur SO_x . Therefore, the lower the value of G_{fme} and g_{eme} is, the higher is the level of ES of the evaluated process.

So, present subsection describes the results of analysis of modern and relevant issues of technogenic and ecological safety of urban systems as the component of national security of Eastern-European countries based on the example of Ukraine in the time of armed aggression and as a prerequisite for a «green» transition during post-war reconstruction. The purpose of the study is determining the aspects of assessment and providing the necessary level of ecological safety of transport exploitation, in particular the fire units and emergency rescue vehicles, as a component of Ukraine's national security in times of armed aggression and as a prerequisite for a «green» transition in times of post-war reconstruction. The object of the study is ecological safety of the exploitation of transport, in particular units of fire and emergency rescue vehicles, as a component of the national security of Ukraine. The subject of the study is aspects of assessment and provision of the necessary level of indicators of the object of the study in times of armed aggression and as a prerequisite for a «green» transition in times of post-war reconstruction.

The factors of ecological hazards from the sources of such kinds as power plants with reciprocating internal combustion engines, namely fire and rescue vehicles of departments of State Emergency Service of Ukraine have been observed. Based on the results of analysis of Reports of World Congresses of Society of Automotive Engineers of USA over the past 25 years main trends in the field of engine and vehicle construction have been outlined and described. The structure of vehicle fleet of Ukraine was subjected to detailed analysis and based on it was discovered that

the most of vehicles in Ukraine have reached a high degree of physical and moral wear and therefore cannot meet the modern European standards of toxicity of their exhaust gases. At the same time, the so-called emulators of the system of neutralization of legally standardized pollutants in the exhaust gases flow have become widespread. The basic problems of ensuring the implementation of the legal norms of ecological safety of the process of exploitation of vehicles with reciprocating internal combustion engines in Ukraine have been determined. The classification of ecological safety factors, the source of which are vehicles with reciprocating internal combustion engines, has been improved and detailed. A detailed analysis of the impact of fuel consumption of reciprocating internal combustion engines on the factors of ecological safety of the vehicle exploitation process has been carried out.

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Annotation

Part 1. Interdisciplinary insights into modern digitalization and management

1.1. *Natalia Bobro*. Digitalization and management of the modern educational process.

The article analyzes the management of the modern educational process in the context of digitalization. The features of the digital transformation of education are considered and its main advantages and disadvantages are outlined. The use of immersive educational technologies, in particular, the use of virtual and augmented reality, as well as other means of interaction to create an interactive learning environment, is analyzed. The possibilities of using virtual and augmented reality technology in the learning environment are highlighted. It is noted that digital technologies can significantly improve the quality of education, provide greater flexibility and adaptability of the educational process, expand access to education for different groups of the population, improve monitoring and assessment of knowledge, and increase students' motivation and interest in learning.

1.2. *Nataiia Bozhko, Olha Tsubova*. Lviv Medical University's architectural complex: a historical perspective on its establishment and development.

The purpose of the study is the history of the development of the main stages of the design and construction of educational buildings, which have become the central premises for the study and training of medics at Lviv University. The methodological basis of the study became historiographical analysis and synthesis methods and historical-systemic method used under the principles of historical objectivism.

The main results of the study. The study examines the process of founding Lviv University as one of the oldest in Ukrainian lands. Attention is drawn to the progress of secularization in the Austrian Empire, which provided an opportunity to use the fortunes of liquidated monastic orders for the needs of the state, in particular, the restoration of educational institutions in Lviv. The scientific investigation examines the process of the formation and development of the medical faculty into a medical university proper, as well as the possibility of using the old hospital premises of Lviv monasteries. Information is highlighted concerning the construction of new educational buildings for the medical faculty of Lviv University and educational premises where future medical professionals were trained at city medical institutions at the end of the 19th and 20th centuries.

Conclusions. The presented information shows that the history of the design and construction of premises where medics studied is inextricably linked with the formation of the historical landscape of the city of Lviv during the 19th and 20th centuries. This period also provides an opportunity to analyze the changes that took place in the development of the city's infrastructure, especially in its eastern suburb – the Lychakiv district. The author of the study draws attention to the creative activity of famous European architects and constructors who participated in the design and construction of the city's medical institutions and educational buildings of the medical university. Their creative output makes it possible to trace the evolution of the use of architectural styles in Lviv from baroque to twentieth-century constructivism.

1.3. Vasyl Kot, Valentyna Yuskovych-Zhukovska. Control software by electronic load of the household. The latest information technologies today affect the pace of development and changes of the element base and software in the electric power industry. The use of computer information technologies ensures uninterrupted supply of electricity to household consumers. Control of parameters, monitoring and forecasting of indicators takes place with the help of controllers, routers, networks, and software. In the context of the formation of the information society and the need to ensure the reliability and efficiency of autonomous energy supply systems, the authors propose a computerized approach to energy consumption management.

1.4. Igor Shaforenko, Svitlana Zaika. Optimization of the stages of accepting administrative decisions to minimize the impact of uncertainty. In the conditions of fierce competition and limited resources, enterprises need to make effective management decisions that will enable them to achieve their goals and minimize risks. Existing theories and methods of management decision-making do not always account for the specifics of decision-making in uncertain conditions, necessitating their scientific study.

The study examines issues related to improving the management decision-making process under conditions of uncertainty. The authors investigate the main stages of management decision-making, as well as factors influencing their effectiveness in uncertain conditions.

The results of the study can be valuable for enhancing the effectiveness of management decisions in uncertain conditions, reducing risks associated with decision-making, and enhancing the competitiveness of enterprises.

1.5. Sviatoslav Shaforenko, Svitlana Zaika. Remote work: analysis of the essence and strategic significance. The study examined the impact of remote work on Ukrainian society in the context of martial law, revealing its significance and necessity as a strategic tool for supporting the country's economy, ensuring labor productivity, and promoting the social well-being of citizens. Remote work has proven to be an effective response to numerous problems related to the forced migration of Ukrainians and the imperative to ensure the safety of workers, enabling them to sustain their professional activities amidst uncertainty and change.

The proliferation of remote work not only contributes to job preservation and the maintenance of economic stability but also opens up new opportunities for the implementation of flexible forms of employment that can be adapted to various life circumstances. The importance of this transition to new work formats lies not only in addressing current issues but also in laying the foundations for the future development of enterprise personnel and the economy.

It has been established that remote work holds significant potential as a tool for enhancing the country's economic and social stability during crisis conditions. It provides the necessary adaptability and flexibility, aiding in overcoming challenges associated with the economic and social consequences of war while facilitating the integration of Ukrainians into the international labor market.

It is crucial to continue developing and supporting policies and initiatives that facilitate the expansion of telework opportunities while ensuring adequate working conditions and social protection for all categories of workers.

1.6. Iryna Shumilova, Nataliia Hrechanyk, Serhii Kubitskyi. Pedagogical prognostication of formation of innovative and entrepreneurial competence in future managers of education. The article is aimed at pedagogical forecasting of the formation of innovative and entrepreneurial competence of future education managers. The article defines and characterizes the direction of the strategy of entrepreneurial activity of the university of sustainable development; the role of the «entrepreneur-scientist» – a new type of manager who has economic thinking, mobility and can effectively carry out innovation and entrepreneurial activities based on a sufficient level of innovation and entrepreneurial competence. The features of the intensified influence of the formation of innovation and entrepreneurial competence of future education managers are characterized.

1.7. Svitlana Zaika, Andriy Avriata. Information technologies as a driver of tourism business development. In the modern world, information technologies play an increasingly important role in the development of all sectors of the economy, including tourism. They contribute to the improvement of management efficiency, the promotion of the tourist product, and the enhancement of the quality of the provision of tourist services.

The purpose of the study was to generalize the theoretical and practical aspects of the influence of information technologies on the development of the tourism business.

As a result of the study, it was established that information technologies have a positive impact on the development of the tourism business, in particular:

- contribute to increasing the efficiency of management of tourist enterprises by automating routine operations, such as booking, financial, and personnel management.

- improve the quality of service for tourists by providing them with access to information about tourist destinations and services at any time and in any place. This also allows them to compare the offers of different tourist companies and choose the best option.

- create new types of tourist products and services.

Therefore, the introduction of information technologies in tourism is an inevitable process that has a significant impact on the development of this industry. Tourism businesses need to understand these impacts and develop strategies that will allow them to get the most out of their application.

1.8. Iryna Hrabovets, Liudmyla Kalashnikova, Liudmyla Chernous. Information privacy: threats and challenges in the conditions of hybrid war in Ukraine. The article analyzes modern threats to Ukraine's information security under martial law conditions. Particular attention is paid to the fact that today, in connection with the full-scale war in Ukraine; information security issues are becoming extremely acute and urgent. The level of security of information resources becomes one of the critical factors that determine the course of military operations and affect the privacy of life and the national security of the state as a whole. An important component of this analysis is an understanding of what threats specifically exist in the modern information environment and how they can affect private security in wartime conditions.

1.9. *Serhii Kachurynets*. The essence of the concept «choreographic projects» in the media industry: social-humanitarian dimensions. The article deals with the topical aspects related to the essence of the concept of «choreographic projects» in the context of the media industry and their social-humanitarian dimensions. The importance and the role of choreographic projects in the modern media space as a key element of the cultural paradigm has been revealed. The influence of choreographic projects on the formation of social values and the perception of art by the audience has been analyzed. The possibility of using choreographic projects as a means of communication and solving social problems in society has been studied. The role of the media industry in the formation and dissemination of choreographic projects and their influence on the cultural development of modern society has been considered. Examples of choreographic projects have been offered for a better understanding of the deep socio-cultural and media-discursive processes that take place in the modern media space.

1.10. *Tetiana Koliada-Berezovska, Stanislav Berezovsky*. Cross-cultural communication: Ukrainian-Polish informational-educational connections. Authors, basing themselves on the definition of information and communication technologies as the driving force of progress, as declared in a globally recognized document of the international organization for education, science, and culture, provide a retrospective analytical overview of the development of Ukrainian and Polish printing as components of the general civilizational cross-cultural process. Defining the polyvalent nature of the latter, the role of historically significant figures that ensured mutual influence in the field of publishing, design, and dissemination of Ukrainian and Polish printed books is emphasized – as determinants of culture, spirituality, and national spirit. As a result, an expanded understanding of cultural connections in the late Middle Ages among all Slavic peoples and their neighbors is proposed in the context of ethnocultural identification as a counteraction to dehumanizing tendencies of modernity.

1.11. *Hanna Stepanova*. Electronic evidence in the criminal process of Ukraine. The parties to criminal proceedings are increasingly using the practice of submitting electronic evidence, which is due to the specifics of certain types of criminal offenses, the method of commission of which directly involves the use of devices and instruments which operate with information in electronic (digital) form.

The article notes that electronic evidence has certain specific features which will be reflected in the procedural legislation and proves that compliance with the requirements for the form of an electronic document forms its evidentiary value, the possibility to put it in the basis of a procedural decision and refer to it when considering criminal proceedings in court.

1.12. *Liutsiia Tsyhaniuk*. The music of the Ukrainian composer V. Bibik in the global information space of the 21st century. The article describes the personality of Valentyn Bibik, an outstanding Ukrainian composer of the second half of the twentieth century, describes his life and creative work, analyses the reasons that led to the silencing of his music in Ukraine in Soviet times, because of which the composer's music is sometimes better known in the world information space than in Ukraine. The article analyses the polyphonic cycle «34 Preludes and Fugues»

for piano by V. Bibik, its constructive, artistic and interpretive features, and highlights an extraordinary event for the world and Ukrainian artistic community – the premiere of the entire cycle in the United States on 7, 8 and 9 March 2018 by American pianist Timothy Goft with the assistance of Ukrainian-American composer, pianist and conductor Virko Balei, who has become a kind of «a bridge» between Ukrainian and world music culture, persistently promoting Ukrainian art in the global information space of the 21st century.

Part 2. Advancing education in the digital age: insights and strategies

2.1. Alina Chaikina. A competent approach to the information security digital skills formation in the educational environment. The article examined the concept of lifelong learning, which involves constantly acquiring new knowledge, abilities, and skills for successful functioning in society. European approaches to defining competencies that should be formed in future specialists were analysed. It was determined that formal and informal education in Ukraine should provide higher education students with opportunities for their development, as well as forming key competencies such as digital literacy, critical thinking, adaptability, stress resistance, information security, and others.

2.2. Vasyl Levkulych, Oksana Petriv, Mykola Yehupov. European strategy «Open Science» as a driver of innovation in the information society. The last decades have seen the growth of integration processes in the world, the development of trends towards joint solutions of social, research and economic problems by countries. Another difference is related to the scientific and technological revolution and the emergence of the «information society». The reality is that globalisation is an objective and absolutely inevitable phenomenon of our time, which can be slowed down by means of economic policy (which is happening in some cases), but cannot be stopped or «cancelled», as it is an imperative requirement of modern society and scientific and technological progress. The scientific system and its various components, in particular, the Open Science strategy, the so-called «databases», are a global research, analytical, comparative and ranking, bibliographic and abstract system of scientific research data, a tool for tracking the citation of scientific publications and other results of scientific and research activities. As this need was felt in different countries with a relatively small time difference, various research technologies were invented and developed in the context of the common strategy of Open Science.

2.3. Liudmyla Zagoruiko, Yevhen Plotnikov, Iryna Didenko. Quality assessment of blended language learning courses: a practical case. The paper is aimed at identifying the features of quality evaluation of blended courses for foreign language teaching based on a practical example of their implementation. The pre-service English learners from several Ukrainian universities were asked to take a questionnaire to determine their general readiness to work with e-courses, identify factors that may influence the effectiveness of blended learning, and find out their attitudes towards working with e-courses. Those e-courses were placed on Moodle platform.

The results of the proposed questionnaire made it possible to identify the quality of studied e-courses, namely via assessment of teaching methods, examining assessment techniques, inquiry into student engagement and evaluating technology support. That feedback supported identifying strengths, weaknesses, and areas for improvement of blended courses.

2.4. Viktor Zinchenko, Tetiana Bilan, Nataliia Vynnyk. Transformation of the education system in preparation for the «Digital Era». A strategic and long-term approach to the digital transformation of education and science is essential to prepare people for life and work in a changing world. In recent decades, many initiatives and investments have been made in educational technology and digital skills development. As digital change accelerates, it is essential that science, education and training systems adapt accordingly. While the responsibility for the content of teaching and the organisation of educational systems lies primarily with Member States, there has been a growing momentum in recent years to share best practices in digital science, education, and training; and to develop common tools and frameworks at EU level. Joining forces and working together on digital education has never been more important. The EU can play a more active role in identifying, sharing and scaling up good practice and supporting Member States and the education and learning communities at large through tools, frameworks, guidance, technical expertise and research.

2.5. Natalia Afanasieva, Natalya Byelyayeva, Viktoria Shkoda. Psychological features of the adaptation of Ukrainian adolescents to learning conditions in a foreign school. The article presents the results of a study of the peculiarities of the socio-psychological adaptation of teenagers – Ukrainian migrants – in German schools. Modern events forced a large number of Ukrainian citizens to go abroad. Germany has taken in about one million Ukrainians seeking asylum, most of them school-age children. The results of the study showed that female respondents suffer from depression. In the group of girls, depression has much greater and closer connections with adaptation and its criteria. It has been scientifically proven that early diagnosis and treatment of depression helps prevent or minimize its negative consequences. According to the results of the study, a close relationship between the depression index and the self-assessment of the feeling of loneliness was found in the boys, although depression as such was not found in them. Therefore, it will be appropriate to pay attention to the feeling of loneliness in boys, which can improve their general emotional state.

2.6. Zhanna Bogdan. Theoretical justification of soft skills development of youth students. The article presents a theoretical analysis of the problem of flexible skills and shows that the ideas about their structure, list and characteristics are scattered in modern studies of psychological, pedagogical and managerial directions. The presented study shows a new author's model of soft skills of a modern specialist, which represents the inter- and intrapsychic reality of the individual and contains soft skills described in traditional studies, as well as those proposed for consideration for the first time.

2.7. Oksana Davydova. Optimization of the process of adaptation of visually impaired persons to life in war conditions: empirical dimension. The work presents a comprehensive study of the problem of psychological aspects of adaptation of visually impaired persons in wartime conditions. The results of theoretical and empirical research on the relevant issues are analyzed. The sample of respondents is characterized, the quantitative and qualitative analysis of the results of the formative stage of the experiment is presented. The study was conducted in the context of Russian aggression, which is currently ongoing during a large-scale war in Ukraine, In the theoretical discourse, the aspects of the phenomenon of adaptation as a functional possibility of the individual are clarified, it is about the problems of integration and social-psychological adaptation of people with visual impairments. It was determined that traumatic events in a person's life are related to the phenomenon of stress resistance, coping strategies, the activation of human resources to overcome negative emotional experiences and depends on the effectiveness of continuous social and psychological support, relying on the positive potential of a person with visual impairments.

2.8. Marina Zaushnikova, Liubov Dolynska, Yulia Tonkopei. Psychologist communicative competence as a condition for his efficiency in the realities of the information society. The article highlights the study of a psychologist's communicative competence as a condition for his successful professional activity in the realities of using information and communication technologies. It is noted that professional activity in the «person-person» system has its own specificity, which determines the necessary professionally significant qualities and its set of competences, among which the leading place is occupied by communicative competence, which subsequently acquires changes in the conditions of the information society: on the one hand, it expands and improves the psychologist's field of activity, and on the other hand, it leads to a decrease in the development of communicative competence and complicates the consultation process. Accordingly, the problem of forming a psychologist's communicative competence in accordance with society's requirements in a combination of modern and traditional teaching methods arises.

2.9. Olexiy Os'machko, Roman Maiboroda, Eduard Shcholokov. Use of software environments of simulation for the information society development. In the article a scientific problem of designing the technological object has been analyzed. The information technology of the technological object computer-aided design and its information support have been developed. Demonstration the decomposition a general task of synthesis system of technological object on separate task. Demonstration the information technology of synthesis system of technological object. The information support of process of designing technological object is developed.

2.10. Oleh Samborskyi. Multidisciplinary approach to pharmaceutical management and marketing teaching. The article reveals the importance of an interdisciplinary approach to pharmaceutical management and marketing teaching in the professional training of future specialists in the field of pharmacy. The study discipline «Pharmaceutical Management and Marketing» in pharmacy taught at the Higher Education Institution has been characterized and evaluated. Emphasis is placed on the expediency of implementing an interdisciplinary approach as an effective didactic tool for increasing the efficiency of professional training of future pharmacists.

2.11. Svitlana Sechka, Maryna Kushnarova. Application of innovative methods in English language lessons as an educational component of the information society development. The article considers the use of innovative methods in English lessons on the example of personality-oriented method. The tasks of modernization of education cannot be solved without the optimal introduction of modern educational technologies in all its spheres. The use of innovative methods gives impetus to the development of new forms and content of traditional activities of students, which leads to their implementation at a higher level. Work with the use of such methods should be organized in such a way that from the very beginning it becomes a powerful psychological and pedagogical means of forming a motivational plan for students, a means of supporting and further developing their interest in the subject. It is emphasized that properly organized work of students with the use of innovations can promote in particular the growth of their cognitive and communicative interest, which in turn will enhance and expand opportunities for independent work of students to master a foreign language, both in class and after school. It is emphasized that the use of innovative forms of learning in contrast to traditional methods gives the student a major role in the acquisition of knowledge, in which the teacher is an active assistant, organizes, directs and stimulates learning activities. In his work, the teacher must not only solve educational problems, but also create conditions for students to independently creatively search, encourage them to research, develop skills of orientation in a huge information space and independent decision-making. And as a necessary condition in solving the tasks is the introduction of innovative technologies in the educational process. The constantly evolving system of information support in combination with technical support ensures the quality of the educational process.

Innovative methods have become an integral part of the process of teaching and learning English. They help students to acquire the necessary skills for free use of English in a short time, namely: listening, reading, writing and communication skills. Given the importance of innovative methods, it should be noted that the central place in the teaching process is the personality of the teacher, who selects, evaluates and implements new methods. Thus, innovative methods help the teacher to solve a large number of organizational issues, to make the lesson more interesting, but innovation cannot completely replace the teacher. An analysis of other innovative trends in the teaching of English may be a prospect for further research.

2.12. Yehor Sypchuk. Physics simulations as a tool for forming the research competence of students in the process of learning physics. The paper reveals the possibilities of physical simulations for the development of research competence of students in physics. The advantages and disadvantages of using simulations

in the educational process are analyzed. Examples of online platforms, mobile applications, which include similar tools are given and described, and an own structure of physical simulations is proposed. It is noted that this technology is one of the effective digital tools for the development of research skills in students during the study of physics, which vividly and accurately models various physical phenomena and processes, and also greatly facilitates the process of perception and assimilation of the material.

2.13. Iryna Ushakova, Bohdan Liashenko, Anastasia Mahonina. Psychological factors of procrastination in students. The article is devoted to consideration of the current issue of procrastination and the psychological factors that determine it. Procrastination is defined as a tendency to put off important and difficult, unpleasant things and make decisions «for later». Its differences from laziness and rest are shown. The main causes (factors) of procrastination have been identified: internal and external, permanent, and situational, motivational, emotional, behavioral, psychophysiological and temporary. The results of an empirical study of the relationship between procrastination and perfectionism, anxiety and coping strategies are presented. It was established that they can act as positive and negative factors of delaying actions. Initial recommendations regarding the prevention and correction of procrastination among students have been provided.

2.14. Iryna Shymkova, Svitlana Tsvilyk, Vitalii Hlukhaniuk. Formation of environmental competence of labor education future teacher in the higher teaching school. The study deals with the peculiarities of the formation of environmental competence of the future teacher of labor education. The directions of this process are as follows: formation of ecological awareness, environmentalization of the content of professional disciplines, organization of ecological and technological activities of students. It was established that the formation of environmental competence of the future teacher of labor education is effective under certain organizational and pedagogical conditions: familiarization with the purpose, tasks, and content of environmental education; formation of a value-motivational attitude towards nature; environmentalization of learning content; organization of ecological-technological and artistic-creative practical activities.

2.15. Olha Yuzyk, Sergiy Veyna, Halyna Bilanych. Tests as a modern knowledge assessment technology. The article substantiates the role and place of competence formation in the modern New Ukrainian School and institutions of higher or professional higher education. The role and types of assessment of students are studied.

The essence of the concept of «testing» as a method of measurement and one of the technologies of modern assessment in such levels of education (primary, secondary, higher education) is revealed. It is taken into account that testing is a process of measuring quantitative indicators using a test. Examples of test tasks for the 6th grade textbook «Informatics» that can be used in written testing and computer testing are given. We offer test tasks with one best answer and test tasks with several best answers. We offer examples of educational resources on the methodology of test item design that are available on YouTube.

The author argues that test technologies can be key to the quality training of students.

Part 3. Navigating the digital frontier: innovations in management and economy

3.1. *Olena Chukurna, Olena Stanislavyk, Olena Radius. Digital assets as a tool for financial assets management in the digital economy.* The article discusses digital assets and ways of managing them in the digital economy. Identified types of digital assets, their economic and legal nature. Four components of digital assets were substantiated: economic component, legal component, information component, value component. It had defined the concept of tokenomics. Research aspects of tokenized legal relations and virtual assets. It was systematized and characterized structural components of virtual assets according to their technological, economic-legal and informational-application nature. The most common digital ecosystems of digital asset management were considered.

3.2. *Artem Koldovskiy, Kateryna Shafranova. Reshaping management infrastructure in the digital financial frontier.* This paper explores the transformative impact of digital technologies, particularly blockchain, on the management infrastructure within the financial sector. Examining a collection of key literature, including studies on blockchain architecture, consensus mechanisms, hybrid blockchains, and diverse applications in banking, trade finance, and digital currencies, the research aims to elucidate the evolving landscape of management practices. Insights from this literature review shed light on how the integration of blockchain technology is reshaping traditional financial management structures. The discussion encompasses challenges, advantages, and the potential for establishing global norms to safeguard the integrity of financial data. By providing a comprehensive overview, the paper contributes to understanding the nuanced dynamics at play in the digital financial frontier and sets the stage for further exploration into the managerial implications of these technological advancements.

3.3. *Volodymyr Koloskov. Digital technologies application for environmental safety management of waste treatment process during emergency situations.* The purpose of the study is to develop the simulation complex of the environmental safety management system of the city during an emergency at the waste storage site on the basis of digital technologies application for the regional economy.

A simulation model of the environmental safety management system of the city during an emergency at the waste landfill was developed. On its basis, a soft ware and computing complex was created to support decision-making in the environmental safety management system of the city.

Developed simulation complex may be applied to fulfill the task of ensuring the required level of safety, but also to increase the effectiveness of protective measures implemented to solve it in the system of regional and state economy.

3.4. *Olha Komelina, Inna Miniailenko. Smart – concept of regional policy of spatial development in conditions of digitalization.* The main task of the post-war reconstruction of Ukraine is determined – the application of smart – concept of regional policy of spatial development in conditions of digitalization. The fundamental principles of sustainable spatial development have been formed. An algorithm for forming a smart concept of regional spatial development policy in conditions of digitalization has been developed. The peculiarities of the priorities of smart specialization in Ukraine are noted. Practically-oriented methodical approaches

to the development of a regional smart strategy are analyzed. It has been proven that strategic planning of spatial development on the basis of smart-specialization is the only means of forecasting and planning the development of territories for the future regarding the acceleration of innovative development. The principles of formation and implementation of spatial development strategies of regions on the basis of reasonable specializations are highlighted. A digital platform for strategic planning of the spatial development of regions based on the criteria of smart specializations has been created.

3.5. Olha Komelina, Mariana Vasylychenko. Exploring the startup ecosystem's vibrant growth: lessons learned from the advanced economies. The main purpose of the given paper is to put everyone in the picture about the economic essence of the startup ecosystem as a driving force for innovation and economic prosperity, to analyze the role of the leading players in the startup ecosystem's development, to compare the American and European models of the startup ecosystems' growth and to determine the lessons learned from the advanced economies that can be implemented in Ukraine to support its national economic development in the conditions of the full-scale war. It is emphasized by authors that the contemporary startup ecosystem is able to bring together all the stakeholders that gravitate towards ventures that leverage disruptive technologies. The findings of the analysis indicate that they should work together to promote startups, disruptive business models and leadership in various areas of technology.

3.6. Tetiana Lysiuk. Historical museums in innovative tourism activities in Ukraine. The article examines Ukrainian historical museums, which are currently developing in difficult conditions due to economic difficulties caused by limited funding for museum activities.

The conditions for the use of innovative digital technologies in the work of museum institutions are analysed. The process of digitalisation of museums and its role in the work of modern museology in terms of attracting tourists, which is inseparable from the socio-cultural function of the museum space, are described.

It is determined that under the influence of the latest trends in museology, which have shifted the focus from museum objects to the socio-cultural needs of visitors, society's requirements for the communication capabilities of museums have increased. In the context of information and technological development, in addition to traditional forms, modern ways of interaction between museums and society are emerging in the form of three-dimensional technologies, including creative video screenings, panoramic projection, virtual reality and animation technologies.

3.7. Inna Vlasenko. Assessment of the influence of factors on the formation and improvement of quality and competitiveness of products of industrial enterprises. The article identifies the factors influencing the formation and improvement of the quality and competitiveness of products (QCP) of industrial enterprises. To this purpose, at four industrial enterprises it was conducted a relevant study, on the results of which it was identified and substantiated 6 criteria that characterize the level of quality and competitiveness of products at industrial enterprises. The method of rank correlation and the method of expert evaluations were used to process the research results. According to the results of their use, it is proved the scientific assumption about the dependence of the level of QCP on the efficiency of use of materials, raw materials and resources in the enterprise activity.

3.8. Wladyslaw Wornalkiewicz. Breaking social anxiety – green light for nuclear power plants. In the past period, the world community was surprised by several nuclear power plant accidents. The Chernobyl power plant in Ukraine and the Fukushima power plant in Japan were particularly remembered. This caused many countries to periodically withdraw from the operation of already existing nuclear reactors, also called nuclear reactors, of a similar class as at Chernobyl, and to make efforts to secure them against harmful radiation to the environment. However, not all countries did so. France and the United States continued to improve the structures and control systems of nuclear power plants. Years passed, and offers of improved solutions in the field of nuclear energy appeared on the market. The times of the current climate warming, the increase in the prices of fossil fuels, especially gas and oil, have resulted in a return to the so-called clean sources of renewable energy. We are talking about wind energy, photovoltaics, energy of the Earth and electricity and heat derived from the splitting of uranium nuclei. The next COP28 conference devoted to counteracting climate warming, by gradually reducing the consumption of carbon dioxide-emitting fuels, gave a clear incentive to intensify the efforts of countries, including Poland, towards nuclear energy.

3.9. Wladyslaw Wornalkiewicz. Carbon-nuclear transformation. Nuclear power plants, also called nuclear energy, after the period of stagnation of the 1990s, underwent quite turbulent development in terms of size, construction, control, security, IT technology and fissile fuel supply. The trend of building rather medium and small power plants powered by uranium, thorium or hydrogen emerged. Particularly small SMR nuclear power plants, built modularly, found many supporters in the business world. The elements of nuclear reactors can be transported to the construction site. There is an era of fabrication of these elements and serial production of reactors. This is an impulse towards the coal-nuclear transformation of many already obsolete installations generating electricity and heat and operating on fossil fuels. Meeting this trend involves gradual replacement of boilers in coal-fired power plants with technically modern, designed generation IV nuclear reactors. In this generation, special emphasis was placed on environmental protection, increased safety for the environment and reliability of nuclear reactors. It should be noted that the United States are well advanced in the direction of efficient control of nuclear fission reactions, not only uranium.

3.10. Liudmyla Halan, Evgeniya Borysevych. Features of using Amazon Web Services as digital tools of modern business. Cloud web services of Amazon, AWS (Amazon Web Services) represent a wide set of infrastructure services, such as the provision of computing power, various data storage options, network solutions and databases, which are offered as services, if necessary, with availability within seconds, with payment according to the fact of consumption. At the customer's disposal are more than 200 varieties of AWS: from data storage to deployment tools and catalogs for content delivery. New services can be set up for the client quickly and without initial capital expenditure. This enables corporations, start-ups, small and medium-sized businesses and customers from other sectors to gain access to the components they need to quickly respond to changing business requirements and, most importantly, to increase their competitiveness and customer focus.

3.11. Oleksandr Hladkyi, Tetiana Dupliak, Mikael Hashimov. Innovative technologies of digital management of the tourist enterprise. The essence of innovative technologies as well as the main directions of their application in digital management of tourist enterprises are defined. The classification of innovative technologies in tourism is proposed. The main directions of innovative technologies usage in tour operators' business are analyzed. The main problems and advantages of innovative technologies usage in digital management of tourist enterprises are highlighted. The most promising directions for innovative technologies usage in tourism are: e-commerce, online stores and online travel agencies, as well as extensive development of tours based on virtual (augmented) reality technologies. The application of innovative technologies extremely need for high-tech computer equipment of tourist enterprise as well as for availability of highly qualified personnel.

3.12. Liudmyla Zveruk, Anna Monzolevska. Banking business management in the conditions of digital transformation of the economy. The digital transformation of the economy means the integration of digital technologies into all areas of economic activity, which leads to a change in the way of thinking, strategy and management of the banking business. Updating the management system includes innovative approaches and the introduction of new business models. Digitalisation in management is a comprehensive and systematic process of optimising and automating management decision-making, increasing communication methods and creating a new corporate culture. In the context of digital transformation, the effectiveness of the banking business development management mechanism, which is a set of functional elements: methods, tools, and levers, is important. The innovation management method and the technology management method are relevant. Successful implementation of the banking business development management strategy is ensured by: effective areas of innovation, marketing management, risk management and cybersecurity, improvement of management structures and information and communication technologies. Modern digital tools in business management include cloud technologies, AI analysis of branches, distributed ledger technology (DLT), electronic document management, ERP systems (Enterprise Resource Planning), Agile, and BI systems (Business Intelligence). Modern digital banks include online banks or direct banks, challenger banks, digital natives. The main directions of transformation of the modern banking system under the influence of digitalisation of management are: digital transformation of bank transfers, rethinking the banking business model using blockchain technology and smart contracts, application of cloud technologies, and development of Big Tech.

3.13. Olha Komelina, Sveta Shcherbinina. Digital technologies in the green economy. The article examines the concept of «green economy» and directions for its implementation, defines the features of the formation of the «green economy» model. The principles of building an «inclusive green economy» are revealed. The main aspects of the use of digital technologies in the green economy, their advantages and challenges, as well as examples of the successful implementation of these technologies in various sectors of the economy are studied, and the key role of the «green economy» in the post-war reconstruction of Ukraine is emphasized.

- 3.14. Svitlana Kulakova, Oksana Zhytnyk. Formation features of Ukraine's digital economy in modern conditions.** The purpose of this article is to provide a multidimensional overview of the essence of the digital economy, the process of digital transformation, and a general analysis of the IT sector of the national economy. In addition to the theoretical foundations, the authors paid special attention to determining Ukraine's place in terms of digital development in the international market. It is found that the martial law in force on the territory of Ukraine, imposed in connection with Russia's armed aggression, has slowed down the innovative development of the information and communication technologies sector. However, this sector of the economy is still considered promising. Therefore, the issues of increasing the efficiency of investments in the IT sector, increasing the volume of investments, and accelerating digital transformation by learning from the experience of the leading EU and world countries are of relevance today.
- 3.15. Maryna Mashchenko, Olha Haponenko, Iryna Lisna. Forming a strategy of investment and innovation development of enterprise in the information society.** The article is dedicated to the pertinent issue of forming a strategy for investment and innovation development of enterprises in the information society. The dynamics of capital investments by types of economic activity in Ukraine and their share in the total volume are analyzed. The directions for improving investment and innovation policy are systematized: increasing accessibility of financing; increasing the number of investment projects; state regulation; availability of highly qualified personnel with innovative thinking and knowledge; development and implementation of new technologies; support for small and medium-sized enterprises; attracting foreign experience and investments. A methodical approach to forming an innovative strategy is proposed, which includes: analysis of needs and opportunities for innovation implementation; after market analysis, it is necessary to develop an innovation idea that meets the needs of customers and can compete with other products in the market; development of a detailed plan for implementing the innovation strategy; product testing; market implementation of the innovation; evaluation of the results of implementing the innovation strategy.
- 3.16. Andrii Romin, Nina Rashkevich, Yuri Otrosh. Overview of the modeling approaches of the technical condition of used building structures under force, deformation and high-temperature influences.** The authors reviewed approaches to determine the technical condition and residual resource of both individual structures and buildings and structures as a whole under force, deformation, and high-temperature influences. It was established that the difficulty of solving the problems of the theory and practice of construction in complex soil conditions with the possibility of high-temperature effects during a fire is due to the uncertainty of the initial information, the uncertainty and diversity of structures, the variability of the effects, the properties of building materials, and their insufficiently studied limit state.
- 3.17. Olha Rudachenko, Vitalina Konenko. Analysis of the current state of digital transformation of business processes in business activities of Ukraine.** In this section, the role of digitalization entrepreneurial activity and in the economy of Ukraine as a whole, providing an incremental-iterative methodology that allows narrowing down the scope and research issues using a multiplicative effect. Explanations

for the concepts of «platform», «digital transformation», and «business process management» are provided. An overview of methods for transforming business processes is presented. An analytical review of the characteristics of business processes and platforms is conducted.

3.18. Alexander Sklyarenko. Digital economy and its significance for the development of modern innovative society. The purpose of the article is to study the theoretical foundations and aspects of the development of the digital economy and further informatisation in general, its features, problems and development trends in Ukraine. The paper examines the need for transition of the economy from a traditional format to a digital one in the context of global development of the information and innovation society. The material presented in the article shows that the latest technologies penetrate all spheres of society, thereby affecting the economy, its essence and forming structural innovative changes in it.

3.19. Leonid Tsubov, Oresta Shcherban. Management of life activities of territorial communities under the conditions of marital state. The purpose of the article is to study the peculiarities of managing the financial resources of territorial communities in the conditions of martial law in Ukraine. This article examines the management of financial resources of territorial communities. It is substantiated that one of the key problems faced by the United Territorial Communities (UTCs) is to ensure the proper performance of their duties. This includes the ability to effectively form a budget, accumulate sufficient financial resources to cover urgent social needs of citizens, in accordance with the principle of subsidiarity, and implement strategies for their economic and technological development. The key sources of funding to support the development of territorial communities in Ukraine against the background of decentralization processes are outlined. The importance of financial support in the process of development of local communities is emphasized. The management of financial resources of territorial communities in Ukraine acquires special relevance in the current conditions of wartime. Therefore, finding effective ways of financing territorial communities for their development, managing local budgets becomes a relevant aspect of scientific research. Successful management of this process involves using the unique capabilities of each territory, attracting various sources of financing, accumulating and effectively distributing resources, creating favorable conditions for the implementation of economic initiatives and local social programs. The main sources of funding for the development of local communities include revenues from local budgets, financial support from the state for local self-government, as well as the attraction of additional financial resources by local authorities through the use of the development potential of the territory. The dynamics and structure of revenues of local budgets, as well as their share in the consolidated budget of the country in recent years, were analyzed. The factors affecting financial management in united territorial communities are highlighted, and the positive influence of community unification on local financial management is emphasized. The contribution of territorial communities to the strengthening of the financial situation and the efficiency of filling the Unified Treasury Account is significant. Attention is focused on the fact that it is communities who take responsibility for financing a large number of powers, both delegated and their own, which have not yet been clearly defined in the Budget Code. These duties form the basis for local budgets, as they form the foundation for the stability of local finances.

3.20. *Olena Shevchenko, Svitlana Shcherbinina.* Financial technologies development and their role in improving of financial inclusion in the digital economy.

An analysis of scientific views on the essence of financial technologies was carried out, and the economic essence of this category was clarified. Emphasis is placed, first of all, on the fact that fintech is a synthesis of digital technologies and innovations in the financial sphere, which are used to provide, expand and distribute financial services by technological companies. The global experience of the functioning of the financial technology market in the modern conditions of geopolitical uncertainties and macroeconomic problems was analyzed and it was found that the most popular segments of investing funds are remittances and payments, blockchain and cryptocurrency, and regulatory technologies. It has been proven that fintech performs an important function – expanding access to digital financial services for all segments of society without any economic or non-economic barriers. The advantages of financial technologies in improving financial inclusion are studied, which include: ensuring economic stability in the financial market in conditions of increasing risks, reducing income inequality and increasing the general well-being of the country, economic growth through the mobilization of population savings, investments in the development of the economy.

Part 4. Innovative approaches in digital healthcare and rehabilitation

4.1. *Anastasiia Bondarenko, Tetiana Buhaienko.* Using experience of physical therapy

tools for rheumatoid arthritis. The paper analyzes the etiology, pathogenesis, clinical picture and methods of treatment of rheumatoid arthritis. The experience of various authors regarding the use of physical therapy in the conservative treatment of rheumatoid arthritis was studied. It has been established that physical therapy intervention is aimed at maximally improving the function of the affected joints and preventing the destruction and deformation of the joints.

4.2. *Svitlana Gvozdetska.* The correction of memory index of six-age children with a delay of mental development with the help of physical training.

The article is dedicated to the problem of wing physical training in the correction of memory levels of six-age children with a delay of mental development. Correctional employment by the offered technique has allowed to raise a level of formation of memory at children. Improvement of parameters of formation of memory at children of experimental group has allowed 65% of them to reach a level of normally advanced coevals. It has allowed them to go to a comprehensive school together with normally advanced children.

4.3. Viktoriia Horoshko, Andrii Horoshko, Oksana Hordiienko. The path to digitalization in medical applications: analysis, problems and perspectives.

The global healthcare system is going through a period of complex change due to global changes in technology and treatment methods. There is currently a large gap between the provision of skills at various levels of the education system and the demands of digital health. To train specialists in digital health, the state needs to provide knowledge related to both medicine and computer science. Mixed reality, artificial intelligence and quantum computing are key technologies in the implementation of current innovation strategies. However, the experience of emerging countries over the past decade also shows the risks that such medicine poses to patients. The use of medical mobile applications is a promising method, especially in the field of preventive medicine. Further research is needed on the relationship between health mobile application features such as psychological support for healthcare providers, automated feedback, medication adherence monitoring, reminders, and exercise prescription. Further developments should focus on strengthening the evidence base and implementation in developing countries.

4.4. Yana Kopytina. Development of an instrument for assessment of activities of day living / instrumental activities of day living (IADL / ADL) for visually impaired and blind persons.

The publication highlights the process of developing an Activities of Day Living / Instrumental Activities of Day Living (IADL / ADL) profile assessment tool for blind and partially sighted people. The prerequisites for its development are indicated, the features of the content of its constituent thematic blocks are revealed. Practical recommendations for the use of this tool are provided.

4.5. Serhii Lazorenko, Yurii Kurnyshev, Tetiana Kozhemiako. Methodological principles of forming the information and digital culture of future specialists in the field of physical culture and sports.

The modern Ukrainian system of higher education is experiencing rather deep transformational problems. Affiliation with the European academic space, autonomy of higher education institutions, actualization of scientific and creative activities of students (student-centrism), adaptation to the conditions of remote teaching of academic disciplines due to the epidemiological activation of coronavirus infections, full-scale war, etc. Distance learning platforms, which are organically connected with the use of information and communication technologies, are designed to solve the last problem. And in this context, the process of forming the information and digital culture of future specialists, in our case – the sphere of physical culture and sports, is quite promising. Therefore, in this scientific publication, we analyzed the methodological principles that will help speed up the educational processes of forming such education.

4.6. Vitalina Lytvynenko, Natalia Kuksa, Yulia Maliarova. Application of art therapy with the help of video information tools in the rehabilitation of post-stroke patients.

The article is devoted to the actual problem of using video information in art therapy in the context of rehabilitation of post-stroke patients. The scientific approaches to the interpretation of the art-therapy concept are described, the peculiarities of the use some types of art therapy with post-stroke patients are investigated, and the possibilities practical implementation of video information means with patients of this nosological group are considered.

- 4.7. Oleksandr Mishchenko, Tetiana Buhaienko, Olena Vaida. Features of physical therapy for people with post-traumatic gonarthrosis in the post-acute period of rehabilitation.** The etiology, pathogenesis and modern approaches to the treatment of gonarthrosis are analyzed. An analysis of modern approaches and general recommendations for the use of physical therapy in post-traumatic gonarthrosis was carried out.
- 4.8. Mariya Nutrichina, Jevgenija Nevedomsjka. Segmental and reflex massage in the physical rehabilitation of patients with cervical osteochondrosis.** The purpose of the study was to evaluate the effectiveness of segmental-reflex massage for osteochondrosis of the cervical spine. The experimental study included 20 people, including 14 women (70%) and 6 men (30%), diagnosed with osteochondrosis of the cervical spine. Patients of the experimental group (EG) with a diagnosis of osteochondrosis of the cervical spine were offered a physical rehabilitation program developed by us, which included segmental-reflex massage in a complex with therapeutic exercises and mechanotherapy classes on Bubnovsky multifunctional simulators, and patients of the control group (CG) underwent a similar course rehabilitation, but without the use of a course of segmental-reflex massage. According to the results of a scientific study, it was proved that the use of segmental-reflex massage in the complex of physical therapy of persons with osteochondrosis of the cervical spine is effective. Positive dynamics of the mobility indicators of the cervical spine during flexion and extension were observed, as well as quantitative changes in the level of pain sensations in the cervical spine and the impact of pain on the daily life of patients according to the Ukrainian version of the Neck Disability Index.
- 4.9. Oksana Polianska, Igor Polyanskyi, Olha Hulaha, Inna Moskaliuk. Use of virtual technologies in the training of doctors at the post-graduate stage of education.** The development of innovative technologies makes it possible to improve the training of doctors and trainees with the development of a new approach to the rehabilitation of patients who experience a decrease in the quality of life after an illness or injury, which is expressed by a violation of movement coordination, a decrease in reaction speed, and loss of hand control. When conducting practical classes with trainee doctors, virtual reality technologies make it possible to create an artificial, fully controlled environment that simulates the real conditions of therapeutic exercises. With the simultaneous application of the motion capture and feedback system, it is possible to achieve complete immersion of the subject in the created virtual situation, make it interactive and correct the patient's actions in the virtual situation in real time.
- 4.10. Anna Rudenko, Oleksandr Zviriaka, Anastasiia Syvachenko. Telerehabilitation of patients with acute cerebrovascular accident in the long-term rehabilitation period.** The article considers the possibilities of implementing alternative methods of systematic and controlled recovery of patients with acute cerebrovascular accident using telerehabilitation. The organizational and methodological aspects of telerehabilitation of post-stroke patients in the long-term rehabilitation period are determined in accordance with the above problems based on the International Classification of Functioning, considering its main components at the level of function, activity and participation. The structural components of telerehabilitation intervention are formed: therapeutic exercises to increase the strength of all muscle groups; therapeutic exercises for the development of the vestibular apparatus; therapeutic exercises to improve the range of motion in the affected limbs; breathing exercises, walking.

4.11. *Iryna Skrypka, Inna Kravchenko. Social and psychological adaptation of children with special educational needs in the process of informatization of modern society.*

The article is devoted to the issues of the modern understanding of the concept of «Inclusion in sports» and the conditions and main components of creating an «Inclusive sports environment». In turn, the uniqueness and ability of sports to overcome linguistic, cultural and social barriers, i.e. problems related to norms, values and line of behavior of children with special needs and children with disabilities, were established. It was established that in order to create an inclusive sports environment for the purpose of socio-psychological adaptation of children, coaches should actively use the basic concepts of information technologies in their professional activities.

Part 5. Artificial intelligence and innovative educational approaches in digital society

5.1. *Liudmyla Bazyl, Valerii Orlov, Tetyana Nestorenko. Preparation of future specialists for a career in youth entrepreneurship: realities and perspectives.* In a scientific article «Educational programs for Combat Horting – implementation during training classes strength fitness for a successful personality: athletes (pupils, students and cadets) of Combat Horting (experimental work)» the justification of the expediency of implementation during training sessions of strength fitness for athletes (pupils, students and cadets) of Combat Horting is revealed.

Based on the theoretical and practical research of S. Sychov and Z. Dikhtiarenko, recommendations on the use of strength fitness in training have been developed, which confirmed their effectiveness in the process of training athletes (pupils, students and cadets) in Combat Horting. Therefore, the authors of the publication considered in detail the block system of training (theoretical, physical, technical, tactical, psychological) and educational work) of Combat Horting athletes during educational and training sessions.

5.2. *Liudmyla Bazyl, Valerii Orlov, Mykola Pryhodii. Professional development of vocational teachers in the context of society digitalization.* The publication reflects the study results of the preparing teachers' problems for successful work in the digital transformation conditions of the educational environment through the prism of their professional development. The levels of digital competence of vocational teachers are characterized. It is concluded that most teachers who teach general and special disciplines need additional training in the development of e-learning resources and the use of digital technologies in the system of vocational (vocational and technical) education. The reasons that actualize the problem of developing the digital competence of vocational teachers from the standpoint of professional development are substantiated; the key philosophical and methodological principles of professional development of teachers of vocational education institutions are identified; the psychological and pedagogical substantiation of this process in the digital age is carried out. The importance of training teachers of general and special disciplines to use SMART technologies for their professional development in the digital era is revealed. Particular attention is drawn to the need to use artificial intelligence, virtual and augmented reality, which is a promising area of teachers' professional development in the digital transformation of the educational environment.

5.3. Olena Titova, Petro Luzan, Iryna Mosia. The concept of college teacher's professional competence development. The research dealt with the process of professional competence development for the teachers at a college. The understanding of the fact that the teacher's professional competence is essential in the process of vocational education development under the current global and local challenges requires the college teacher to be involved in the continuing improvement of their professional knowledge and skills. The conceptual idea of the research was based on the assumption that for the purposeful development of the teacher's professional competence, it was necessary to develop a system that covers all the elements of the educational process. The conceptual model was built to illustrate the process of a college teacher's purposeful professional development.

5.4. Oleg Bogut, Valentyna Yuskovych-Zhukovska. Peculiarities of using artificial intelligence in the processes of training and evaluation of web programmers in IT companies. This article explores the innovative application of artificial intelligence in IT companies with respect to the processes of training and evaluating web programmers. It examines the current state and potential of artificial intelligence technologies and the possibilities of their application to enhance the efficiency and productivity of web programmer development and evaluation programs. Key advantages and challenges associated with the use of artificial intelligence are discussed.

5.5. Tetiana Karpenko, Olena Lakomova, Daria Shiyan. The significance of school geographic education in Ukraine for the «green» transition. The article is devoted to the analysis of the possibilities of geography training programs of basic general secondary education in Ukraine for the formation of an ecological style of thinking and ecological behavior among students in accordance with the «Concept of the New Ukrainian School». The greatest attention is paid to the curriculum of the 9th grade «Ukraine and the world economy», which consists of five sections. Each section opens various opportunities for the formation of knowledge about the features of the «green economy» and the policy of sustainable development, and as a result of the formation of an environmentally conscious personality.

5.6. Oleksandr Kondratenko, Olha Lytvynenko. Ecological safety of transport as a component of national security of Ukraine during armed aggression and as a prerequisite for a «green» transition during post-war reconstruction. Present paper describes the results of analysis of modern and relevant issues of technogenic and ecological safety of urban systems as the component of national security of Eastern-European countries on example of Ukraine in the time of armed aggression and as a prerequisite for a «green» transition during post-war reconstruction. The purpose of the study is determining the aspects of assessment and provision of the necessary level of ecological safety of exploitation of transport, in particular units of fire and emergency rescue vehicles, as a component of Ukraine's national security in times of armed aggression as a prerequisite for a «green» transition in times of post-war reconstruction. The object of the study is ecological safety of the exploitation of transport, in particular units of fire and emergency rescue vehicles, as a component of the national security of Ukraine. The subject of the study is the aspects of assessment and providing the necessary level of indicators of the object of the study in times of armed aggression and as a prerequisite for a «green» transition in times of post-war reconstruction.

- 5.7. Oleksandr Sheremet, Valentyna Yuskovych-Zhukovska. Modern computer vision technologies.** The technologies of artificial intelligence, machine learning, neural networks, computer vision, the Internet of Things, and robotics have become trends and one of the main vectors of the development of the modern digital society. Information technologies are developing rapidly and a close relationship has formed between them. This nexus of technologies allows machines to see and understand their environment, recognize and identify objects, be independent and make decisions on their own. This, in turn, affects the development of other industries and spheres of society.
- 5.8. Valentyna Yuskovych-Zhukovska, Yurii Lotiuk. The influence of artificial intelligence on the digitalization of society.** The task of artificial intelligence technologies is development of technological solutions that work on the principle of human intelligence and solve complex practical problems in various subject areas facing society. Successful companies are focusing their attention on providing better customer service, and for this, they are increasingly implementing conversational platforms based on artificial intelligence. Accordingly, innovations in the field of artificial intelligence have a positive effect on the processes of digitization in society.
- 5.9. Wladyslaw Wornalkiewicz. Trend of application of AI in search engines.** The use of advanced artificial intelligence in search engines results in better recognition of the question addressed to the virtual database. The study focuses on the development of search engines, on the leading role of the Google search engine. It has already implemented several new algorithms for interpreting the page or website being viewed. This is to properly rank in the lists, shared pages, and entries, because of answering the questions asked by Internet users. It was pointed out that the progress in the field of software methods was possible thanks to the results of work on the functioning of the human brain, taking over by the programs the skills of current learning based on the observation of the use of the Internet by specific groups of users. The impulse in improving the «intuition» of search engines, some of which are presented in this material, is the development of an application for recognizing natural languages and directing answers, as relevant as possible in the language of the inquirer.
- 5.10. Vyacheslav Borisov, Iryna Lapshina, Svitlana Lupinovych. Methodological approaches to the formation of information security in the conditions of information warfare.** The presented study is aimed at minimizing the negative impact of Russia's full-scale aggressive attack on Ukraine, namely the use of informational hybrid weapons to destroy the mental health of children of primary school age. Primary school students are the future potential of Ukraine. The level of their civic consciousness is important for the country's development in the coming decades. During the information war, younger schoolchildren are an important target for enemy agencies to distort consciousness and involve it in sabotage and provocations. Computerization of education made it impossible to isolate children of primary school age from the global information space. A critically important and reliable way to protect children is to develop their information security skills. The monograph provides a classification of the signs of information threats and possible consequences of their influence in case of insufficient or untimely reaction.

5.11. Vyacheslav Borisov, Iryna Lapshina, Svitlana Lupinovych. Training of students majoring in elementary education for the formation of information security of elementary school students in the conditions of information warfare. Informational hybrid weapons have the potential to destroy the physical and mental health of elementary school children. This is a threat to any country. In the conditions of war, this leads to the loss of children's health and lives. It is important for younger students to develop the skills to protect themselves from dangerous information.

Citizens of our country do not have adequate experience in countering information and psychological operations and propaganda. Therefore, it is difficult for them to teach their children in the family. This is work for professional teachers and psychologists. For this, they must also undergo appropriate training. It is important to develop a methodology for teaching children safety skills and protection against disinformation. The monograph presents step-by-step proposals for the preparation of primary school teachers for the formation of information protection skills in younger schoolchildren.

5.12. Tetiana Pashchenko, Anna Ostapenko, Oleksandr Yamkovyi. Technological aspects of professional competence development of college teachers. The aim of the research is to analyze the application of educational technologies in the system of postgraduate education to develop the professional competence of college teachers. The article shows the improvement of the college teacher's professional competence in the system of continuous professional education. The characteristics of the main technologies for the development of the professional competence of the college teacher are given.

5.13. Mykola Pryhodii, Andrii Hurzhii, Oleksandr Humennyi. Preparation of vocational education teachers for activities in the conditions of digital transformation of education. The key aspects of preparing vocational teachers to work in the digital educational environment include: mastering digital tools; developing media education competencies; using interactive teaching methods; online communication skills; adapting to changes; stimulating creativity and innovation; ensuring cybersecurity. To prepare vocational teachers to work in the context of the digital transformation of education, it is necessary to systematically involve them in trainings on the use of digital technologies in the educational process, compliance with cybersecurity rules in the organization of online communication, as well as in reviewing cases to stimulate the creativity of students and introduce innovative interactive teaching methods, and conduct reflection sessions on adaptation to changes.

5.14. Valentyna Radkevych. Development of the innovative competence of teachers in vocational education institutions in the conditions of the digital transformation of society. The impact of digital transformation on the professional activities of educators in vocational education institutions has been examined. The focus is on the necessity of integrating digital technologies into the educational process to develop professional competence, critical thinking, and independence among vocational education students. Special attention is given to the use of electronic learning platforms such as Coursera, EdX, FutureLearn, LinkedIn Learning, and Google for Education, which facilitate the effective organization of the educational process and provide access to a wide range of educational resources. It is emphasized that this approach enables the most effective use of digital technologies for developing innovative competence in teachers at vocational education institutions.

5.15. Olena Sierikova. Implementation of the educational component «Green technologies of urban ecosystems» in the educational process. Education systems play a significant role in promoting sustainable resource management. By integrating this into the curriculum, providing hands-on learning experiences, encouraging student engagement and collaborating with external organizations, they could help to shape a more sustainable future. Therefore, it is necessary and important to develop and implement new educational components that effectively achieve the program results, and are relevant and expedient.

5.16. Serhii Shevchenko. Use of unmanned aircraft by fire and rescue departments of Ukraine. The article examines the process of creating the concept of using unmanned aerial vehicles in the State Emergency Service of Ukraine. According to the results of the conducted statistical research, the legal and regulatory application of unmanned aerial vehicles was considered, the number of unmanned aerial vehicles of the copter type in the State Emergency Service of Ukraine was established, an analysis was carried out by models of unmanned aerial vehicles, the technical characteristics of the most numerous model of unmanned aerial vehicles and examples of the work of operators were given. The author's conclusions are given regarding the concept of using unmanned aerial vehicles in the State Emergency Service of Ukraine.

About the authors

Part 1. Interdisciplinary insights into modern digitalization and management

- 1.1. *Natalia Bobro* – PhD in Economics, Director of the Scientific Laboratory "NooLab & AI"
European University, Kyiv, Ukraine.
- 1.2. *Nataiia Bozhko* – PhD in History, Associate Professor
Danylo Halytsky Lviv National Medical University, Lviv, Ukraine
Olha Tsubova – Lecturer
Lviv Polytechnic National University, Lviv, Ukraine.
- 1.3. *Vasyl Kot* – PhD of Technical Sciences, Senior Teacher
Rivne Professional College of National University of Life and Environmental Sciences of Ukraine, Rivne, Ukraine
Valentyna Yuskovych-Zhukovska – PhD of Technical Sciences, Associate Professor
Academician Stepan Demianchuk International University of Economics and Humanities, Rivne, Ukraine.
- 1.4. *Igor Shaforenko* – PhD Student
Svitlana Zaika – PhD in Economics, Professor
State Biotechnological University, Kharkiv, Ukraine.
- 1.5. *Sviatoslav Shaforenko* – PhD Student
Svitlana Zaika – PhD in Economics, Professor
State Biotechnological University, Kharkiv, Ukraine.
- 1.6. *Iryna Shumilova* – Doctor of Pedagogical Sciences, Professor
Nataliia Hrechanyk – Doctor of Pedagogical Sciences, Professor
Serhii Kubitskyi – PhD of Pedagogical Sciences, Professor
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine.
- 1.7. *Svitlana Zaika* – PhD in Economics, Professor
Andriy Avriata – PhD Student
State Biotechnological University, Kharkiv, Ukraine.
- 1.8. *Iryna Hrabovets* – PhD in Sociology, Associated Professor
Liudmyla Kalashnikova – Doctor in Sociology, Professor
Liudmyla Chernous – PhD in Sociology, Associated Professor
Kryvyi Rih State Pedagogical University, Kryvyi Rih, Ukraine.
- 1.9. *Serhii Kachurynets* – Honored Artist of Ukraine, Associated Professor
Khmelnyskyi Humanitarian-Pedagogical Academy, Khmelnyskyi, Ukraine.

- 1.10.** *Tetiana Koliada-Berezovska* – PhD in Philology, Associated Professor
State University of Intelligent Technologies and Telecommunications, Odesa, Ukraine
Stanislav Berezovsky – Senior Lecturer
Odesa State Agrarian University, Odesa, Ukraine.
- 1.11.** *Hanna Stepanova* – PhD in Law, Associated Professor
National Academy of Internal Affairs, Kyiv, Ukraine.
- 1.12.** *Liutsiia Tsyhaniuk* – PhD in Arts, Associated Professor
Khmelnyskyi Humanitarian-Pedagogical Academy, Khmelnytskyi, Ukraine.

Part 2. Advancing education in the digital age: insights and strategies

- 2.1.** *Alina Chaikina* – PhD in Economics, Associated Professor
National University “Yuri Kondratyuk Poltava Polytechnic”, Poltava, Ukraine.
- 2.2.** *Vasyl Levkulych* – Doctor in Philosophy, Associated Professor
Institute of Higher Education of the National Academy of Educational Sciences
of Ukraine, Kyiv, Ukraine
Oksana Petriv – PhD in Philosophy, Associated Professor
Drohobych Ivan Franko State Pedagogical University, Drohobych, Ukraine
Mykola Yehupov – PhD in Philosophy, Associated Professor
National University of Ukraine on Physical Education and Sport, Kyiv, Ukraine.
- 2.3.** *Liudmyla Zagoruiko* – PhD of Pedagogical Sciences, Associated Professor
Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
Yevhen Plotnikov – PhD of Pedagogical Sciences, Associated Professor
Nizhyn Mykola Gogol State University, Nizhyn, Ukraine
Iryna Didenko – PhD of Pedagogical Sciences, Associated Professor
Taras Shevchenko National University of Kyiv, Kyiv, Ukraine.
- 2.4.** *Viktor Zinchenko* – Doctor in Philosophy, Professor, Chief Researcher
Institute of Higher Education of the National Academy of Educational Sciences
of Ukraine, Kyiv, Ukraine
Tetiana Bilan – PhD in Philosophy, Associated Professor
Drohobych Ivan Franko State Pedagogical University, Drohobych, Ukraine
Nataliia Vynnyk – PhD in History, Lecturer
Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine.
- 2.5.** *Natalia Afanasieva* – Doctor in Psychology, Professor
Natalya Byelyayeva – PhD in Economics, Associate Professor
Viktoria Shkoda – Student
Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine.
- 2.6.** *Zhanna Bogdan* – PhD in Psychology, Associated Professor
Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine.

- 2.7.** *Oksana Davydova* – PhD in Psychology, Associated Professor
Kremenchuk Mykhailo Ostrohradskyi National University, Kremenchuk, Ukraine.
- 2.8.** *Marina Zaushnikova* – PhD of Sciences in Physical Education and Sports, Associate Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine
Liubov Dolynska – PhD in Psychology, Associated Professor
State Tax University, Irpin, Ukraine
Yulia Tonkopei – PhD in Psychology, Professor
Dragomanov Ukrainian State University, Kyiv, Ukraine.
- 2.9.** *Olexiy Os'machko* – PhD of Technical Sciences, Associate Professor
Roman Maiboroda – Lecturer
Eduard Shcholokov – Lecturer
National University of Civil Protection of Ukraine, Kharkiv, Ukraine.
- 2.10.** *Oleh Samborskyi* – PhD in Pharmacy, Associated Professor
Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine.
- 2.11.** *Svitlana Sechka* – PhD of Pedagogical Sciences, Associated Professor
Maryna Kushnarova – Student
Donbas State Pedagogical University, Sloviansk, Ukraine.
- 2.12.** *Yehor Sypchuk* – PhD Student
Donbas State Pedagogical University, Sloviansk, Ukraine.
- 2.13.** *Iryna Ushakova* – PhD in Psychology, Associated Professor
Bohdan Liashenko – Lecturer
Anastasia Mahonina – Student
Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine.
- 2.14.** *Iryna Shymkova* – PhD of Pedagogical Sciences, Associated Professor
Svitlana Tsvilyk – PhD of Pedagogical Sciences, Associated Professor
Vitalii Hlukhaniuk – PhD of Pedagogical Sciences, Associated Professor
Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Vinnytsia, Ukraine.
- 2.15.** *Olha Yuzyk* – Doctor of Pedagogical Sciences, Professor
Rivne State University of Humanities, Rivne, Ukraine
Sergiy Veyna – Master's Student, Teacher
Rivne State University of Humanities, Rivne, Chartory Lyceum of Manevychi village council, Chartory, Ukraine
Halyna Bilanych – PhD in History, Associate Professor
Academy of Culture and Arts, Uzhhorod, Ukraine.

Part 3. Navigating the digital frontier: innovations in management and economy

- 3.1.** *Olena Chukurna* – Doctor in Economics, Professor
Olena Stanislavyyk – Doctor in Economics, Professor
Olena Radius – Senior Lecturer
State University of Intellectual Technologies and Communication, Odesa, Ukraine.
- 3.2.** *Artem Koldovskiy* – PhD in Economics, Associated Professor
Kateryna Shafranova – PhD in Economics, Associated Professor
Zhytomyr Economic and Humanitarian Institute of the University “Ukraine”,
Zhytomyr, Ukraine.
- 3.3.** *Volodymyr Koloskov* – PhD of Technical Sciences, Associate Professor
National University of Civil Protection of Ukraine, Kharkiv, Ukraine.
- 3.4.** *Olha Komelina* – Doctor in Economics, Professor
Inna Miniailenko – PhD in Economics, Associated Professor
National University «Yuriy Kondratyuk Poltava Polytechnic», Poltava, Ukraine.
- 3.5.** *Olha Komelina* – Doctor in Economics, Professor
Mariana Vasylchenko – PhD in Economics, Associated Professor
National University «Yuriy Kondratyuk Poltava Polytechnic», Poltava, Ukraine.
- 3.6.** *Tetiana Lysiuk* – PhD of Pedagogical Sciences, Associated Professor
Volyn National University named after Lesya Ukrainka, Lutsk, Ukraine.
- 3.7.** *Inna Vlasenko* – PhD Student
Khmelnyskyi National University, Khmelnytskyi, Ukraine.
- 3.8.** *Wladyslaw Wornalkiewicz* – PhD, Professor ANS-WSZiA
The Academy of Applied Sciences – Academy of Management and Administration
in Opole, Opole, Poland.
- 3.9.** *Wladyslaw Wornalkiewicz* – PhD, Professor ANS-WSZiA
The Academy of Applied Sciences – Academy of Management and Administration
in Opole, Opole, Poland.
- 3.10.** *Liudmyla Halan* – PhD in Economics, Associated Professor
Evgeniya Borysevych – Senior Lecturer
State University of Intellectual Technologies and Communication, Odesa, Ukraine.
- 3.11.** *Oleksandr Hladkyi* – Doctor in Geography, Professor
Tetiana Dupliak – PhD in Economics, Associated Professor
Mikael Hashimov – PhD Student
State University of Trade and Economics, Kyiv, Ukraine.
- 3.12.** *Liudmyla Zveruk* – PhD in Economics, Associated Professor
Anna Monzolevska – Master's Student
Kyiv Cooperative Institute of Business and Law, Kyiv, Ukraine.

- 3.13.** *Olha Komelina* – Doctor in Economics, Professor
Sveta Shcherbinina – PhD in Economics, Associated Professor
National University «Yuriy Kondratyuk Poltava Polytechnic», Poltava, Ukraine.
- 3.14.** *Svitlana Kulakova* – PhD in Economics, Associated Professor
Oksana Zhytnyk – Master's Student
National University «Yuriy Kondratyuk Poltava Polytechnic», Poltava, Ukraine.
- 3.15.** *Maryna Mashchenko* – Doctor in Economics, Professor
National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine
Olha Haponenko – PhD in Economics, Associated Professor
Southampton Business School, University of Southampton, Southampton, United Kingdom
Iryna Lisna – PhD in Economics, Associated Professor
National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine.
- 3.16.** *Andrii Romin* – Doctor in Public Administration, Professor
Nina Rashkevich – PhD, Associated Professor
Yurii Otrosh – Doctor of Technical Sciences, Professor
National University of Civil Protection of Ukraine, Kharkiv, Ukraine.
- 3.17.** *Olha Rudachenko* – Doctor in Economics, Associated Professor
Vitalina Konenko – PhD in Economics, Associated Professor
O. M. Beketov National University of Urban Economy in Kharkiv, Kharkiv, Ukraine.
- 3.18.** *Alexander Sklyarenko* – Scientific Researcher, Deputy Head of Scientific and Organizational Department
Lashkaryov Institute of Semiconductor Physics National Academy of Sciences of Ukraine, Kyiv, Ukraine.
- 3.19.** *Leonid Tsubov* – PhD in History, Associate Professor
Oresta Shcherban – PhD in Economics, Associated Professor
Institute of Entrepreneurship and Perspective Technologies National University “Lviv Politechnic”, Lviv, Ukraine.
- 3.17.** *Olena Shevchenko* – PhD in Economics, Associated Professor
Svitlana Shcherbinina – PhD in Economics, Associated Professor
National University «Yuriy Kondratyuk Poltava Polytechnic», Poltava, Ukraine.

Part 4. Innovative approaches in digital healthcare and rehabilitation

- 4.1. *Anastasiia Bondarenko*
Tetiana Buhaienko – PhD of Pedagogical Sciences, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine.
- 4.2. *Svitlana Gvozdetzka* – PhD of Sciences in Physical Education and Sports, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine.
- 4.3. *Viktoriiia Horoshko* – PhD of Medical Sciences, Associated Professor
National University «Yuri Kondratyuk Poltava Polytechnic», Poltava, Ukraine
Andrii Horoshko – Master of Technical Sciences
Graz University of Technology, Graz, Austria
Oksana Hordiienko – Senior Lecturer
National University «Yuri Kondratyuk Poltava Polytechnic», Poltava, Ukraine.
- 4.4. *Yana Kopytina* – PhD of Sciences in Physical Education and Sports, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine.
- 4.5. *Serhii Lazorenko* – Doctor of Pedagogical Sciences, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine
Yurii Kurnyshev – PhD of Pedagogical Sciences, Associated Professor
Y. Fedkovych Chernivtsi National University, Chernivtsi, Ukraine
Tetiana Kozhemiako – PhD in Biology, Associated Professor
Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine.
- 4.6. *Vitalina Lytvynenko* – PhD of Pedagogical Sciences, Associated Professor
Natalia Kuksa – PhD of Pedagogical Sciences, Associated Professor
Yulia Maliarova – PhD of Pedagogical Sciences, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine.
- 4.7. *Oleksandr Mishchenko* – PhD of Sciences in Physical Education and Sports, Associated Professor
Tetiana Buhaienko – PhD of Pedagogical Sciences, Associated Professor
Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine
Olena Vaida – PhD of Medical Sciences, Assistant
I. Horbachevsky Ternopil National Medical University, Ternopil, Ukraine.
- 4.8. *Mariya Nutrichina* – Master's Student
Jevgenija Nevedomsjka – PhD of Pedagogical Sciences, Associated Professor
Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine.
- 4.9. *Oksana Polianska* – Doctor of Medical Sciences, Professor
Igor Polianskyi – Doctor of Medical Sciences, Professor
Olha Hulaha – PhD of Medical Sciences, Assistant
Bukovinian State Medical University, Chernivtsi, Ukraine
Inna Moskaliuk – PhD of Medical Sciences, Professor
Opole University, Opole, Poland.

- 4.10.** *Anna Rudenko* – PhD of Sciences in Physical Education and Sports, Associate Professor
Oleksandr Zvirliaka – PhD of Sciences in Physical Education and Sports, Associate Professor
 Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine
Anastasiia Syvachenko – Occupational Therapist at the Neurological Department
 Clinical Hospital No. 4 of the Sumy City Council, Sumy, Ukraine.
- 4.11.** *Iryna Skrypka* – PhD of Sciences in Physical Education and Sports, Associate Professor
Inna Kravchenko – PhD Student
 Sumy State Pedagogical University named after A. S. Makarenko, Sumy, Ukraine.

Part 5. Multidisciplinary dimensions of quality of life in a globalized world

- 5.1.** *Liudmyla Basil* – Doctor of Pedagogical Sciences, Professor, Leading Researcher
Valery Orlov – Doctor of Pedagogical Sciences, Professor, Chief Researcher
 Institute of Vocational Education of the National Academy of Education Sciences
 of Ukraine, Kyiv, Ukraine
Tetyana Nestorenko – PhD in Economics, Associated Professor, Professor AS
 Academy of Silesia, Katowice, Poland, Berdyansk State Pedagogical University,
 Zaporizhzhia, Ukraine.
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Valery Orlov – Doctor of Pedagogical Sciences, Professor, Chief Researcher
Mykola Pryhodii – Doctor of Pedagogical Sciences, Professor
 Institute of Vocational Education of the National Academy of Education Sciences
 of Ukraine, Kyiv, Ukraine.
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Iryna Lapshina – PhD of Pedagogical Sciences, Associated Professor
Svitlana Lupinovych – PhD of Pedagogical Sciences, Associated Professor
 Khortytsia National Educational and Rehabilitational Academy, Zaporizhzhia,
 Ukraine.
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 of Ukraine, Kyiv, Ukraine.
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 of the National Academy of Educational Sciences of Ukraine, Chief Researcher
Oleksandr Humennyi – PhD of Pedagogical Sciences
 Institute of Vocational Education of the National Academy of Education Sciences
 of Ukraine, Kyiv, Ukraine.
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 of the National Academy of Educational Sciences of Ukraine
 Institute of Vocational Education of the National Academy of Education Sciences
 of Ukraine, Kyiv, Ukraine.
- 5.15.** *Olena Sierikova* – PhD of Technical Sciences, Associate Professor
 National University of Civil Protection of Ukraine, Kharkiv, Ukraine.
- 5.16.** *Serhii Shevchenko* – PhD of Technical Sciences, Senior lecturer
 National University of Civil Protection of Ukraine, Kharkiv, Ukraine.



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