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The Importance of Digitalization and Innovation within the Framework of Industrial Revolution in the Context of Modern Challenges

Abstract. An analysis of the main digital trends within the framework of Industry 4.0 and its successors — Industry 5.0 and Industry 6.0 has been conducted in this paper. The concept of digitalization has been analyzed as a prerequisite to innovative technologies' development. It has been substantiated that digitalization and automation can help increase labor productivity and ensure resource savings, improve interaction with customers, detect changes in customer needs in a timely manner and effectively respond to current pandemic and geopolitical challenges. The results of the study demonstrate clear signs of the need for further digital development and innovation to support industrial transformation and future industrial revolution. It has been recommended for the global industrial manufacturers to actively work towards digitalization strategy development and use analytics, process analysis and robotic process automation as key technologies to build further innovations upon.

Keywords: industrial revolution, Industry 4.0, Industry 5.0, Industry 6.0, digitalization, innovation, advanced technologies, digital production

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1. Introduction

Global and domestic industry today faced the challenges of the geopolitical crisis, the COVID-19 pandemic and other negative factors that disrupt supply chains, production sustainability, change the labor market and increase labor turnover. Each of these challenges has a negative impact on the development of industrial production, but at the same time defines and stimulates innovation and transformation, especially given the progress of digital technologies. Digitalization of-

fers companies a basis for the implementation of modern advanced technologies and innovations: additive manufacturing, artificial intelligence (AI) and machine learning (ML), augmented and virtual reality (AR/VR) and industrial metauniverse.

The evolution of information systems and technologies in general has contributed to the progress of the digitalization of industry, which has forced companies to increase their investment in solutions and tools that allow the automation of processes within the company and improve their productivity. Global industrial manufacturers pay special attention to the process of production development, investing in new technologies adapted to their requirements.

Industrial manufacturing companies today are actively working towards digitalization strategy development and use analytics, process analysis and robotic process automation as key technologies, thus optimizing production processes for digital production. Digital business models and automation of production systems aim to achieve the highest cost efficiency, better customer satisfaction, greater transparency and faster processes to ensure sustainable economic success. By reducing low-value-added processes, the saved resources can be redirected to improve other strategically important processes.

2. Digitalization and the Digital Revolution as Prerequisites for the Emergence and Development of Industry 4.0

It was digitalization and the digital revolution that became a prerequisite for the emergence and development of Industry 4.0. The concept of "Industry 4.0" emerged after the digital revolution, and this concept is based on close interconnection, automation and machine learning. The concept of "Industry 4.0" was first presented in 2011 thanks to the strategic initiative of the German government. One of its strategic goals was the maximum digitalization of companies' activities, using the potential of new technologies. Each of these technologies has benefits and capabilities that can help companies address today's challenges of supply chain disruption, resilience and changing working conditions, as well as employee turnover (Steden and Kirchne, 2018).

There are still debates among scientists and practitioners regarding the universal definition of the industrial revolution, and the technological revolution itself is viewed through the prism of four generally recognized stages. The first revolution is characterized by the introduction of mechanical means for the production of water and steam, the second covers the application of electrical technologies of mass production. The use of electronics and information technology (IT) that

support additional automation of production characterizes the third revolution. Finally, the use of the Internet of Things (IoT) and Cyber-Physical Systems (CPS) project a new industrial revolution (Khaitan and Mccalley, 2014). The term «Industry 4.0» arose in the context of innovation policy, which is defined by the combination of advanced technologies in which the Internet is widely used to support other technologies, such as the integration of intelligent machines, people and physical objects, throughout the organizational value chain (Borras and Edquist, 2013).

Industry 4.0 transforms production systems by digitizing processes and business models, as well as by automating and expanding the use of the latest technologies. Often, ways to improve Industry 4.0 are evaluated in terms of productivity, flexibility and efficiency. Given how rapidly new technologies are changing the economy and society in general, it is important for governments to have objective mechanisms for assessing the timeliness and pace of technological advancements to achieve inclusive economic growth.

Innovation is necessary for effective development in the era of the Fourth Industrial Revolution, so many countries have developed plans to stimulate industrial innovation and digitalization, which often differ by region and level of economic development. Innovation is the main driver of the development of domestic science and technology, but the risks associated with the financing of innovation are high due to the uncertainty of the rate of return on investments, mainly related to high-tech products. The policy of stimulating the progress of science and technology affects not only scientific, technical and industrial development, but also accelerates the formation of national industrial competitiveness. Government policies on industrial innovation can reduce business difficulties and, thus, corporate leaders can innovate more effectively and take risks (Kniaziev, 2020).

An example of a successful strategic initiative for the development digital transformation is German «Industrie 4.0» (Industrie 4.0 (I40)) — a national strategic initiative from the German government through the Ministry of Education and Science (BMBF) and the Ministry of Economy and Energy (BMWI). This initiative is aimed at the development of digital technologies in production by increasing the digitalization and interconnection of products, value chains and business models. It also aims to support research, a network of industry partners and standardization. I40 is designed for 10–15 years and is based on the German government strategy «Strategy of high technologies 2020». The initiative was launched in 2011 by the efforts of the Industry Science Research Alliance (FU) with the assistance of the Ministry of Education and Science. Its result was the approval of the High Technology Strategy 2020 Action Plan. Representatives of German industry and other interested parties see I40 as a strategic initiative and a mechanism for consolidating German technological leadership in mechanical engineering and

industry in general. I40 managed to limit segregation among industry sectors, rapidly translate scientific research into common practice in a fairly short period of time, and scale nationally into the largest industry community united around a given initiative (Rodrigues et. al., 2021).

Approximately 15 million jobs in Germany are directly or indirectly related to the production of goods, so the evolution of digital technologies in manufacturing opened up key opportunities for German manufacturers. As a leading supplier of industrial equipment at the global level, the digital restructuring of German industry created the prerequisites for increasing the international competitiveness of German production and creating new jobs (Rodrigues et. al., 2021).

Modern digital industrial production consists of a a set of integrated, cross-functional smart manufacturing approaches at the enterprise level that take advantage of today's advanced information systems, technologies, and tools to improve manufacturing competitiveness through efficient supply chains, high flexibility and optimized energy efficiency, enabling efficient production of highly customized product and components from digital designs at the right time and place. The key components of such production include an improved research and development mechanism, as well as taking into account the final speed and productivity, efficiency of supply chains, output processes, energy efficiency and improved sustainability in the production process; improved security, configurability and flexibility of the process, as well as a higher level of satisfaction and professional pride in the work performed. Modern digital industrial production defines how digital flows, integrated information systems, big data and analytics mutually reinforce and ensure a high level of use of advanced information technologies by the industrial complex in order to improve the competitiveness of the latter. Digital flows connect data supply chains (from creation, transformation, extension, manipulation, transformation to use) that reflect the evolution of a product throughout its life cycle from conception to production and to its end use, including maintenance.

An efficient digital flow enables the interconnection, visualization, interpretation and optimization of digital designs through integrated artifact modeling while the product structure is produced digitally through manufacturing add-ons or is used to digitally drive traditional manufacturing in multi-enterprise end-to-end supply chain operations. Such digital flows predict the future of production, where the time from design to production is significantly optimized thanks to advanced manufacturing technologies, high-precision modeling and simulation, new models of human interaction (for example, the use of virtual reality and environments), which will significantly shorten the process of creating a design, developing a prototype and testing cycles.

Integrated information systems foresee the future of production using knowledge, data and key attributes that will positively influence the speed of development of digital designs, will be effectively exchanged and used by actors and objects of supply chains at many levels (manufacturers, consumers, suppliers, distribution uters, supply nodes, partner channels, etc.) with no or low resistance to ensure high quality and configurability of products for consumers. The integration of currently diverse heterogeneous centers of information automation will reduce time and costs of inventory and components in production, as well as quickly identify problems for prevention and corrective interventions and develop decision-making scenarios to ensure maximum production efficiency.

Big data, visualization and analytics provide a new level of knowledge, technical capabilities and tools to use all the data that may still be untapped, to obtain and anticipate results (predicting consequences and adjusting actions) from this production data. This data should be collected and categorized from disparate systems, devices, networks and people using open metadata standards. There is a need for new visualization and analytics models that capture data that is collected or stored at various stages of production and parts of operational equipment, in various applications and tools within end-to-end supply chains for more agile, real-time decision-making. This data must be properly linked with digital flows from design, modeling, simulation, prototyping, testing, as well as non-operational data such as energy and product management data to enable digital flows and digital manufacturing to improve efficiency of production. The widespread use of sensors and devices in the production process and supply operations will increase the need for improved management to effectively use the large volume of data. These large amounts of data need to be effectively managed throughout the product lifecycle using a data lifecycle management system. The data cybersecurity framework in the context of digital flows is key to enabling effective Big Data production and competitive advantage.

3. Digital Technologies and Innovations as Tools of the Industrial Revolution

Industry 4.0 involves the widespread use of advanced technological innovations that allow making effective and accurate engineering choices in real time by combining a number of information and communication technologies with existing production systems. Digital flows are a crucial component of Industry 4.0, and the combination of digital technologies and operations with manufacturing technologies enables vertical integration of intra-organizational systems and horizontal

integration of inter-organizational systems through the IoT, cloud technologies and computing services, as well as end-to-end balanced solutions along the entire value chain (Gilchrist, 2016).

Among the main technologies driving the industrial revolution today are CPS, blockchain, AI, digital twinning, IoT, big data and analytics, cloud computing, and additive manufacturing. A CPS integrates real-world physical processes with computers and communications infrastructure; the IoT provides the collection of information from physical objects using a computer network or the acceleration of a wireless connection; big data and analytics deal with the analysis of data generated by IoT networks to optimize the processing of information compared to the use of raw data; cloud computing provides software, infrastructure, and platform-as-a-service that enables real-time data exchange across the entire supply chain. In contrast to cloud computing, blockchain technology refers to pure digital ledgers of transactions programmed to record the value of any type of transaction and provide assets for secure and transparent forms for transaction data. AI technologies enable continuous learning and adaptive decision-making based on massive, sometimes unstructured data sets. Additive manufacturing, often called 3D printing, makes it possible to create three-dimensional objects by forming a layer of material under computer control (Fehmi and Ilker, 2019).

Today, industrial companies are at the epicenter of technological transformation. The world industry creates individual digital capabilities and intelligently connected products. Innovative processes such as connected manufacturing, predictive maintenance and innovative service models are increasingly being used in production. The use of modern digital technologies is becoming a necessity, which prevents the risks of losing relevance in the market of modern industry. Let's take a closer look at some prospective trends in the development of modern world industry today:

Nanoengineering — nanotechnology refers to the manipulation of materials at the smallest level. This rapidly growing industry offers ample opportunities for the development of industrial production. In the coming years, producers will use nanotechnology to produce stronger composite materials, develop and manufacture renewable energy storage systems, advanced biomedical devices, and more.

Biomechatronics — with the rapid growth of biomechatronics, the development of robotics in production has taken another step forward. This is a field that seeks to unite the body and the machine, involves the design and testing of complex architectures of devices imitating the skeletal-muscular structure of the body. Producers will primarily be involved in the design of mechanical sensors, controllers, and actuators for biomedical devices used in prosthetics and min-

iature medical implants. In addition to the medical field, research is also being conducted on the use of biomechatronics in the military industry.

AI will define the development of industrial production in the coming decade and continues to expand its impact on the software used in production. Generative design programs automatically optimize design and calculation systems to best match the functional purpose of the part — including how it will be manufactured. Software vendors are developing AI systems to advise engineers on material selection and compliance with established codes and standards. Meanwhile, workflow automation software allows AI to perform tasks such as verifying change orders, managing materials estimates, and finding opportunities to standardize parts across multiple products. AI is increasingly used to support the entire production chain of value creation, which provides a detailed quantitative assessment of current market data and allows to effectively solve strategic tasks. Also, AI is used in autonomous systems. These include vehicles and unmanned aerial vehicles, as well as robots — those that guide parts in factories and warehouses (they may one day replace conveyor belts) or those that deliver medicine and supplies to hospitals. AI makes possible the use of a wide range of complex products that autonomously respond to the environment or given commands (Gilchrist, 2016).

Intelligent quality control with the help of AI helps industrial companies to effectively use the capabilities of ML and advanced image recognition systems to automate the visual inspection and control of malfunctions of equipment and its small components. Dynamic process modeling and optimization will allow end users to plan their machine usage efficiently, plan material flow and dynamic supply, and predict possible stoppages.

Over the next decade, AI will become smarter, faster, and much more accurate. But it will still have to overcome one important barrier — trust. It will be at least a decade before anyone trusts a highway full of autonomous cars driven by AI, or a multimillion-dollar engineering factory making its own decisions about the production process without human support.

Expanding the use of online applications in indistrial production opens up a whole set of advantages and is an important step in the direction of the development of Industry 4.0. For example, remote operations help manage devices from one central control center and provide machine support and maintenance. The data obtained from the machine can be used for monitoring and optimization. However, the increased use of online communications increases the vulnerability of engineering companies to cyber attacks. Cyber-attacks can have a devastating effect on the production, and therefore, ensuring cyber security plays an increasingly important role in ensuring the safety of industrial companies.

The use of «big data» and its quality in industrial production are growing nowadays. We are witnessing the growing proliferation of embedded IoT sensors that simplify and facilitate real-time information gathering. The spread of 5G wireless networks, which promise not only to increase the speed of data transfer by 5–100 times, but also to have much lower latency than existing 4G networks, also contributes to the quantity and quality of data.

The IoT today is a concept that is dynamically developing and its importance will grow in indutsrial production. The IoT technology makes it possible to earn higher incomes and increase margins in production. Also, the IoT technology is actively used in agricultural engineering. Today, there is an increasingly widespread use of digital technology in the development and implementation of new tools and machines. The wider spread of IoT will allow information to be collected from products in the field and be compared with their digital twins in production. In factories, this would allow manufacturers to track engineering equipment to optimize production or predict maintenance shutdowns. It will allow engineers to evaluate why some designs will not be able to extend the life of parts or machines in the future. Over the next decade, engineers and marketers will increasingly differentiate their products through intelligent use of the data they collect (Barna, 2021).

Thanks to Industry 4.0 and technological innovations, industrial design and production can be improved using the concept of a «digital twin». This concept involves displaying a physical asset on a digital platform and using sensors to monitor the performance, condition and status of the asset in real time. The concept of a digital twin is designed to help enterprises identify physical problems faster, predict their results more accurately and produce better products (Gilchrist, 2016).

Modern industry is highly dependent on equipment and it is important that machines and equipment work at full capacity as any malfunctions or breakdowns can affect operational results and product quality. Production using the concept of a digital twin allows manufacturers and specialists on production lines to receive rapid feedback and information about the ergonomics of a component, and therefore the possibility of operational 3D printing of an improved model within one or two days. Accordingly, manufacturers can instantly respond to new trends and customer challenges, as well as continuously implement incremental improvements in the design of machines and components based on the information obtained from the digital twin. The concept of a digital twin can significantly reduce the time to market and at the same time help to take into account the specific requirements of customers in production and achieve a competitive advantage.

Despite the increasing complexity of supply chains around the world today, many industrial manufacturers continue to rely on relatively simple means of

tracking and managing their supply chain processes. Current geopolitical and other global challenges have demonstrated the limitations of this approach. Instead, digital twin technology can be used to model supply chains and business processes, helping companies better understand the complexity of value chains, identify problems at early stages, and shape solutions. Given the vast amounts of data available in today's supply chains, digitalization has become a necessity to gain effective vision and perspective.

One of the key deficiencies in the decision making within supply chain management is the inability to provide context or situational awareness within the entire supply chain. A comprehensive digital counterpart of the supply chain, placed in an industrial meta-universe that leverages existing technologies, including AR/VR, can be used to create intuitive visualizations that are far easier to perceive than numbers on a table or points on a chart. The industrial metauniverse allows companies to harness the power of large-scale computing and deep visualization to analyze and interrogate a digital counterpart, providing a higher level of situational awareness on a global scale based on the availability of massive amounts of data. In turn, the integration of AI/ML into the industrial metauniverse platform can further increase the value of the digital twin. AI/ML is already doing great at sorting and classifying large data sets to help uncover the most useful information. When applied to supply chain management, this capability can help quickly sort and organize the vast amounts of data generated by today's global supply chain, making it easier to focus on the most important trends and patterns. Also, the more an AI/ML system is used, the better it is at recognizing patterns and predicting future supply issues before they occur (Fehmi and Ilker, 2019).

For the future development of industrial production, it is also important to find sustainable industries that will help companies become more efficient, more competitive and better prepared for today's challenges. Advanced digitalization technologies can facilitate the analysis and current practices of sustainable decision-making by manufacturers. Sustainability programs can benefit greatly from the power of AI and machine learning. For example, an AI/ML engine can help automate the aggregation of all the information a company needs to create collective intelligence without overwhelming employees with tedious information searches. This collective intelligence will help the company make an objective assessment of sustainability performance and create solutions to eliminate production and supply gaps.

Additive manufacturing, namely the method of building any objects according to their 3D model, is an important tool in promoting sustainable development. Casting and machining are processes that typically generate waste. The transition to additive processes can significantly reduce the material costs of parts, elimi-

nating the need for molds and the waste generated in the subtractive processing process. This method also benefits from the relative lack of design constraints compared to other manufacturing processes. As a result, designers can create components that are more efficient in several areas, including material use, thermal performance and strength-to-weight ratio, helping companies to be more energy and resource efficient (Gilchrist, 2016).

The rapid development of science and technology changes the requirements for the qualifications of employees. Simply investing in digitalization processes without intention or strategy risks is leaving many employees out of the labor market. For manufacturers, it is important to find a balance between modernization and attracting new talent, retraining and retention of current employees. The technology, which is intuitive and easy to master, will help both new and existing employees to master their work faster. Company employees can benefit from hands-on virtual training sessions that take place in the metaverse and offer a learning environment where mistakes are much cheaper than in a real production process. The industrial metauniverse will also change the way factories work, creating a virtual space to work on real projects that are more interactive and relevant.

4. Digitalization Shaping Future Industrial Revolutions

The active implementation of digitalization and advanced technologies of Industry 4.0 will contribute to increased labor productivity, more efficient and automated production processes, better quality and shorter product delivery times, the development of the world industry in modern conditions of globalization, geopolitical and pandemic challenges, lightning fast introduction of new digital technologies and growing competition in world markets. The rapid development of the latest technologies creates prerequisites for the development of the next industrial concepts of Industry 5.0 and Industry 6.0 already today.

Industry 5.0, also referred to as the fifth industrial revolution, is a new phase of industrialization that emerges when humans work together with advanced technologies and AI-based robots to improve work processes. Its focus is human orientation, as well as increasing the flexibility, resilience and sustainable development of the industry. This new phase goes beyond manufacturing, is based on the fourth industrial revolution and is realized thanks to information technology developments, which include such main components as AI, automation, big data analytics, IoT, ML, robotics, smart systems and virtualization. Industry 5.0 shifts priorities from a purely economic plane to a broader concept of social value and well-being. Although such a concept has already been mentioned in the past, for

example, in the form of corporate social responsibility, it was Industry 5.0 that cemented the idea of prioritizing social and environmental values over profits, establishing a new focus for industrial development. The concept of Industry 5.0 goes beyond industry and encompasses all organizations and business strategies to create a broader perspective compared to Industry 4.0. A comparison of the main characteristics of Industry 4.0 and Industry 5.0 is shown in Figure 1.

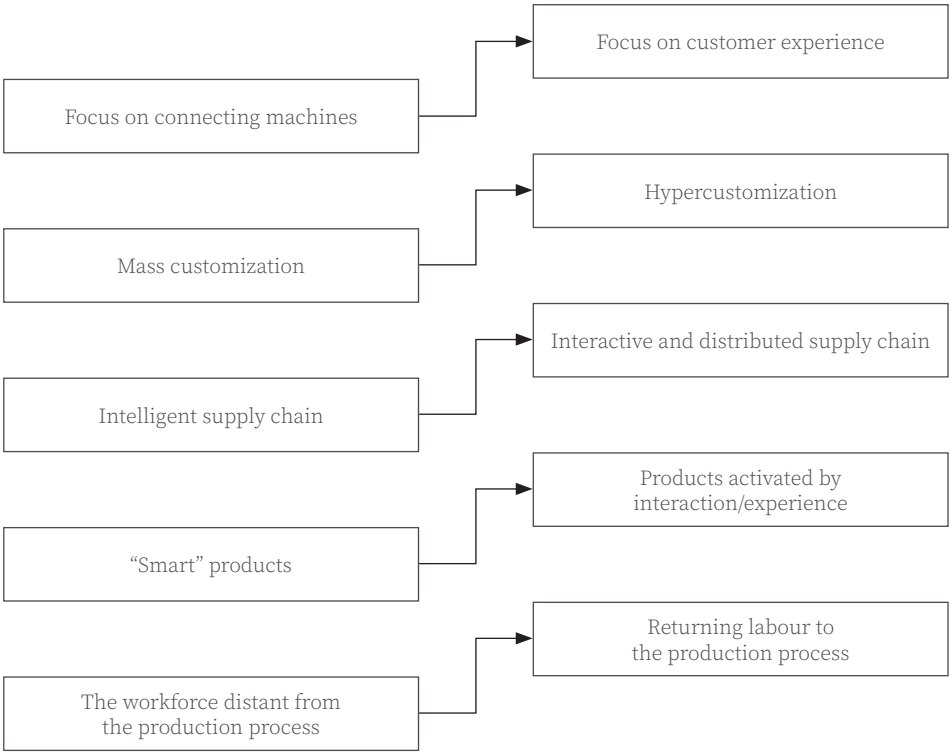

Figure 1. Comparison of the main characteristics of Industry 4.0 and Industry 5.0
Source: i-Scoop (2023)

Thanks to personalization and close cooperation with collaborative robots (cobots), employees can concentrate on performing additional tasks within the framework of Industry 5.0 with a focus on the client. This concept goes beyond manufacturing processes and includes increased sustainability, a human-centered approach and an emphasis on sustainability. Therefore, the main benefit of Industry 5.0 is the creation of workplaces with the possibility of generating higher value, which provide greater personalization for customers and improved design freedom for employees. Automation of production processes allows employees to

focus more on providing improved individual services and creating customized products (adapted to specific consumers). At the same time, increased attention to sustainability means that businesses are becoming more flexible and have a positive impact on society, rather than simply mitigating any negative effects of production processes (i-Scoop, 2023).

While the concept of Industry 5.0 refers to the personalization and synergy between the work of people and machines, the world's leading scientists are already predicting what Industry 6.0 will be like in order to prepare the foundation for the effective implementation of its mechanisms. Industry 6.0 will be an era of renewable energy, total machine independence, aerial manufacturing platforms, anatomical improvements and quantum control. Already today, certain research topics are relating to specific industries and lying directly on the path to the next industrial revolutions. There are several areas being driven by today's product markets that hold the potential for the next industrial revolutions, namely drone delivery, DDx (differential diagnosis) portable medical kits, bionic organs, quantum computing, AI for automated driving, the use of neuroscience and AI for consumer research etc. (Duggal et al., 2021).

Industry 6.0 is the next step in the latest technologies and processes, the foundations of which are being laid today. For example, drone research is a familiar topic, but combining drones with other devices to realize a new service/product opens up new possibilities that have not been explored before. Drones can be used in industrial logistics to reach places where conventional methods are inaccessible due to uncontrollable external factors such as temperature, electrical hazards, chemical hazards, etc. Portable medical diagnostics is another vivid example of a research direction paving the way for the sixth industrial revolution. In particular, in order to expand the research, the medical profile of the user can be connected to the smart technologies of health care systems, creating even more personalized solutions in this field. Also, 5D printing technology, which allows you to print objects not from one point upwards, but from five axes, is already starting to develop today. The printer's print head moves at 5 different angles during printing. These movements allow the printer head to enter at different angles that cannot be achieved with 3D printing. With these new angles, the print head can follow the contour of the mold and the contour of the object, and printed parts can be created using curved layers instead of flat layers. These curved layers allow you to print stronger parts with complex designs. So, using several examples, we have illustrated the birth and development of many new technologies that will determine the next industrial revolution. Therefore, despite the long-term prospect of the active implementation of Industry 6.0 in industry, it is advisable to start researching its technologies today in order to lay the foundation for ef-

fective strategic planning of the industrial development based on innovation and competitiveness (Duggal et al., 2021).

Modern global studies of the next industrial revolution highlight robots as a key role in the production process, which will become the industrial norm. The likely outcome of previous revolutions focused on digitalization, technical automation and personalized manufacturing will be monolithic manufacturing centers where machines will be connected to multiple AI algorithms to perform specific tasks that will work together to produce based on customer requirements. The sixth industrial revolution is predicted to use the following technologies in order to improve various aspects of production and the general quality of life: multidimensional printing, robo-medicine, home robotics, neuroscience technologies using AI. It is worth noting that forecasts and visions of the development of Industry 6.0 differ depending on the specific industries under investigation. However, the common denominator of such forecasts is a complex, customer — and human-oriented production with a high level of digitalization, innovation, sustainability and virtualization, extensive collaboration with robots, a high level of connections between various industries, mass customization (adaptation and customization of a product for a specific audience), and personalization services and products with the addition of the concept of dynamic supply chain management, highly specialized thinking on one lot size, and rapid global information exchange.

5. Conclusions

According to global forecasts of economic development, many of today's challenges and their consequences will be relevant in the future, namely, geopolitical crisis, pandemics, disruptions in supply chains, the need to implement innovative technologies, changes in the labor market, etc. Therefore, the timely mastering and implementation of digital technologies will help manufacturing companies to develop cooperation, efficiently collect and process data, and explore innovative solutions, saving time and money. Digitalization and automation of manual processes can help increase labor productivity and ensure resource savings, as well as improve interaction with customers, detect changes in customer needs in a timely manner and adapt to changing market conditions. An important challenge for enterprises is to ensure the speed and flexibility of their digitalization programs, and to choose the optimal level of management and control that enables, not inhibits, these programs. Digitalization as an important component of Industry 4.0 is a prerequisite for ensuring competitiveness in an industry environment

that is constantly changing. It is important to implement innovative technologies within the framework of Industry 4.0 and to involve more computerization and flexible decision-making processes in production regarding software and intelligent systems.

Despite the increasing complexity of supply chains around the world today, many industrial manufacturers continue to rely on relatively simple means of tracking and managing their supply chain processes. Current geopolitical and other global challenges have demonstrated the limitations of this approach. Given the vast amounts of data available in today's supply chains, digitalization has become a necessity to gain effective vision and perspective.

The post-pandemia and post-crisis recovery and effective development of the world industry depends on the introduction of the latest technologies and the activation of industrial development within the framework of Industry 4.0. With the evolution of manufacturing, science, technology and the Internet, the implementation of so-called "smart" manufacturing will be a strong response to the rising cost of labor and changing consumer habits, supporting the development of the industrialization of the economy. At the same time, it is expedient to continue researching evolving innovative industry trends in order to ensure the development and competitiveness of the economy. And the study of the latest concepts of Industry 5.0 and Industry 6.0 are relevant already today with the aim of forming a knowledge base and future support on the way to the implementation of the latest technological achievements and transformation of business and production processes in accordance with the latest models of industry development.

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Znaczenie cyfryzacji i innowacji w ramach rewolucji przemysłowej w kontekście wyzwań współczesnych

Streszczenie. W artykule przeprowadzono analizę głównych trendów cyfrowych w ramach Przemysłu 4.0 i następujących po nim — Przemysłu 5.0. i Przemysłu 6.0. Przeanalizowano koncepcję cyfryzacji jako warunku rozwoju innowacyjnych technologii. Udowodniono, że cyfryzacja i automatyzacja mogą pomóc w zwiększeniu wydajności pracy i zapewnieniu oszczędności zasobów, usprawnić interakcje z klientami, wykrywać zmiany potrzeb klientów w odpowiednim czasie i skutecznie reagować na aktualne wyzwania związane z pandemią i geopolityką. Wyniki badania wyraźnie pokazują potrzebę dalszego rozwoju cyfrowego i innowacji w celu wspierania transformacji przemysłowej i przyszłej rewolucji przemysłowej. Zalecono globalnym producentom przemysłowym, aby aktywnie pracowali nad rozwojem strategii cyfryzacji i wykorzystywali analitykę, analizę procesów i zrobotyzowaną automatyzację procesów jako kluczowe technologie, na których można budować dalsze innowacje.

Słowa kluczowe: rewolucja przemysłowa, Przemysł 4.0, Przemysł 5.0, Przemysł 6.0, cyfryzacja, innowacja, zaawansowane technologie, produkcja cyfrowa

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Technological, Scientific and Social Drivers of Open Innovations in the Context of Military and Socio-economic Crisis: Ukraine's Experience

Abstract. The aim of the article is to identify the peculiarities of the impact of technological, scientific, and social factors on the process of developing open innovations (OI) in the context of an intense socio-economic crisis and war in the case of Ukraine. The article defines the essence of open innovation and its difference from traditional innovation, stages of development and challenges of open innovation in the context of crisis, drivers of OI development, and their impact on solving OI challenges. The key drivers that help organisation overcome challenges of market uncertainty are technological, scientific, and social. Digitalization as a technological driver ensures constant feedback, and flexibility, and creates global access to important resources. Collaboration and interaction of the organisation with the scientific community (universities and educational institutions) provide access to quality knowledge and ensure the alignment of practice and theory, and organizations gain access to qualified personnel. Non-governmental organisations (NGOs) as social driver contributes to the accumulation of the experience of the members of NGOs, provides various

research projects, and disseminate the results among its members and other stakeholders, creating valuable knowledge that is needed for the sustainable operation of organisation.

Keywords: innovation, open innovations, the process of developing innovations and its challenges, digitalization, NGO, university

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1. Introduction

Open Innovation (OI) is a concept that has gained significant traction in recent decades, with increased organizations recognizing the value of utilizing external sources of knowledge and resources to drive innovation. The development of OI is driven by a number of factors. The most significant ones are technological, scientific, and social. Technological factors that drive the development of open innovations include the rapid digitalization of all spheres of life. The scientific factors include the evolution and transformation of the role of universities, and the social drivers include the development of professional organizations, including non-governmental organisations (NGOs).

The rise of technology is driving the global digitalization of all spheres and industries, creating new opportunities and challenges, as well as the emergence of new systems of interaction and business models. In addition, uncertainty is growing, the market environment is changing dynamically. Only in the past decade humanity has dealt with the COVID-19 pandemic, economic crisis, and ongoing war on the European continent. Companies should transform in line with uncertainty in a market environment, be in line with fast-changing competition, and meet the market needs.

If earlier it was possible to increase competitiveness by changing efficiency and changing the company's business practices in line with benchmarks, in the current digitalized environment strong competitiveness can be achieved through the development of ecosystems and implementation of innovations. There is a necessity to update approaches to the development process of innovations.

Customers, stakeholders, institutions, and other market actors are waiting for organisations to be more open and transparent, quicker, more creative, and lead the change. The rapid spread of the Internet and, the rise of e-commerce and online platforms has drastically changed the way companies approach the way of doing business. Retail ecommerce market in 2021 reached 4.9 trillion U.S. dollars and is expected to grow to 7.4 trillion dollars by 2025 (Statista, 2023). With the ability to reach a global audience and track customer behavior through data analytics, e-commerce has opened new opportunities for businesses to interact with customers through innovative informational tools. Exponential progress was

made in the development of technologies such as artificial intelligence (AI), blockchain, cloud computing, advanced analytics based on big data, 5G and mobile, Internet of Things (IoT). These are technologies that ensure new value creation and place ecosystems at the center of innovation development.

Today's world is developing based on the information and knowledge economy, which are components of the innovative development model. Society faces challenges that need to be addressed in new ways and there is an urgent need to use the achievements of science and technology to transform the global economy. A key role is playing the integration of universities in the ecosystem of development OI to stay in line with the dynamic market environment, to develop new advanced technologies, to support relevant knowledge base and balance between practice and theory, and to create new jobs related to the use of advanced intelligence.

One of the roles of universities nowadays is to be an entrepreneurial center with the ability to sustain ease of knowledge transfer and commercialization capabilities. It creates space for OI to be developed (Sharifi et al., 2014). Knowledge transfer as the main activity can be represented through collaborative research, contact research, consultancy to commercialization activities that are associated with academic entrepreneurship and patenting (Perkmann et al., 2013). It may also mean including students in practical problems of industries. The broader engagement activities can be a valuable source where the knowledge transfers to the private sector fast and easily, ensuring continuous development of competitive advantages, and from the other side may be one of the income streams for academic institutions. Interaction between universities and industrial practice opens new opportunities for OI to be developed and increases the significance of these institutions as a part of organisations' ecosystems.

The development of civil society and democracy is characterized by the emergence and development of non-governmental institutions. NGOs play a critical role in promoting open innovations in civil society by fostering collaboration and encouraging creative problem-solving. They provide a platform for communities and associations from people with different backgrounds to come together, identify challenges, and work towards finding solutions. Through their advocacy efforts, expertise, and community-building initiatives, NGOs help to create an environment that supports innovation and fosters the development of new ideas. They also provide valuable resources and support for individuals and organizations working on socially impactful projects that lead to qualitative change on different levels: from policy making to improvement of individual life. The establishment of NGOs and their evolution is a sign of the maturity of civil society and its openness to dialogue and constructive feedback which are critical for the development of open innovations.

Transformation is taking place on the way to changing the existing economic regime of Ukraine and strengthening the role of a democratic society, in particular, the introduction of digitalization in the interaction between citizens and the state, the development and formation of NGOs, and the role of universities is transforming to support and stimulate innovative development. This process has been accelerated by the socio-economic crisis and war.

It remains unexplored how to effectively use the main drivers of development (technological, scientific, and social) of open innovations in the current crisis conditions in Ukraine and ensure sustainable development in the post-crisis period.

The article aims to identify the peculiarities of the impact of technological, scientific, and social factors on the process of developing open innovations in the context of an intense socio-economic crisis and war.

To achieve this goal, the article will address the following tasks: defining the essence of open innovation and its difference from traditional innovation, stages of development and challenges of open innovation in crisis contexts, drivers of OI development and their impact on solving OI challenges.

2. Literature Review

The concept of innovations has been widely spread in scientific research. However, the scientific community and practitioners have ongoing discussions about a common definition of "innovation." In the era of 4th Industrial Revolution "innovation" is defined as a process, an outcome, and a mindset (Kahn, 2018, 453–460). The study about innovations, their typology, and development process was led by M. Bogers and J. West (2012), H. Chesbrough (2003a), C. Höllmüller (2008), and others. Among Ukrainian scientists who led studies in this area are S. Ilyashenko (2010), K. Kostianchuk and O. Zozuliov (2020), O. Pryhara (2020), A. Starostina and V. Kravchenko (2020), et al.

Marketing innovations as one of the types of innovations that occur in the evolution process of industries. With the development of advanced technologies and easy access to the Internet, the role of marketing innovations increases. Marketing innovation can be one of the product or process (Chen, 2006, p. 101–123). Digitalization and online shopping create a wide range of opportunities, as well as risks. Decision strategies of consumers are developed to reduce the risk and help them to act with relative confidence in the environment of large amounts of information and make the consequences of their actions more meaningful (Bauer, 1960). Organisations should be aware of customers' behavioral charac-

teristics including an understanding of risks and seek solutions that create ways of reducing them.

Marketing innovations are one of the instruments that help to reduce perceived risks of customers and add dynamic competitive advantage for the business. Based on firms' need to combine their internal and external developments there are two types of innovations: closed and open (Chesbrough 2003a; 2003b; 2004). Closed Innovations (CI) refer to the traditional method of creating innovations. They are created by the organization's own departments and Research and Development (R&D) center. Thus, the organization fully controls the entire process of creating innovations. At the same time, the disadvantages of creating closed innovations are the excessive cost of development, lack of flexibility, and the launch process can be lengthy. The main difference between OI and CI is in using external resources within the creation process (Figure 1).

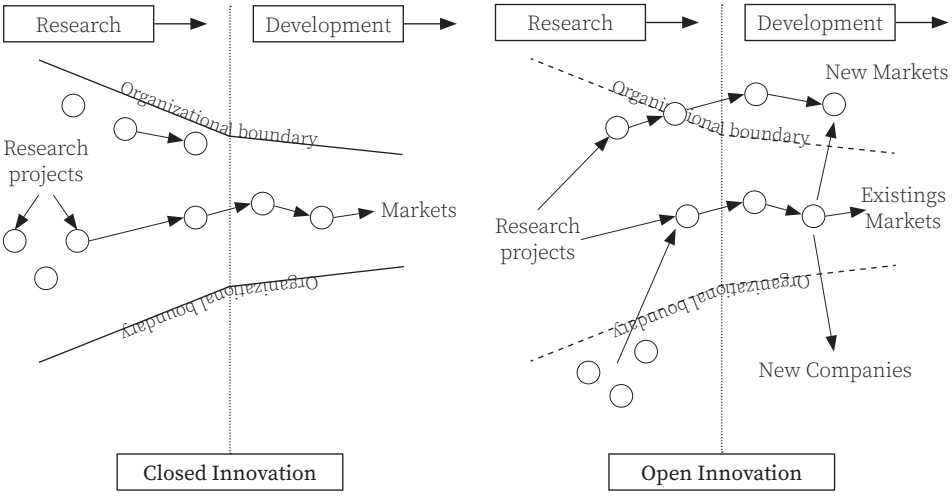

Figure 1. Difference between closed innovation and open innovation
Source: Höllmüller (2008), authors

Distributed innovation is dispersed beyond organizations boundaries (Bogers and West, 2012; 2014). The concept of OI was first introduced by Chesbrough in 2003. Chesbrough defined OI as "the paradigm that assumes that firms can and should use external ideas as well as internal ideas." The central idea of OI is to open access to the process of creating innovations to other businesses, individuals, research centers, universities, consumers, and other stakeholders to ensure the free flow of ideas inside and outside the organization (Chesborough, 2004). Open innovation is also defined as "a modification to the vertical integration paradigm."

The Oxford Review Encyclopaedia of Terms defines two types of open innovation:

- *inbound innovation* — search and acquisition of experience outside the organization.
- *outbound innovation* — commercialization and capture of ideas developed within the organization in the external environment (The Oxford Review, 2021).

The process of developing innovation consists of five main stages: defining the problem and ideation, research and development, prototyping, testing and validation, commercialization, and scaling.

The first stage of developing open innovation is to define the problem or opportunity. This involves identifying the specific area where the company needs to innovate, such as a new product or service, a new production process, or a new business model. The company must also identify the specific goals and objectives that it hopes to achieve through the innovation process. The second stage is to conduct research and develop prototypes. This includes identifying potential partners, such as universities, research institutions, start-ups, and other companies, that have the expertise and resources to contribute to the innovation process. The third stage is prototyping. This involves building prototypes and testing them. The company must also establish a process for evaluating the acceptance of prototypes in the market. The fourth stage is to evaluate the prototype and determine its viability. At the last stage of commercialization and scaling organisation brings innovation to the market and scales it.

However, during a social economic crisis or war, these stages face various challenges that can hinder the success of the innovation. In the context of a crisis, access to funding and resources for idea generation may be limited, leading to a reduction in the number of new ideas being generated. Another challenge that organisation faces is a shortage of skilled workers, raw materials, financial funding, and other resources. It becomes more difficult to develop and test prototypes. An uncertain environment can lead to a lack of access to technology and equipment, making it difficult to build and test prototypes effectively. There may also be a lack of access to data, customers, and other resources, making it difficult to obtain accurate results. Challenges that occur at the last stage are a decrease in consumer demand, leading to reduced sales and slower growth.

3. Technological, Scientific, and Social Drivers of Open Innovations

3.1. Technological Drivers of OI: Digitalization

One of the factors that influence change in the process of OI development is the exponential growth of technologies and the formation of a digital economy. The focus is on the amount of data that is produced with digitalization, and the rising need for its protection, analysis, and full transparency.

AI, advanced analytics, hybrid cloud, 5G and mobile, IoT, and blockchain are technologies that ensure further development of open innovation and the creation of ecosystems. AI enables machines to approximate capabilities of the humans; advanced analytics enables huge data of analytics to be processed in real-time and with deep insights. Hybrid cloud supports integrated, efficient, modular infrastructure and unifies public and private cloud services. IoT creates opportunities for new business models. Blockchain works as a trusted digital ledger that supports transactions and other exchanges among partners. 5G and mobile enables high-speed data transfer.

With the help of rising technological advancement, organisations create ecosystems of interaction within their marketing environment. One of the real case studies of emerging OI as ecosystems is State Bank of India. India's largest bank built its customer-centric platform called YONO which means "You only need one". It connects to one hundred businesses. It addresses lifestyle and personal needs including banking (Lele, 2022). The number of SBI users has grown to more than 50 million users by mid-2022 and became an essential part of "go-to-market" of other businesses (e.g., Amazon India) (ibm.com, 2022).

Tech giants such as Apple also take care of being with their customers whenever and wherever they need them. It can be effortless to pay with a phone or AppleWatch with ApplePay or monitor health with a health tracker on mobile devices. Apple makes innovations that are inevitable for its ecosystem of products and services (Loboyko, 2021).

One of the successful case studies in Ukraine with OI model is neobank Monobank (Barabash, 2022). It had more than 5 million customers in 2022. It gives their customers a whole ecosystem of services: from cashback while buying various categories to contactless pay in popular restaurants in Kyiv. During the period of war, they created the most convenient and easy-in-use instrument called "banka", which helps thousands of volunteers to receive donations from Ukrainians in a few clicks (Shkil, 2022).

Introduction of innovations to the insurance market in Ukraine such as Internet insurance is one of the ways of reducing the effect of market risk factors that are associated with the low consumer paying capacity, high tariffs for insurance services, fraud cases, distrust of the population, etc. (Starostina et al., 2020, pp. 44–55). The role of Internet insurance by Ukrainian companies increased because of the war. In the early days of the war, there was a shortage of paper forms. The electronic policy does not require printing of the Green Card, so drivers could apply for it via smartphone and receive it in PDF format by email. This alternative relieved the burden on insurance companies during the rush and helped Ukrainians get insurance remotely. In mid-March, hotline.finance launched the online Green Card issue. The entire process — from filling out an application to receiving insurance — takes 5 minutes. As of May 2022, every 5th Green Card policy has been issued through the hotline.finance service (forbes.ua, 2022). The introduction of innovation led to a decrease in processing time, reduced costs and tariffs, and made it available in other countries.

During the active phase of COVID-19 in Ukraine, a study about behavior and perceived risks connected with online shopping was conducted. The study is part of research that creates a broader view of markets of ready food, Internet education, shoes and clothes, and cosmetic products. The survey about Internet education and online learning services was conducted in May-June 2020 and 650 responses were received from students, while 69,1% of them were suitable for further processing.

The research of online learning services is one of the examples of OI that appeared with the rapid digitalization of processes in society. Internet education provides a variety of courses that are easily accessible (IT courses, courses in studying languages, etc). These educational materials widely spread knowledge and skills and are forming future researchers, scientists, entrepreneurs, and others, making OI the leading paradigm in the educational sphere.

Research results show that 90% of respondents consider online learning to be a protective measure for their health during the COVID-19 pandemic. The three most important risks for consumers in online learning services are inappropriate quality, psychological dissatisfaction with the purchase, and loss of money (Table 1).

Perceived risk of inappropriate quality correlates with the high standards that consumers expect from online education. This indicates a desire to become highly qualified specialists. The risk of psychological dissatisfaction with the purchase is fear of obtaining knowledge that does not meet the requirements that will be imposed on consumers of online courses in a professional environment in the near future. Although the quality of the courses may be high, students are afraid that they are receiving outdated knowledge (Henderson and Lyons, 2013, 1–12).

Table 1. Ranking of risks for consumers of online learning services (on a 5-point scale)

Types of risks	Mean value	Ranking
1. Inappropriate quality	4,06	1
2. Psychological dissatisfaction with the purchase	3,66	2
3. Loss of money	3,65	3
4. Personal data loss	3,47	4
5. Inappropriate warranty service	3,46	5
6. Violation of the terms of service provision	3,23	6
7. Health disorders	3,03	7

Source: Calculated by authors

Understanding perceived risks help organisation to use appropriate risk management methods and implement innovative solutions. For example, to reduce the risk of loss of money and risk of inappropriate quality — Taras Shevchenko National University of Kyiv implemented transparent communication within available and convenient channels for students (website, social media, emails). Information includes all the information about study programs, requirements, and feedback from graduates.

3.2. Scientific Drivers of OI: Universities

OI appears in the response to challenges in macromarketing environment and constant feedback between organisation and its micromarketing environment (suppliers, customers, stakeholders, institutions, and others). Interaction between actors creates a strong ecosystem. One of the important actors that drives open marketing innovations in Ukraine is universities. Universities provide a strong theoretical and systematic knowledge base about marketing. Mostly, researchers in Ukraine have a stronger background and comprehensive view of marketing, and market research than real businessmen. It happens because practitioners tend to simplify the interpretation of the process of marketing research from the perspective of the so-called digital marketing, which undermines a single, reliable information basis for making business decisions (Starostina and Domina, 2022, p. 7–19). Interaction in the micromarketing ecosystem within universities and businesses can significantly increase the quality of the managerial decision-making process and stimulate innovative activity.

One of the responses to the risk of inappropriate quality and risk of psychological dissatisfaction as perceived risks of consuming online learning services was the creation of Diia.Business KNU based at Economic Faculty of Taras Shevchenko National University of Kyiv (business.diia.gov.ua, 2020). Diia.Busi-

ness KNU is a center that connects students, and future entrepreneurs with active businesses of different sizes and governmental initiatives from the Ministry of Digital Transformation providing educational activities from different levels of specialists (from junior managers to CEOs). It helps students to understand that university is in line with current business practices and ensures the quality of education (balance of theory and practice) for a successful career path in the future. So, joint efforts of universities, businesses, and NGOs are critical to developing effective open innovation.

3.3. Social Drivers of OI: NGO

Another significant actor in micromarketing environment is non-governmental organisations. Appearance of NGOs indicates a qualitative transition to the stage of maturity of marketing science in Ukraine (Starostina and Domina, 2022, pp. 7–19) (OMU, 2023). One of the examples is the Ukrainian Union of Marketing Experts which was founded in 2019. The role of the NGO is to accumulate the experience of the members, conduct various research projects based on it, and disseminate the results among its members and other stakeholders.

The current research project conducted by the Ukrainian Union of Marketing Experts in partnership with Taras Shevchenko National University of Kyiv shows that the most important spheres for NGO activity are providing research for the purpose of recovery of economic potential in Ukraine, development of partnerships with the business community, establish partnerships with foreign professional organisations in marketing sphere (Table 2).

Table 2. Rating of the importance of the activities of the NGO Ukrainian Union of Marketing Experts in 2022 (on a 7-point scale)

Main activities	Grouped median	Ranking
Carrying out research for the purpose of restoring economic potential of Ukraine	6,69	1
Development of partnerships with business community in Ukraine	6,57	2
Establishment and development of partnerships with foreign professional organisations in marketing sphere	6,40	3
Supporting of the members of the NGO in their professional activities	6,23	4
Development of partnerships with governmental authorities	6,19	5
Organization of conferences, round tables and publication of articles	5,95	6

Source: Calculated by authors

The survey was conducted in April-May 2022 among higher education institution employees in the context of ongoing war. The mentioned activities were placed as priorities in the strategic plan of the NGO. Results of the survey were sent to the Ministry of Education and Science and the Union of Rectors of Ukraine to be incorporated into the development of state policies in the economy, education, and science.

3.4. Ecosystem of Organisation in the Process of Development OI

The creation of an ecosystem between an organization and its micro-marketing environment has become increasingly important. Technological advancement

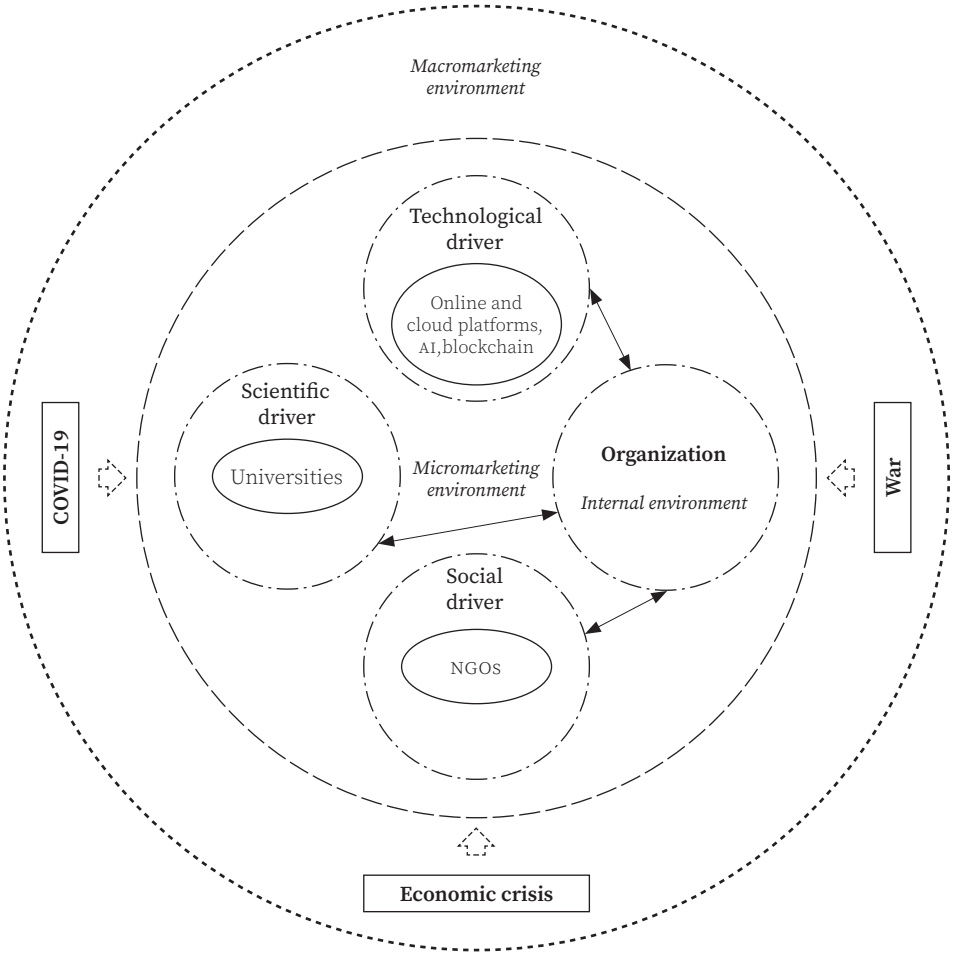

Figure 2. An ecosystem of organisation within micromarketing environment
Source: Developed by authors

has transformed the way organizations interact with their customers and stakeholders, making it crucial for them to effectively manage and utilize technology in order to succeed (e.g. generate valuable data and transform it into insights). The interaction with scientific communities such as universities and interaction with NGOs can provide organizations with valuable insights, resources and expertise that can help enhance innovational efforts and overall operations. Building strong partnerships with these organizations can also help organizations stay ahead of industry trends, maintain their competitive edge, and contribute to the development of sustainable solutions in the uncertain market environment. The ecosystem of an organization within the framework of its interaction with the micromarketing environment can be represented as follows in Figure 2.

Creating an ecosystem within micromarketing environment with the help of technology helps an organisation constantly receive feedback from all within it and collect it as a dataset. The collected dataset is transformed into valuable knowledge about the market and creates opportunities to develop OI. All of the involved are receiving access to information and knowledge in different proportions, except competitors where organisation receives feedback and does not share it back. It is possible to receive feedback from competition because of the data gathered with open sources, for example, social media. Also, everyone who is involved in organisations ecosystem gets a reward. Rewards can be financial and non-financial. For example, reducing order processing time for customers because of the feedback they had given, or increasing the quality of the university study program.

In the ecosystem of constant feedback from all, open innovation develops faster, and this helps the company to gain a dynamic competitive advantage and act fast in an unpredictable macromarketing environment. An organisation receives a lot of unstructured real-time data that lately is proceeded to into valuable insights about the innovation that is needed in the market. Information flows in real-time which also helps to clearly communicate all goals and objectives within an ecosystem to all stakeholders.

3.5. Solving the Challenges of OI in the Conditions of Crisis in Ukraine

The process of innovation development during a social economic crisis or war can be greatly hindered by a shortage of resources, limited access to technology and skilled workers, and reduced demand for products and services. These challenges can be addressed with the help of key drivers of OI among which are technological, scientific, and social. With the help of digitalization as part of the technological driver, it enables organisations to have wide access to resources and

expertise, to connect and collaborate globally. It facilitates access to technology through cloud-based platforms and open-source software, reducing the need for expensive infrastructure. And digitalization enhances knowledge sharing through online platforms and communities, leading to more efficient and effective innovation processes.

Scientific and social factors that are represented by universities, educational institutions, and NGOs, provide access to research and development capabilities, and facilitate partnerships between universities, NGOs, and businesses, creating a supportive ecosystem for innovation. Also, it offers opportunities for skills development and capacity building, enabling communities with different backgrounds to participate more in the innovation process and ensure its effectiveness.

In times of economic crisis and war, it is important to provide and encourage stakeholders of the innovation process to focus on solving real-world problems and meeting local needs, leading to more sustainable and relevant innovations.

To fully realize the potential of open innovation in the context of socio-economic crisis and war, it is important to create an enabling environment that supports collaboration and knowledge sharing. This includes the creation of dedicated platforms, funding mechanisms, and policies that encourage and support innovation.

4. Conclusions and Discussion

In conclusion, open innovation is a powerful concept that allows organizations to access a wider pool of knowledge and resources, which can lead to more diverse and innovative solutions. By effectively utilizing OI, organizations can gain a competitive advantage in today's fast-paced, highly competitive business environment.

The process of developing open innovation includes defining the problem and ideation, research and development, prototyping, testing and validation, commercialization, and scaling. By adopting open innovation, companies can access a wider pool of ideas and resources, faster innovation and product development, increased collaboration and knowledge sharing, greater flexibility and adaptability, and improved innovation performance and competitiveness. However, in the context of socio-economic crisis and war, organisations are facing challenges. Among the main of them are access to funding and resources for idea generation may be limited, leading to a reduction in the number of new ideas being generated. Another challenge that organisation faces is a shortage of skilled workers,

raw materials, financial funding, and other resources, a lack of access to technology and equipment, and a lack of access to data, customers, and other resources, making it difficult to obtain accurate results. Challenges that appear at the stage of commercialization are a decrease in consumer demand that leads to slower growth and a decrease in sales.

Technological, scientific, and social drivers are some of the main ones that help to overcome challenges in the process of development OI in the uncertainty of the market environment. As was shown, the digitalization of processes helps ensure constant feedback, ensures flexibility, and creates global access to important resources. Collaboration and interaction with the scientific community (universities and educational institutions) provide access to quality knowledge and ensure the alignment of practice and theory, and organisations gain access to qualified personnel. NGOs as an essential part of civil society contribute to the accumulation of the experience of the members of NGOs, conduct various research projects based on it, disseminate the results among its members and other stakeholders, and create valuable knowledge that is needed for sustainable operation of organisation.

In the context of an uncertain market environment organisations develop an ecosystem within their micromarketing environment. That helps them to overcome challenges, innovate effectively based on gathered data, and have constant feedback from the market in real-time. An organisation has a wide picture of uncovered needs that creates a dynamic competitive advantage.

Based on the ecosystem approach for the development of OI suggested next steps for further research are: evaluation of factors that influences interaction efficiency within micromarketing environment and organisation, defining the role of universities, NGOs, governmental institutions, and their influence on the efficiency of development of OI within organisation.

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Technologiczne, naukowe i społeczne czynniki napędowe otwartych innowacji w kontekście kryzysu militarnego i społeczno-gospodarczego: doświadczenia Ukrainy

Streszczenie. Celem artykułu jest identyfikacja specyfiki wpływu czynników technologicznych, naukowych i społecznych na proces rozwoju otwartych innowacji w kontekście głębokiego kryzysu społeczno-gospodarczego i wojny na przykładzie Ukrainy. Artykuł definiuje istotę otwartych innowacji i ich odmienność od tradycyjnych innowacji, etapy rozwoju i wyzwania otwartych innowacji w sytuacji kryzysu, motory rozwoju OI i ich wpływ na rozwiązywanie wyzwań OI. Kluczowe czynniki, które pomagają organizacjom w pokonywaniu wyzwań związanych z niepewnością rynku, mają charakter technologiczny, naukowy i społeczny. Digitalizacja jako technologiczna siła napędowa zapewnia stałe sprzężenie zwrotne, elastyczność, tworzy globalny dostęp do ważnych zasobów. Współpraca i interakcja organizacji ze środowiskiem naukowym (uniwersytetami i instytucjami edukacyjnymi) zapewnia dostęp do wysokiej jakości wiedzy oraz dostosowanie praktyki i teorii, a organizacje zyskują dostęp do wykwalifikowanego personelu. Organizacje pozarządowe (NGO) jako czynnik społeczny przyczyniają się do gromadzenia doświadczeń członków organizacji pozarządowych, realizują różne projekty badawcze i rozpowszechniają ich wyniki wśród swoich członków i innych interesariuszy, tworząc cenną wiedzę, która jest potrzebna do zrównoważonego działania organizacji.

Słowa kluczowe: innowacje, otwarte innowacje, proces tworzenia innowacji i jego wyzwania, digitalizacja, NGO, uczelnia

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Digital Communications in Personnel Management as a Modern Means of Information Exchange in Distance Work Conditions

Abstract. In the conditions of the COVID-19 pandemic and martial law in Ukraine, many employers and employees were forced to transfer to distance work, and managers were forced to change approaches to personnel management. The lack of contact communication changes the usual methods in personnel management. The analysis of the concepts and principles of distance work organization given by scientists made it possible to form and reveal the advantages and disadvantages of such work, which must be taken into account during personnel management under the conditions of the transition to a distance form. A significant number of publications does not provide a complete understanding of how to build mutual relations in the team, how to improve communication relations in the conditions of changing factors of the external environment of the field of activity and the transfer of personnel to a distance work format. It was found that during remote work, the effectiveness of personnel management directly depends on the organization of communication processes. The article examines the forms of digital communication and gives examples of their tools that can be used to achieve the set goals and objectives. Not all employees have time to quickly adapt and work with existing tools, but new ones appear on the communications market. When building mechanisms for the formation and use of communications in conditions of remoteness, it is necessary to develop a unified model that will combine all forms of communication. Taking into account the identified shortcomings, basic practical recommendations were given to managers regarding the use of digital communication tools to achieve effective personnel management in distance work conditions. Digital communication tools will help to manage and complete tasks,

assess the quality of task performance, control information exchange, and act according to planned steps in distance work conditions.

Keywords: personnel management, distance work, digital communications, digital communication tools

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1. Introduction

Personnel management is a complex system of actions, methods, mechanisms, the task of which is the effective use of personnel potential to achieve the set goal. Personnel management is directly related to the establishment of communication relations both within the enterprise and with external contactors. The main task of communication relationships is to ensure understanding and correct perception of the transmitted information. The COVID-19 pandemic and the state of war in Ukraine have made adjustments to the established process of the organization's internal and external relations. A significant part of the staff, in some cases the entire team, is forced to work in the "online" mode. Building communication relationships at a distance requires the use of a special, individual approach, which forms an effective mechanism for managing the organization's system as a whole. There appears a need for studying the problems of personnel management and communication relationships in the conditions of distance work.

2. Analysis of Research and Publications

Such scientists as Krushelnytska O.V., Melnychuk D.P. (Krushelnytska & Melnychuk, 2005), Shubalyi O.M. and others (Shubalyi et al., 2018) give an idea of the main concepts related to personnel management, introduce management methods and tools. They consider communications in personnel management in the classical sense, which is defined as an algorithm for transferring information from one person to another in the form of verbal or written tasks, movements, and gestures. Despite the large number of issues covered concerning the organization of information exchange, the direction of improving communication relationships in the conditions of changes in the factors of the external environment of the activity sphere and the transfer of personnel to a distance work format remains insufficiently investigated.

The analysis of the factors of the external and internal environment that affect the mechanism of personnel management was carried out by such scientists as Kolomina O.B. (Kolomina, 2015, p. 56–61) and Kosmyna Yu.M. (Kosmyna, 2013,

p. 67–73). They systematized the factors of the external and internal environment, which alone or in combination with each other influence the personnel behavior management, which made it possible to highlight and analyze the priorities in greater depth. Among the priority factors are technological and innovative development and working conditions, because the process of development, improvement of technology, innovations, changes in working conditions and places of work lead to the problems in work and ineffectiveness of the personnel management process. The authors tend to think in terms of training and professional improvement in new working conditions, which will certainly lead to increased employee motivation.

Jack Nilles, known worldwide as one of the leading experts in remote work, introduces the concept of remote work and an effective remote work program in his book „Managing Telework: Strategies for Managing the Virtual Workforce" in 1998. He introduces such concept as „remote work", „distance work" or „telework". The author provides comprehensive information on effective methods of managing people who work remotely, legal issues related to remote workers and the use of the right technologies. As Nilles explains, the key to a successful virtual workforce is to make the best use of these opportunities through proper planning and management style development (Nilles, 1998). It is worth noting that the term „telework" is somewhat inaccurate since the root „tele" means „remote, at a distance", is associated with television, accordingly, „telework" is work on television. At the same time, the given concept of „remote work" also does not fully reflect the meaning of this concept because work outside the office has definite varieties.

Evan De Fillippis and others explore the impact of COVID-19 on employee digital communication patterns. The article presents the advantages and disadvantages of digital communication for employers and employees based on the analysis of studies of events in the conditions of lockdowns in Europe and the countries of the Middle East. The examples and analyses of digital relationships between employees to achieve work efficiency are given. They also give advisory opinion to help coping with problems during distance work, namely: increasing the total volume of online meetings and electronic communication by mail; reducing the duration of meetings; an increase in the duration of the working day due to an increase of rest and recuperation time. It is explained how the main communication relationships in the organization change during remote work (De Filippis et al., 2022, p. 1–11).

Vyshnovetska S.V. shows that in theory and practice, different approaches to the interpretation of remote work as one of the forms of non-standard employment of employees are being formed. The concepts of «distance work», «remote work», «home work», «telework» are analyzed. She emphasizes the difference

between remote (telecommuting) work and that performed at home, identifies the problems of legal regulation of remote work of employees and insists on proper legal regulation of labor activity in the distance work format (Vyshnovetska, 2015, p. 1–11).

However, the use of digital communications and the combination of their tools in personnel management in the conditions of distance work require further research and clarification, which determined the choice of the article topic.

3. The Purpose of the Article

It is the purpose of the present paper to identify the problems of distance work, review the forms and means of digital communications and formulate recommendations for improving the personnel management process in conditions of remote work.

4. Presentation of the Main Material

An important role in effective personnel management is played by a well-established process of information interaction in the team — communication relationships. However, communication relationships appear to be a complex system consisting of the following elements:

- the person who generates ideas or collects information and transmits it;
- information to be transmitted;
- means of information transmission;
- the person to whom the information is transferred.

Special attention should be paid to the means of information transmission, the choice of which directly depends on changes in external factors of the environment in the sphere of activity and forms of employment of the employee. Distance work is one of the atypical forms of employment that has already become widespread in almost all areas of activity.

Distance work means "a form of labor organization in which the work is performed by the employee outside the workplace or territory of the owner or the body authorized by him, in any place by the employee's choice and using information and communication technologies. Now the employee independently determines the workplace and is responsible for ensuring safe and harmless working

conditions there, allocates working time at his own discretion, may not follow the rules of internal labor regulations. By agreement between the employee and the employer, the performance of remote work can be combined with the performance of work by the employee at the workplace in the premises or on the territory of the employer" (Pro dystantsiinu robotu, 2021).

Having analyzed the concepts in the organization of distance work, it is possible to say that along with the advantages this type of employment has brought a number of new complications, an increase in the direct influence of conditions outside the working area on performance: place of residence, presence of family members who stay in a limited area, adaptation of home gadgets to work needs, changing the employment schedule. This situation gives rise to new challenges, which both the employee and the manager must cope with: to adapt to new conditions, adjust the work regime, support and increase labor productivity. The advantages and disadvantages of this type of employment are presented in Table 1.

Table 1. Advantages and disadvantages of distance work

Advantages	Disadvantages
Independent distribution of working time	Absence of external control, increasing role of self-control
Saving time and money on the way to the office	Lack of communication with colleagues
The ability to work anywhere upon availability of Internet connection	Physiological problems (reduction of physical load, constant use of a computer, gadgets)
Expanding the geography of employees	Absence of the usual working environment
Expanded job selection	Loss of division between work and personal space
The possibility of involving the disabled, women with children, students and pensioners	Technical problems (absent or unstable Internet, incorrect operation of the operating system or other programs, viruses, etc.)
Absence of premises rent	Difficulty in understanding the tasks set
No costs for organizational technical means	
Stability in the labor market	

Source: Supplemented by: Hrebeniuk & Martseniuk (2021, pp. 136–141)

The advantages and disadvantages presented in the table affect significantly the mechanisms of the labor team formation, the use of labor resources, the development of labor potential especially when managing personnel remotely. The effectiveness of personnel management directly depends on the effectiveness of communication processes in the organization of work.

Communication is the process of exchanging information between employees using words, letters, symbols and gestures. This is a necessary element in the

activity of the organization, which affects the timeliness of receiving information, the speed of assigned tasks performance, supports mutual relations in the team. Taking into account the changes in external and internal environmental factors that affect the mechanism of relationships in the team, along with oral and written forms of information transmission, a new form — electronic — is becoming more widely used. The electronic form of information transmission is the transmission of information (text and video messages, files, etc.) in the «online» mode. The electronic (digital communication) form is complex and extraordinary in technology, but effective and modern.

Well-thought-out and coordinated digital communication relationships reduce time spent on solving any issue, bring results achievement closer, prevent conflicts and misunderstandings and so improve the management process. The team with well-established communication links demonstrates quick adaptation to changes in the field of employee activity.

Analysis of the results of the surveys conducted by Deloitte and the International Labor Organization (Povernennia do roboty v novykh umovakh, 2021; ILO Monitor on the world of work, 2022) provides an opportunity to review the traditional concept of communication relationships in the team and the employee's use of digital communication tools that process, form, and store data, which allows for corrections distance personnel management methods.

Modern information transfer tools make it possible to work in a variety of conditions and transform information into an understandable form. Let's highlight the main effective forms of digital communication and give examples of information transfer tools in Figure 1.

Communication relationships in the team are multifaceted. As we can see from scheme 1, they involve various electronic forms of information transmission, which in turn can be implemented with the help of web services, mobile applications, web platforms for downloading, storing and processing information.

The lack of regular communication significantly affects the effectiveness of remote personnel management. Not all employees have time to familiarize themselves with and learn to work with existing tools and new ones appear on the communications market. When building mechanisms for the formation, use and development of labor resources in conditions of remoteness of the company, enterprises are in need for a general model that will combine all forms of information transmission. In turn, for the effectiveness of digital communication forms, it is necessary to focus on the tool that will be convenient and with an understandable interface for employees as well as on the possibility of a simple merger with the information system. Which exactly digital communication tool to choose should be researched in practice; it should be tested depending on

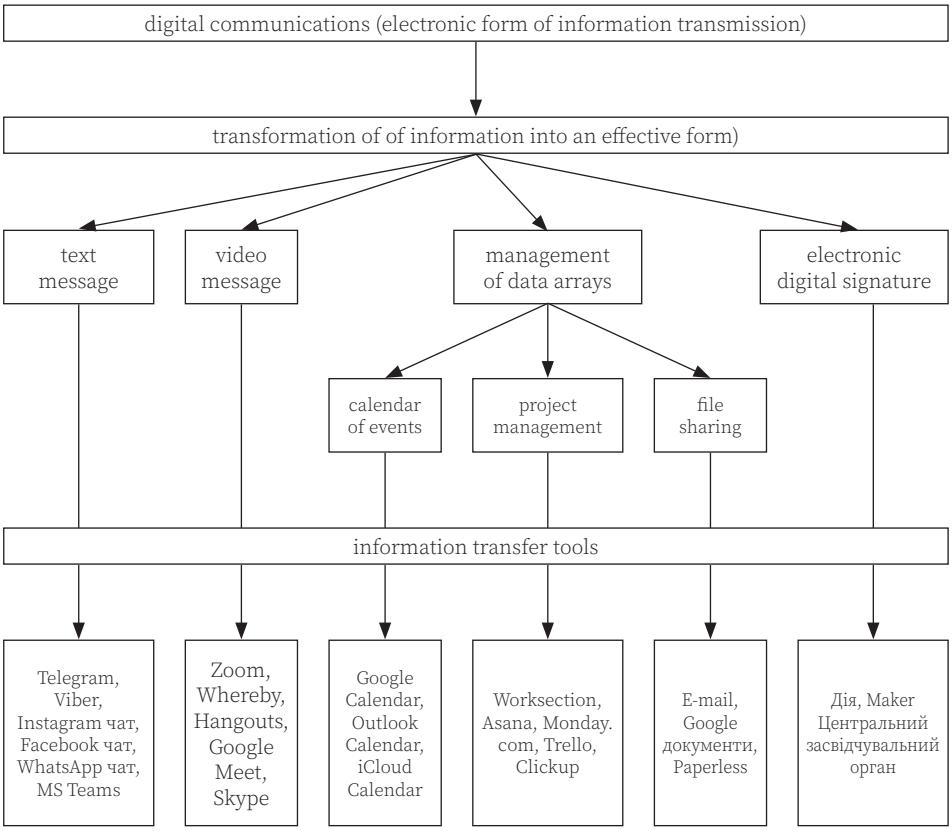

Figure 1. Information transfer during distance work
Source: Developed by the authors

the type of activity and the tasks set. Specialists who can form communication relations at a professional level and combine them into a single network must be involved when choosing digital communications and introducing them into the organizational system of the enterprise.

The manager is largely responsible for establishing relationships in order to achieve effective personnel management in distance work conditions. The manager's task is to create conditions under which each employee will be focused on his task, but at the same time they will all adhere to a common goal. The following recommendations can be made for the implementation of digital tools that greatly simplify the establishment of long-distance relationships.

The organization of corporate communication should be conducted in one convenient messenger that can be installed on all communication devices. The same principle should be followed when organizing the exchange of documents.

It is possible to divide the staff into groups and subgroups depending on the type of activity.

Video communication should be used when you need to hold a daily scheduled meeting and simply discuss business points. It is better to hold planned meetings according to a planned schedule, which will give an opportunity for the employee to plan his working hours. Video conferences should be conducted with the cameras turned on, which will allow the staff to feel the realism of the meeting in the office.

In the conditions of remote organization of work, the most difficult thing is to manage the time of employees (time management). Use of an online calendar, in which it is possible to display events, tasks, changes, replacements, etc. This application will help to combine ideas, tasks and work processes into one simple and understandable graphic picture. The event calendar will reduce time spent on production processes. To it, employees can make their corrections, monitor performance, mark the completion of tasks, etc., conveniently schedule meetings, conduct joint projects.

Electronic digital signature (EDS) simplifies and speeds up document flow and the procedure for concluding contracts and providing electronic banking services. The implementation of just such an element in management in a remote format is the key to the formation of the organization's information culture.

Based on the above, it can be argued that the effectiveness of personnel management in conditions of remoteness directly depends on the use of digital communications. This is the key to successful and modern management and building effective relationships of the workforce. Digital communications make it possible to establish relationships regardless of time and space boundaries, to save resources when transmitting information and sending it to the addressee, to respond faster and perform assigned tasks, to perform several tasks at the same time, to involve several employees when performing assigned tasks.

5. Conclusions

Digital communications are becoming indispensable in modern life since distance work has become the main type of employment in the conditions of the COVID-19 pandemic and martial law in Ukraine. Both in oral or written forms as well as in the electronic form of information transmission there are disadvantages and difficulties, but the growing need speaks of the desire of enterprises to develop and be modern. The need for making changes to the construction of a distance personnel management mechanism has become an urgent demand of today for

enterprises in Ukraine. Taking into account the fact that the exchange of information is increasingly moving to the "online" environment, it can be stated that the appropriate use of forms of digital communication will help to adapt personnel management to new realities, increase its effectiveness and productivity in the conditions of distance work. In the future, there arises a need to develop a communication mechanism for personnel management.

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Komunikacja cyfrowa w zarządzaniu personelem jako nowoczesny sposób wymiany informacji w warunkach pracy zdalnej

Streszczenie. W warunkach pandemii COVID-19 i stanu wojennego na Ukrainie wielu pracodawców i pracowników musiało przejść na pracę zdalną. Wobec braku bezpośredniego kontaktu menedżerowie zostali zmuszeni do zmiany metod zarządzania personelem. Analiza przedstawionych przez naukowców koncepcji i zasad organizacji pracy zdalnej pozwoliła na sformułowanie i ujawnienie zalet i wad takiej pracy, które muszą być brane pod uwagę przy zarządzaniu pracownikami. Znaczna liczba publikacji nie daje pełnego zrozumienia, jak budować wzajemne relacje w zespole i jak je poprawiać w sytuacji zmieniającego się otoczenia zewnętrznego i przenoszenia personelu do pracy zdalnej. Stwierdzono, że podczas pracy zdalnej efektywność zarządzania personelem zależy bezpośrednio od organizacji procesów komunikacyjnych. W artykule przeanalizowano formy komunikacji cyfrowej i podano przykłady narzędzi, które można wykorzystać do osiągnięcia wyznaczonych celów. Nie wszyscy pracownicy mają czas na szybką adaptację i pracę z istniejącymi narzędziami, a na rynku komunikacyjnym wciąż pojawiają się nowe. Budując mechanizmy tworzenia i wykorzystywania komunikacji w warunkach oddalenia, konieczne jest wypracowanie jednolitego modelu, który połączy wszystkie formy komunikacji. Menedżerom udzielono podstawowych zaleceń praktycznych dotyczących wykorzystania cyfrowych narzędzi komunikacji do efektywnego zarządzania personelem w warunkach pracy zdalnej, uwzględniwszy ich słabe strony. Cyfrowe narzędzia komunikacji mogą pomóc zarządzać zadaniami i je realizować, oceniać jakość wykonania zadań, kontrolować wymianę informacji i działać zgodnie z zaplanowanymi krokami w warunkach pracy zdalnej.

Słowa kluczowe: zarządzanie personelem, praca zdalna, komunikacja cyfrowa, narzędzia komunikacji cyfrowej

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Working with Constraints in Project Management

Abstract. The purpose of the article is to identify the influence of the theory of restrictions on the general management of project management in the company and the ability to use it by the Office of Project Management to reduce the impact of critical restrictions of project portfolio. The article shows the relationship between various theories of constraints in project management and theories of constraints in general management (TOC). Constraints are the restraining factors of the project, with which all project managers and project offices must work on the way to achieving project goals. Each project is unique and has limitations that consist of the specifics of the industry, a specific enterprise, and the project. The project manager and the project office need to identify the most influential constraint, or several constraints, that reduce the performance of the entire system. That is, it is necessary to identify and eliminate restrictions that primarily affect the entire portfolio of projects. The theory of constraints makes it possible to determine exactly where in the process of project implementation there is a bottleneck that reduces the productivity of project implementation. The elimination of bottlenecks and the optimization of processes lead to an increase in the efficiency of project execution and the project portfolio as a whole. This makes it possible to obtain better project results at lower costs of limited resources by improving the quality of project management by the project management office.

Keywords: project constraints, project management triangle, Critical Chain Project Management, theory of constraints, project management office

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1. Formulation of the Problem

Successful project management involves understanding the restrictions. Balancing of these restrictions with the maintenance of stakeholder satisfaction is a permanent project activity performed by the project manager or project office.

Restriction is a deterrent factor that influences project management, program, or project portfolio. Traditionally, such restrictions are the "content and limits of work" that determine the amount of work, "time" and "cost". Such restrictions

were called “Project Management Triangle”, where each party is a certain restriction. Each project has its own amount of work, which must be done within a given budget, a given time of work (work schedule) and at the same time the product must correspond to the agreed level of quality. They are restrictions and always the project manager should choose how to balance the impact of one restriction at the expense of others (The standard of management, 2021). One side of a triangle cannot be changed so as not to affect the other sides. For example, if you increase the amount of work, then the budget and/or the time of work should be increased.

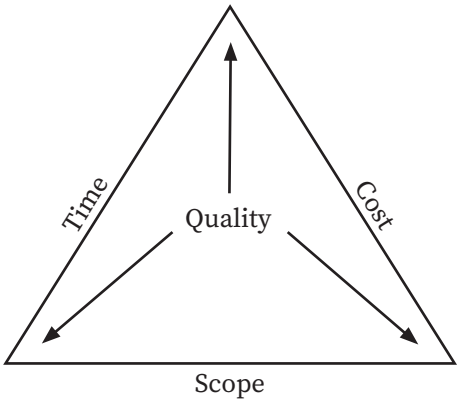

Fig. 1. Project Management Triangle
Source: Project Management Triangle (2023)

My experience with projects in different industries shows that different sectors of the economy have their own industry specificity of the availability or shortage of resources and the possibilities of their involvement. For example, construction enterprises tend to have a greater impact of time limit. They cannot stop or extend the construction time, as they will have significant, multiple costs and risks in the quality of the building from the impact of technology and environmental impact. Mass products, such as bread, grocery, meat, dairy products, and other mass products, usually work at high speeds, sales, but with a small margin. Therefore, their projects are most influenced by budget restrictions. For enterprises that produce high technological products that compete at the expense of unique consumer characteristics, the main limiting factor is the quality of the product.

2. Literature Review

From the beginning of the creation of a comprehensive project management theory, in the standards of project management (PMI), the concept of project restrictions and methods of working with the project and the project management triangle and the critical project management triangle. But if in the 3 edition of project management standards, these restrictions and methods are considered in the context of projects, then in the development of project management theory in the latter today 7 editions of project management standards, these restrictions are already considered to a set of projects, programs, portfolios of projects, i.e. more complex management systems (The standard of management, 2021). Little B. Studies the impact of human capital, leadership and communication on the success of the project and proves that such methods of working with restrictions as a critical way of managing the project have shortcomings because it does not take into account them (Little, 2011). E. Goldrat, by combining the theory of physics and economics, created the theory of restrictions for business. Its theory is based on the search and management of a key restriction of the system, which determines the success and efficiency of the whole system as a whole. Kumar P. analyzes the influence of E. Goldrat's constraint theory on project management theory (Hendricks & Singhal, 2001). Kannan V., Tan K. Just is studied as the impact of process optimization and elimination of restrictions in projects can improve the quality of the product. Which, in turn, improves customer satisfaction and sales volume (Kannan & Tan, 2005).

3. Main Results of the Study

Individual enterprises have their systemic restrictions that affect their projects and project portfolios. This can be the ability to get the necessary equipment, hire staff to implement projects, limit the setup or development of IT systems for projects, the ability to attract funding, and others. To reduce the impact of the restrictions that most affect the project, project executives and project offices balance their impact at the expense of other resources. This is how the critical resource and the critical way of managing the project emerged. Critical Chain Project Management (CCPM) — is a method of project planning and management that puts the first place to manage resources (physical and human) needed to accomplish the project tasks. It appeared as a direction of project management theory that is related to project restrictions. The CCPM method is focused on project planning aspects, but does not include anthropic aspects such as leadership

and communication (Little, 2011); In addition, this concept is limited by a lack of economic interpretation in the plane of choice of organizational structure of the project (Hodgson, 2002). In particular, this unified model is intended to provide a new understanding of resource management within the project (Hall, 2012). In addition, the theoretical model should include a comprehensive assessment of the components of a successful project, by analogy of the Project Management Triangle, which covers the volume, time and cost drivers. In the beginning, the main attention of project management theory was focused on the tasks and their duration. However, traditional project management methods, in particular EVM/ES, have not taken into account the impact of multitasking and uncertainty related to the assessment of the duration of the task (Little, 2011). The idea of introducing buffers to soften the effects of multitasking and uncertainty was presented within the framework of the CCPM concept (Little, 2011). CCPM focuses on planning actions within the project activity and proposes to estimate the length of work with 50% probability of timely completion. In addition, CCPM proposes to use buffers to take into account uncertainty (Little, 2011). In fact, the concept of CCPM is one direction of the development of theory of theory of constraints (TOC) for projects. The main task is to increase the productivity (or increase the percentage of tasks completed) in the organization. Applying the first three of the five major TOC steps, system restrictions for all projects are defined as resources. To use limitations, the task on a critical path is prioritized than other activities. In general, projects are planned and managed in such a way that resources are available when the critical path tasks should begin, subordinating all other resources to the critical path.

Theory of constraints, developed by E. Goldrat in the 1980s, proposes an approach to management based on the vision of the system as one or several restrictions that reduce its effectiveness (Hendricks & Singhal, 2001; Kannan & Tan, 2005; Kumar, 2017). Restriction is all that prevents the system from achieving its goals. After determining the restriction, the theory focuses on overcoming this restriction, which will expand the capacity of the system and accordingly enhance the efficiency of its functioning. The methodological approach within the framework of the theory of restrictions involves a number of steps. First, you need to determine the system restriction. It is a step that defines one or more factors that limit the performance of the system. It is important to note that not all restrictions are the same. Some restrictions are more important than others, and the task is to determine the most important restriction. Secondly, it is necessary to decide how the system can function more effectively within the existing restriction. As part of this step, you need to find out how to get the maximum return within the existing restriction. Third, it is necessary to subordinate all other management

decisions and measures to function more effectively with a previously defined restriction. Accordingly, all other actions in the system must be subordinated to a decision on a previously defined restriction. In other words, all other actions should be designed to support the organization of the organization under certain conditions. Fourth, it is necessary to overcome the previously defined restriction. This involves the search for ways to expand the capacity of the existing restriction, which will continue to enhance the efficiency of the organization. Finally, for detecting a new restriction, to reproduce the algorithm described above as part of increasing efficiency.

In my opinion, the theory of restrictions applies to a wide range of systems, including production and service sectors, as well as public institutions and nonprofit organizations. The advantages of this theory include improving the efficiency of organizations by concentrating on solving the specific problems that most affect the results of the activity. This is made in the form of the following results:

- Detection and elimination of narrow places: the theory of restrictions allows you to determine where in the process there is a narrow place that reduces productivity. After detection of this place, measures are taken to eliminate or optimize it, which accordingly leads to improving productivity;
- Improving efficiency: elimination of narrow places and optimization of processes lead to an increase in the efficiency of functioning of the organization, which means obtaining a better result at less cost of limited resources at the expense of reasonable management decisions in the plane of the organization; – cost reduction: optimization of processes and elimination of narrow places helps to reduce production and other costs. In particular, it is a reduction in the cost of raw materials, energy, staff, etc.;
- Increasing the level of customer satisfaction: optimization of processes and elimination of narrow places can improve the quality of the product. This can improve customer satisfaction, which in turn can lead to an increase in sales and growth of margin;
- Creation of a more sustainable organization: optimization of processes and productivity increase can lead to an increase in profit and competitiveness, which in turn will lead to the sustainability and long-term success of the organization. At the same time, there is an objective criticism of the theory of restrictions, which is expressed by some experts. In particular, complex systems can be difficult to identify a single key restriction. There may be several such restrictions, and it may be unclear which one is most important. In addition, the restriction can be dynamic. Restrictions can

change over time, so it is important to carry out permanent monitoring and determine the current key restriction (Hassan, 2013; Jarzabkowski et al., 2013; Lalonde, 2010).

4. Conclusion

In my opinion, theory of constraints can be difficult to implement in a practical plane. TOC requires fundamental changes in how organizations see and manage their activities, which is especially problematic for organizations that are used to traditional management methods. In addition, the practical implementation of the methodological approach of the TOC can be related to the significant cost of cash and other resources. TOC requires significant cash in personnel training, technological resources and time. This can be an obstacle to some organizations. But in my opinion, TOC as a methodological approach can produce good results for long-term use, within 1-2 annual cycles of project implementation. During this time, project managers and project office tend to understand what restrictions on projects in their company are systemic and how these restrictions can be influenced how to build systematic work with these restrictions.

Therefore, the following conclusion can be drawn: in the short term, the TOC does not give decisions to improve project management, but in the long run TOC can be used by the project management office to improve the management system of enterprise project management by reducing the impact of restrictions that affect the entire project portfolio.

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Praca z ograniczeniami w zarządzaniu projektami

Streszczenie. Celem artykułu jest określenie wpływu teorii ograniczeń na ogólne zarządzanie projektami w firmie oraz możliwość wykorzystania jej przez biuro zarządzania projektami w celu zmniejszenia wpływu krytycznych ograniczeń portfela projektów. Artykuł pokazuje związek między różnymi teoriami ograniczeń zarządzania projektami a ogólnymi ograniczeniami zarządzania. Aby osiągnąć cele projektu wszyscy menedżerowie projektów i biura projektowe muszą wziąć pod uwagę czynniki ograniczające projekt. Każdy projekt jest wyjątkowy i ma ograniczenia, na które składają się specyficzne cechy branży, konkretnego przedsiębiorstwa i projektu. Kierownik projektu i biuro projektu powinni określić najważniejsze ograniczenie lub kilka ograniczeń, które zmniejszają wydajność całego systemu. Oznacza to, że konieczne jest zidentyfikowanie i wyeliminowanie ograniczeń wpływających przede wszystkim na całe portfolio projektu. Teoria ograniczeń pozwala ustalić, gdzie w procesie projektów istnieje wąskie gardło, które zmniejsza wydajność wdrażania projektu. Usunięcie wąskich gardeł i optymalizacja procesów prowadzą do zwiększonej wydajności projektu i całego portfela projektu. Pozwala to uzyskać lepsze wyniki projektu przy niższych zasobach poprzez poprawę jakości zarządzania projektami przez biuro zarządzania projektami.

Słowa kluczowe: ograniczenia projektu, trójkąt zarządzania projektami, zarządzanie projektami krytycznymi, teoria ograniczeń, biuro zarządzania projektami

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Innovations in the Business Processes Management as a Significant Component of the Rapid Recovery of the Industry of Ukraine

Abstract. The article provides a comparative analysis of the paradigms of classical management theory and that corresponding to modern reality. Particular attention is paid to the features of rapid growth in large organizations using the example of the transition to digitalization as a growth strategy. The main stages of the digital transition are identified, as well as three main techniques for an enterprise or organization to overcome crises and adapt to rapid changes, such as business model innovation, strategy innovation, and management innovation. The necessity of managing business processes (a part of management innovations) as a reaction to inevitable changes in internal communication, the evolution of the company's strategy and culture, chaos, and adaptation to constant changes in emphasis and priorities is substantiated. The influence of the war in Ukraine as a strong factor of uncertainty on the industrial sector of the economy of the regions of Ukraine is analyzed. Based on the analysis of the experience of digital transformations of the world's giant companies, an attempt was made to highlight the key points of such transformations in Ukraine. The need for state support for developing innovations and digital transformation of the Ukrainian industry was emphasized.

Keywords: management, innovation, digitalization, innovation in management, rapid growth

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1. Introduction

Innovations in management have been a key driver of success in the industrial sector, with technology playing an increasingly important role in streamlining operations, reducing costs, and improving productivity. The need for rapid inno-

vation is paramount in Ukraine, as the country faces a multitude of challenges, including political instability, economic struggles, and technological gaps. It is also consequential for Ukraine's growth and development, allowing the country to remain globally competitive and attract foreign investment. Failure to innovate quickly could lead to further economic decline, a brain drain of talented professionals, and a lost opportunity for Ukraine to take advantage of its strategic location and natural resources. Having the right policies, investments, and partnerships, the country can achieve sustainable growth and prosperity, and the focus on speed of management innovations can also help Ukraine address issues such as energy efficiency, environmental sustainability, and social inequality.

2. Analysis of Research and Publications

Current business conditions require enterprises to have adequate mechanisms for responding to dynamic changes in the external environment, growing customer demands, and severe market challenges. Mandatory conditions for the survival of enterprises are the production of competitive products, ensuring flexibility and efficiency of management. Adaptive abilities, organizational flexibility, and maneuverability of production systems provide the enterprise with innovative development.

The relevance of the problem of innovative development of enterprises is confirmed by a significant number of studies by western scientists, such as P. Drucker (2020), S. Gupta (2020), M. Hammer and J. Champi, R.S. Kaplan and D.P. Norton and others.

Thus, scientists and researchers of the National Academy of Sciences of Ukraine are engaged in studies of the industrial development of Ukraine considering the trends of Industry 4.0, the features of the digital transformation of industrial sector, and its role in the modernization of the industrial potential of the Ukrainian economy and innovations in management. Research work of O.I. Amosha is related to the study of organizational and economic mechanisms for the activation of innovative activity in Ukraine, which emphasize the importance of promoting the formation of large structures in the corporate sector of the economy, the need to improve the quality of corporate governance and strengthen state intervention in the innovative activities of enterprises (Amosha, 2005). Also, the team of authors of the Institute of Regional Research of the National Academy of Sciences of Ukraine investigates the problems of the development of mechanical engineering as a strategic segment of the global and national economy and ways to solve them, specifically considering the indicators of innovative activity

in the industry (Ishchuk, 2022). In particular, the research work of S. Ishchuk and L. Sozansky is related to the search for ways to ensure the competitiveness of the industrial sector of the regional economy and the development of methods for evaluating the effectiveness of its functioning (Ishchuk & Sozanskyi, 2022). Gaets V.M. substantiates the fundamental components of innovative development of Ukraine's economy and social sphere in terms of its further integration into the world economic, scientific, and technological space based on a study of the state of the innovative sphere and analysis of global trends (Gaets, 2015). T.G. Vasyltsiv assessed the state and dynamics of key parameters of knowledge, intellectual and digital development of the regions of Ukraine as one of the prerequisites for the implementation of smart specialization (Vasyltsiv & Levytska, 2020).

Paying tribute to the existing scientific developments, it is worth noting that the system of management of innovations, including the business process management, in the industrial sector of the region should be focused on the speed of introduction of new technologies in order to achieve a successful competitive position on the way to European integration. Therefore, the purpose of the article is to justify and emphasize the need for the rapid implementation of an innovative model of the development of Ukraine's industry for its faster recovery and further dynamic growth given the current state due to the consequences of the current military aggression by the Russian Federation, taking into account the experience of global companies in the use of breakthrough techniques of rapid growth.

3. Results of the Research

Today's challenges of deep transition are sharp because the changes are more radical than those that occurred due to the Second Industrial Revolution, the Great Depression, or World War II. The peculiarity of these changes is that they are *different* and even contradict what is still considered successful. The emergence of new challenges is caused by various social, demographic, and economic realities (like population decline in Europe, global competition, the war in Ukraine that impacts almost all world, etc.). The changes are so complex that they cannot be solved by the government, politicians, or the free market. Conversely, their solution will first require managers equipped with the concept of management theory that complies with the current reality.

As for the theory of management itself, the concept of reality in this field of knowledge is much more critical than for the natural sciences because the science of management theory is based on it, but as a system of concepts accepted in the natural sciences, does not influence the objective physical world. Today, we face

the problem that reality is changing very rapidly, becoming less and less similar to the ideas that have formed the management theory we are used to operating. Accordingly, there is a need to revise such ideas, change the paradigm and innovate in management.

A well-known researcher of management theory and the author of the concept of "management by objectives" (Drucker, 1954) and an adept of decentralization — Peter Drucker, in his work „Challenges for Management in the 21st Century," examines the classical theory of management from the beginning of the 1930s to today and concludes that modern management theory requires revision of the main paradigms based on modern challenges (Drucker, 2020, p. 10), since in the social sciences the most important should be considered the system of general ideas and changes in it following the essentials of the time. Most scientists, researchers, and practitioners of management theory adhered to the following two systems of ideas about the realities of the theory and management practices that are rapidly losing relevance. We summarize these findings in a table that formulates the basis for further research on the importance of rapid innovation in management.

So, we see that the foundation of modern society, economy, and human relations is a managed organization as a social institution with the goal of achieving a result. And management in such a paradigm act as a tool that enables the organization to attain its goals (Drucker, 2020, p. 52). One feature distinguishing giant global companies from others is the ability to develop and optimize management practices at each growth stage. Implementing change in a large organization with a solid corporate culture and established processes is particularly challenging but essential. After all, on the one hand, companies are forced to adapt to the conditions of fluctuations in the external environment, uncertainty, rapid transformation of technologies, and the emergence of new business models, and on the other hand, to take into account the interests of shareholders and successfully manage existing assets. Accordingly, a large organization must strengthen its core and, simultaneously, lay the foundation for future changes, such as the transition to digital technologies.

Digital transition involves simultaneously managing the existing business and building the future. Despite the fact that in the future, the profitability of the digitization of enterprises will be high due to the reduction of production and sales costs, during the transition period, the volume of costs will increase since it will be necessary to work both in the old and new ways at the same time. Even though businesses may find themselves in danger and need of change, they usually remain profitable in the short term and find it challenging to give up profits for an uncertain future.

Table 1. Comparison of ideas about the realities of management science in the period from the 1930s to the present.

System	Area	Before (1930–1980)	Present (after 1980)
Theory Aspect	Purpose of management	Management — is a management of ***business*** organization.	Management is a specific and defining structure of ***every*** organization.
	Organizational structure	*One*: There is one correct organizational structure.	*Many*: The aim of organizational structure is to identify, build and verify in practice organizational structures that meet the set goals. Every independent enterprise needs several types of organizational structures existing in parallel.
	People management	One correct way to ***manage*** personnel.	Management is oriented on ***productivity***. Different types of employees should be ***directed*** (not managed) differently.
Practical Aspect	Perceptions of technology and end use of goods and services	One industry — one technology.	In theory, all technologies can be relevant and impact any industry. Management is no longer focus on the product or service, but on the ***value*** perceived by the consumer and the ***consumer's decision*** regarding the distribution of his income.
	Legacy	Management is based on coercion and control.	Management must be operational and focus on results and efficiency at all stages of the value chain, that also combine cross-industrial partnership. (Ex., a pharmaceutical company, and a biological university)
	Focus	Management is focused inside the organization.	Management exists for the sake of ***results***, defines them, and serves to ensure that every organization can achieve results in the external environment outside the organization.
	Globalization	The country's economy (as a field of business management) is limited by state borders.	Management boarders is not equal to state boarders. The role of government is still important; however, the practice of management will be defined by interests of companies, but not political.

Source: Built by the author considering Drucker (2020)

When thinking about the speed of digitalization, given the uncertainty of the future and the U-shaped profit curve, executives choose between two approaches:

- Quick transition, i.e., a risk strategy that aims to reduce the period of decline in profits.

- Slow transition, a conservative strategy that allows you to win the time and focuses on minimizing risk from an uncertain future.

Each of these approaches has its advantages and disadvantages. However, in general, the speed of digitalization will depend on three main factors: trends in consumer behavior, competitors' strategies and skills, capabilities, and the organizational structure of the company making the transition (Gupta, 2020, p. 252–253).

Based on the study of digital transformations of giant global companies, three main stages of the digital transition can be distinguished (Gupta, 2020, p. 254–256):

- Stage 1: Using technology to reduce costs and improve the efficiency of existing business processes. This stage requires the destruction of established business relationships.
- Stage 2: Companies opening their own technological platforms for customers.
- Stage 3: Platform strategy. At this stage, companies are moving towards opening up their systems to third parties, even competitors.

As digitalization leads to significant changes in internal operations, companies must first be internally prepared for such changes to ensure a successful transition. Moreover, all such changes must be supported by an appropriate organizational structure that leverages the firm's assets and synergies instead of creating conflict between old and new. After all, changes in organizational culture motivate employees to regularly identify the causes of inefficient process execution and independently search for ways to solve them, as well as to ensure monitoring and a high level of satisfaction with customer needs (Buchwald, 2010).

In the context of this study, interesting is the disruptive idea of academics-practitioners Reid Hoffman and Chris Yeh, which consists in prioritizing speed over productivity, which allows companies to grow incredibly quickly in conditions of uncertainty. The idea is described in the context of "blitzscaling," which means a method of action and specific methods that help companies expand extremely quickly (Hoffman & Chris, 2021, p. 25). Although hypergrowth through blitzscaling is a characteristic of startups, large companies using a balanced approach can benefit significantly from the proposed management innovation to overcome their inherent speed and risk-taking weaknesses. Furthermore, under some external conditions, such as the influence of new technologies on the emergence of new markets or the collapse of old ones, the use of the techniques of this strategy can become justified since a careful and balanced approach to accepting risks can cost companies their very existence.

Given the above, it is possible to highlight three main techniques that allow companies to overcome significant global crises: innovation of business model, where technological innovation plays a key role in maintaining profits after updating the business model; innovation of strategy; innovation of management (Hoffman & Chris, 2021, p. 44–53). Accordingly, the strategy of rapid growth in large organizations involves several significant changes in business process management, taking into account the inevitable changes in internal communication, the evolution of the strategy and culture of the company, the acceptance of chaos as a condition of existence, and therefore the use of measures to manage it, adaptation to the constant changing emphases and constantly revising priorities. Scientific and practical, and world experience prove that large corporations can carry out extended reproduction on an innovative basis and ensure the stability and competitiveness of national enterprises on the world and domestic markets (Amosha, 2005). Unlike startups, large enterprises have several undeniable advantages, such as scale (i.e., more considerable amount of finance; reputation; well-known brand), the ability to repeat attempts at rapid scaling many times due to significant resource capabilities (intellectual and material), and can spend more time on attempts, as well as the ability to use the merge and acquisition tool.

In continuation, let us consider the impact of the war in Ukraine as an influential factor of uncertainty on the industrial sector of the regional economy. Developing one's own industrial sector is one of the strategic directions of the state's socio-economic development and its regions in the conditions of European integration processes and in the post-war period. It is required to use such modern methods of planning the activity of an industrial enterprise, which will increase the efficiency of industrial production management and, on this basis, increase the competitiveness of industrial products.

The application of advanced methods, in particular, a process-oriented approach, involves identifying the main business processes in the activity of an industrial enterprise, which are the centers of the formation and obtaining of profit. These processes create the initial results of the company's activity and influence the satisfaction of consumer requirements. Therefore, they are directly related to the creation of products and their implementation, as well as to after-sales service.

The functioning of the main business processes is impossible without a certain set of supporting processes and management processes, which consist in creating the necessary conditions for implementing the main processes and whose purpose is to solve specific tasks following the main goal of the enterprise.

The modern development of business processes in the industry of Ukraine takes place in the conditions of war, which leaves its negative imprint. Thus, ac-

cording to experts' estimates, the country ended 2022 with a 30% drop in real GDP, which was not recorded even during the Second World War (Bank, 2023). At the same time, the industry is the third sector after infrastructure and housing, and communal services in the total cost of damages and lost assets, which is 7.5% of the total damages as of September 1, 2023. (KSE, 2023).

According to the assessment conducted by the Institute of the Kyiv School of Economics as part of the project to develop independent methodologies for the analytical evaluation of infrastructure damage and economic losses resulting from Russia's aggression, as of September 1, 2023, the total cost of direct industrial losses is estimated at $11.4 billion. This figure represents nearly 3.1% of the country's GDP in 2022 (World Economic, 2023). The losses within the industrial sector encompass a minimum of 426 large and medium-sized private enterprises as well as state-owned companies that suffered damage or were destroyed as a consequence of the conflict. Simultaneously, the sum of indirect losses within the industry, associated with income loss and additional expenses related to the war, stands at $51.5 billion or 23% of the total losses. A majority of these enterprises are completely annihilated and necessitate reconstruction, with a particular emphasis on those within the metallurgical industry (Damage Assessment, 2023).

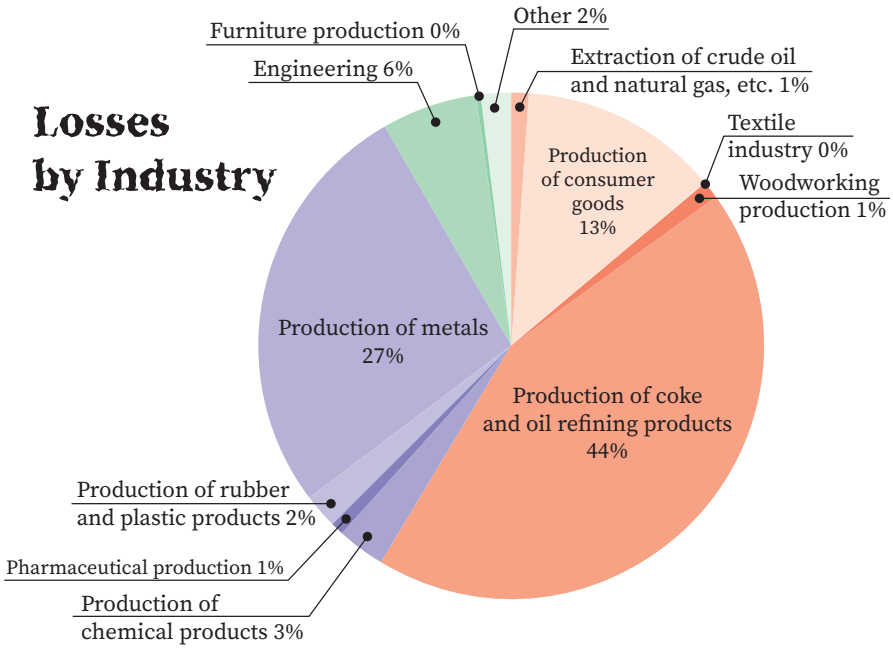

Fig. 1. The amount of losses by industry in billion USD (Share of total industry losses, %).
Source: Built by the author considering Evaluation of KSE Institute (2022)

In a sectoral breakdown, the greatest damage was caused to the processing industry (Fig. 1). At the same time, among the most affected regions of Ukraine: the Donetsk region — 4.2 billion US dollars (51.7%); Kharkiv region — 0.9 billion US dollars (11.2%); Kyiv and Kyiv region — 0.6 billion US dollars (6.9%). Since 2014, the mining industry accounted for 12.1–16.1% of the total industrial production in Ukraine, which on average was about 4.4% of GDP. Due to military actions in the Donetsk and Kharkiv regions in 2022, salt and non-ore mines and one oil and gas production company suffered losses totaling USD 99.7 million, which is 1.2% of the total industry losses.

The largest specific weight in the total amount of industry losses is the losses caused to the processing industry, estimated at 7.9 billion US dollars or 96.9%. Thus, the largest industrial enterprises in Ukraine were affected — the Avdiiv Coke Plant and the Kremenchug Oil Refinery. Half of the losses in the production of basic metals, finished metal products, except for machines and equipment is caused by the destruction of "Azovstal".

Concerning the production of food, beverages, and tobacco products, only the Kyiv region lost a fifth of the warehouse space with significant food stocks due to the war, amounting to about 364 thousand m^2, including office premises and other buildings on the territory of the complexes. Damages caused to other branches of industry, partially damaged and located in the Kharkiv region, amounted to USD 156.4 million or 1.9% of the total industrial losses. Regarding asset types, intangible assets such as equipment and buildings were the most affected, accounting for 25.6% and 21.3% of total assets, respectively.

4. Conclusions

External uncontrollable and hard-to-predict factors, particularly military aggression, influence uncertainty and harm the modern development of business processes and their management in the Ukrainian industry. In a broader context, the times of profound transition provoke significant changes in the paradigm of traditional management in response to the speed of these changes and overcome global crises at both the macro and micro levels. Given the need for response, adaptation, and in the future, rapid recovery of Ukraine's industry in the post-war period, we emphasize the importance of rapid innovation in business process management as an essential component of the Ukraine's industry quick recovery. Therefore, to ensure the profitability of operational activity in the industrial sector of Ukraine, which reflects the efficiency of industrial enterprises, the profit-

ability of their operational activity, the level of cost recovery, etc., it is necessary to develop an effective investment and innovation strategy at the state level. Such a strategy, especially for the post-war recuperation of industrial activity, should be aimed at recovering certain assets or developing labor-intensive service areas. The need to modify the parameters of the current state economic policy to ensure a more optimal impact on the economy at all management levels is also being brought up to date. In particular, an effective government policy of digitization and an effective mechanism for its implementation will contribute to improving business process management, primarily in the industrial sector.

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Innowacje w zarządzaniu procesami biznesowymi jako istotny składnik szybkiego ożywienia przemysłu Ukrainy

Streszczenie. Artykuł przedstawia analizę porównawczą paradygmatów klasycznej teorii zarządzania i tego, który odpowiada współczesnej rzeczywistości. Szczególną uwagę zwraca na cechy szybkiego wzrostu w dużych organizacjach, na przykładzie przejścia do digitalizacji jako strategii wzrostu. Identyfikuje główne etapy cyfrowego przejścia, a także trzy podstawowe techniki, które przedsiębiorstwo lub organizacja może wykorzystać do przezwyciężania kryzysów i adaptacji do szybkich zmian, takie jak innowacje modelu biznesowego, innowacje strategiczne i innowacje zarządzania. Artykuł uzasadnia również konieczność zarządzania procesami biznesowymi (część innowacji zarządzania) jako reakcję na nieuniknione zmiany w komunikacji wewnętrznej, ewolucję strategii i kultury firmy, chaos oraz adaptację do stałych zmian akcentów i priorytetów. Analizuje wpływ wojny na Ukrainie jako silnego czynnika niepewności w sektorze przemysłowym gospodarki regionalnej Ukrainy. Na podstawie analizy doświadczeń cyfrowych transformacji światowych gigantów podejmuje próbę podkreślenia kluczowych punktów takich transformacji na Ukrainie. Podkreśla konieczność wsparcia państwowego dla rozwoju innowacji i cyfrowej transformacji ukraińskiego przemysłu.

Słowa kluczowe: zarządzanie, innowacje, digitalizacja, innowacje w zarządzaniu, szybki wzrost

ZESZYTY NAUKOWE
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Development of Domestic Chemical Industry in the Conditions of Globalization

Abstract. The article is devoted to the analysis of characteristic features, problems and prospects of development of the chemical industry of Ukraine in the conditions of action of global factors. The peculiarities of the functioning of the world market of the chemical industry are given. Based on the annual global rating "Global 500" and using the application package On Front, DEA-analysis was used to assess the effectiveness of the world's leading chemical companies. Input variables — indicators of assets of companies and the number of their employees, and the output variable — an indicator of income, which allowed to determine the most optimal use of these enterprises resources that they direct to production activities. Attention is paid to find out of modern features and issues related to export activity of the domestic industry, which is formed under the influence of both internal transformations and global factors. The analysis of the industry development is conducted, a number of threats and challenges for its development are revealed. On the basis of the conducted research the perspective directions of further development of the domestic

chemical branch are substantiated, which include the processes of import substitution, attraction of highly efficient investments, intensification of innovative activity, modernization of equipment, optimization of export and import structure.

Keywords: chemical industry, exports, efficiency of activity, global economy, competitiveness of products

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1. Formulation of the Problem

Foreign economic relations of the world are determined by the processes of transnationalization and globalization, accordinly there are structural changes in international trade, changes in the factors of achieving competitiveness of goods in world markets. On such conditions, the country's economy and its main export industries may face risks of weakening competitive positions and destabilizing the position of individual product groups in traditional export markets, the need to increase product competitiveness primarily through the introduction of new decisions.

The economy of Ukraine remains export-oriented, at the same time its involvement in the world market has a more characteristic resource character, as the dominant component of exports is products with a low degree of processing. The modern structure of domestic exports tends to deteriorate due to a decrease the part of the products of the metallurgical complex, chemical industry, high-tech products and an increase the part of the products with low added value. Therefore, the further development of foreign trade requires the development of new approaches in light of deepening economic integration of Ukraine and as a result of the development of the knowledge-based economy, which determine the priorities and directions for achieving high efficiency in foreign trade by producing and salling high value added products on world markets.

2. Aims and Methodology of the Study

The aim of the article is research the modern state and exposure of prospects for the transformation of the commodity structure of Ukrainian exports and is to study the features, problems and prospects of the domestic chemical industry in the context of changes that take place at global level.

3. Main Results of the Study

In the structure of domestic export deliveries during 2001–2020, the share of base metals and articles of base metal decreased from 41,3% to 18,4%; vehicles — from 3,4% to 1,5%; chemical industry products — from 9 to 4,1%; machines, equipment and mechanisms — from 10,5 to 9,1%. However, the share of plant products increased from 4,26 to 24,2%; animal or vegetable fats and oils — from 1,39% to 11,7%. The problem is not only the dominance of raw material exports, but the low export of industrial and high-tech goods.

Most industries are developing under the influence of not only domestic but also global factors. Their competitiveness and strengthening of export capacities directly determine the country's foreign exchange earnings, the state of the balance of payments and the possibilities of technological updating directly. The global dimension of the development of export industries causes a number of threats and challenges that should be kept in mind when developing strategic priorities of industries.

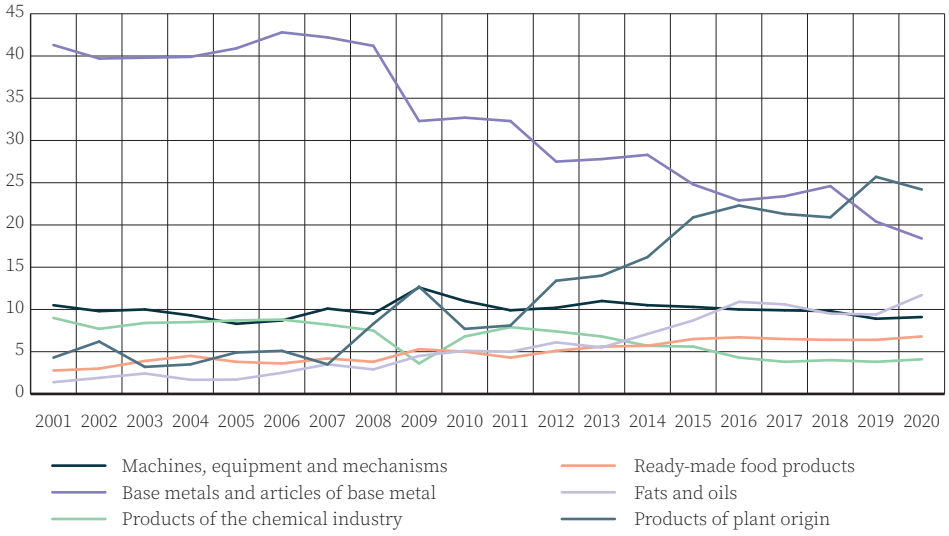

Figure 1. Structure of Ukraine's exports by individual product groups, 2001–2020.
Source: Based on Ukrainian statistical data for 2020

Domestic scientists note that the chemical industry of Ukraine is directly affected by the consequences of the transformation of the competitive environment in the global chemical market, among the key trends in the global chemical industry in recent years they highlight the following: mergers and acquisitions, new

regulatory environment, intensification of investment activities, introduction of innovative technologies (Ishchuk & Koval, 2019, p. 214).

Analysis of the dynamics of Ukraine's foreign trade in chemical products allows us to state that the foreign trade balance in the period 2000–2020 was positive only in 2000 and amounted to $382,2 million. The positive dynamics of exports, which was interrupted by the global financial crisis in 2008, showed a short-term recovery in 2011–2012, but in 2016, exports fell sharply in 2016 to $1277,7 million. As of 2020, there was a slight increase in exports to $1728 million.

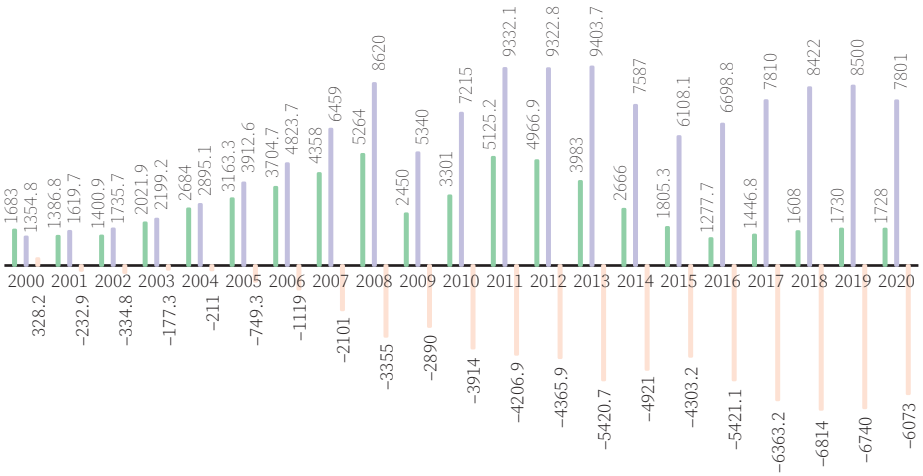

Figure 2. Foreign trade in chemical and petrochemical products in Ukraine in 2000–2020, million US dollars.
Source: SSSU (2020)

In terms of annual gross turnover in the chemical industry, Ukraine in 2020 will reach an enough low level (4.6 billion US dollars), which is close to Bulgaria, Romania, Indonesia, Vietnam (2–5 billion US dollars). In the substantial majority of industrially developed countries, the annual turnover of the chemical industry exceeds 8–10 billion US dollars, the average is in the range of 50 to 100 billion US dollars. All this indicates that the competitiveness of domestic chemical production is gradually declining. In the substantial majority of industrialized countries, the average range of the share of the chemical industry in industrial production is from 8–9 to 18–20%. The minimum level of this indicator in the substantial majority of countries is not less than 5% (ChDNDITEIVKhP, 2020).

Analyzing the annual rating of global companies "Global 500", which is based on the methodology of Fortune magazine (the criterion is the company's profitability) for 2020, we note that the 500 largest companies in the world include 8 companies belonging to the chemical industry. Among them, two each repre-

sent China and the United States, one each from Germany, the Netherlands, Japan and the United Kingdom.

It is advisable to investigate how effective the world's largest chemical companies are in terms of the ratio of resources used and the results obtained. We used the method of DEA-analysis, which allowed each company to calculate the efficiency ratio of their activities.

DEA-analysis is based on the use of the basic postulate of a market economy — the production capacity curve, which reflects the maximum efficiency of production resources, which is determined by the maximum possible output of goods and services for available technologies and available resources. Hence, the algorithm for determining efficiency is to construct a corresponding curve of production capacity and the location of the research objects relative to it.

Efficiency can be estimated after producing of products by construction of output-oriented model, and using resources — input-oriented model. In this case, efficiency means the ratio of the set of values of input parameters to the set of values of output parameters, the value of the efficiency varies from 0 to 1. Accordingly, the object with a value close to 1, rationally uses resources, works at full capacity and is efficient. This technology can be used to analyze industries of economy, regions, large companies and enterprises of different sizes.

In our research, as input variables, we used indicators of company assets and the number of their employees, the output variable was the income indicator. The data used by us for calculations are given in table 1.

Table 1. Indicators of chemical companies included in the "Global 500" rating in 2020.

Place in the rating	Name	Income, million USD	Assets, million USD	Number of employees
143	BASF	70,723	97,593	117,628
164	ChemChina	65,767	121,160	145,526
283	Dow	42,951	60,524	36,500
360	LyondellBasell Industries	34,727	30,435	19,100
376	Mitsubishi Chemical Holdings	33,418	47,489	69,609
389	3M	32,136	44,659	96,163
444	Linde	28,677	86,612	79,886
455	Shenghong Holding Group	27,870	13,562	30,631

Source: Based on Fortune (2020)

Software implementation of DEA-analysis was carried out using the application package On Front. As a result of building an input-oriented model, we calculated the efficiency coefficients, the values of which are presented in fig. 3.

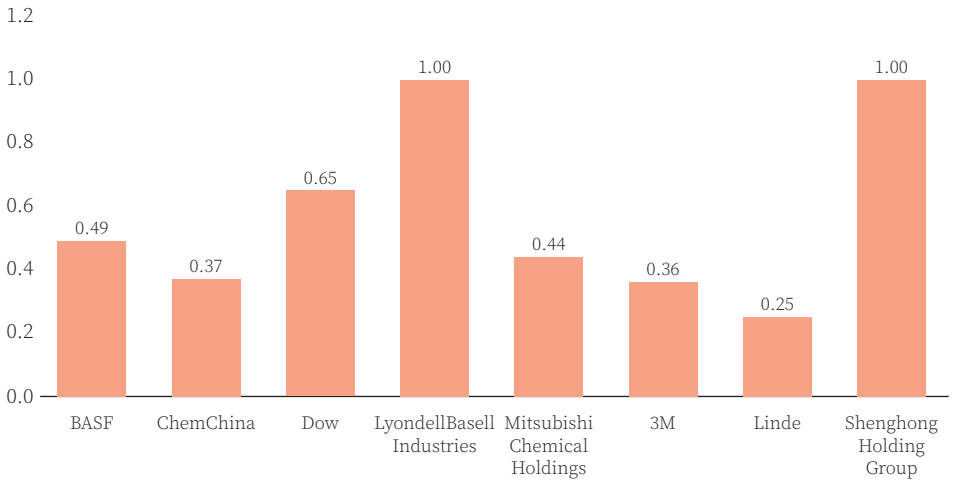

Figure 3. Coefficients of efficiency of the leading companies of the chemical industry
Source: Authors' calculations

As we can see, among the companies we have considered, LyondellBasell Industries (Netherlands) and Shenghong Holding Group (China) are effective, for which the value of the efficiency ratio is equal to one. This indicates the optimal use of these enterprises resources that they direct to production activities. All other companies should optimize the use of their resources, because they can get a similar income by reducing inputs.

It can be noted that in 2020, the 500 largest companies in the world received $33,3 trillion of income. At the same time, the total income received by chemical companies is $336,269 million, that is 1%.

The domestic chemical industry has experienced a partial shutdown of production at some enterprises and a physical loss of powers as a result of destruction from military operations on the east of the country. The industry experiences disparities in the production of goods by different sectors of the industry, as well as a low level of manufacturability and energy intensity of the industry and high — import dependence, which negatively affects the competitiveness of products. There is an increase in the share of energy-intensive and raw materials industries, a decrease in the share of knowledge-intensive products sold and products of deep processing of the industry. There is a significant negative balance of foreign trade and a gradual decline in the share of the chemical industry in total exports (from 9% in 2001 to 4,1% in 2020).

There is a narrowing of the range of exported products, dominance in the structure of exports of semi-finished products and raw materials. Thus, in 2020,

inorganic chemical products worth $741,8 million (1,5% of total exports), organic chemical compounds — $174,1 million (0,4%), pharmaceuticals — $268,2 million (0,5%), fertilizers — $277,4 million (0.8%), tannin extracts — $114, 2 million (0,2%), essential oils — $95, 7 million (0,2%), organic surfactants — $41,7 million (0,1%), protein substances — $52,6 million (0,1%). Domestic scientists emphasize that the current structure of exports increases economic dependence on external factors, in particular, with rising energy prices, Ukrainian chemical producers become uncompetitive not only in foreign markets, but also lose their price competitiveness in the domestic market (Deineko, 2018, p. 46).

Exports are carried out to the markets of the CIS countries, the EU, the Middle East, where competition is constantly intensifying. The largest suppliers to the domestic market are the countries of Europe, the CIS and Asia (for chemical companies in the CIS, natural gas as a raw material is significantly cheaper than for domestic).

Threats should be seen in the increase of price of natural gas, that is key raw materials for the chemical industry; dependence on imports of raw materials used in the production of domestic products (sulfur, phosphorites, potassium chloride, etc.); changes in demand for chemical products on world markets, fluctuations in world prices for chemical products. At world level displacement of global balance take place towards suggestion — the introduction of new production capacities in the world, in particular during the last two decades in Europe, the United States and Asia have put into operation almost 200 modern nitrogen industrial sites (Falko, 2019). Exacerbation of competition in world markets for chemical products necessitates the creation of a competitive raw material base to reduce the cost of domestic products. Solving global problems, including increasing the production of mineral fertilizers to increase soil fertility, should be seen as a way to solve the problem of food security.

Among the promising areas of development of the chemical industry should be noted:

1. Import substitution of chemical products to ensure sustainable growth in the future, to restore the development of organic production.
2. Attracting investments to increase the physical and moral lag of fixed assets of the industry from industrialized countries, updating technological processes, technical re-equipment and opportunities for complete reconstruction, equipping with modern equipment, introduction of low-waste production technologies, optimization of energy consumption.
3. Innovative policy of implementation of the latest scientific and technical solutions, in particular, expansion of the product range of mineral fertiliz-

ers (with microelements, micro- and nanofertilizers), ameliorants, feed mineral additives, etc.
4. Decommissioning of physically worn out and obsolete equipment and commissioning of new equipment that meets the world's leading standards.
5. Optimization of the structure of export-import in the direction of increasing output with higher added value (the range of imports is more diverse).
6. Application of protectionism tools to protect domestic producers, increase motivation and interest in the development of the domestic market.

The draft Strategy for the Development of the Chemical Industry until 2030 contains 10 such priorities: creation of a competitive raw material base, modernization of chemical production, development of intra-industry technological chains based on existing industries, creation of new chemical industries necessary for development of related industries, provision of agro-industrial complex (AIC), effective import substitution, etc. (SKhFR, 2019).

4. Conclusions

Most industries are developing under the influence of not only domestic but also global factors. Their competitiveness and strengthening of export capacities directly determine the country's foreign exchange earnings, the state of the balance of payments and the possibilities of technological renewal. The global dimension of the development of export industries causes a number of threats and challenges that should be kept in mind when developing strategic priorities of industries. The world chemical industry is developing in terms of mergers and acquisitions, the formation of a new regulatory environment, intensification of investment activities, the introduction of innovative technologies.

The domestic chemical industry is characterized by partial cessation of production and physical loss of production capacity, disparities in the production of goods by various sectors of the industry, low level of technology and energy intensity, high level of import dependence, significant foreign trade deficit and gradual decline in the share of chemical exports.

Further development of the industry in the light of the influence of global factors is associated with the processes of import substitution, attracting highly efficient investments, intensification of innovative activity, modernization of equipment, optimization of the structure of exports and imports.

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Rozwój krajowego przemysłu chemicznego w warunkach globalizacji

Streszczenie. Artykuł poświęcony jest analizie charakterystycznych cech, problemów i perspektyw rozwoju przemysłu chemicznego Ukrainy w perspektywie globalnej. Podano specyfikę funkcjonowania światowego rynku przemysłu chemicznego. Na podstawie rocznego globalnego rankingu „Global 500" i przy użyciu pakietu aplikacji On Front poddano ocenie efektywności wiodące światowe firmy chemiczne, wykorzystując do tego analizę DEA. Zmienne wejściowe to wskaźniki aktywów spółek oraz liczby ich pracowników, a zmienna wyjściowa — wskaźnik dochodu, który pozwolił określić optymalne wykorzystanie zasobów tych przedsiębiorstw, skierowanych na działalność produkcyjną. Zwrócono uwagę na aktualne cechy i zagadnienia związane z działalnością eksportową przemysłu krajowego, który kształtuje się zarówno pod wpływem przemian wewnętrznych, jak i czynników globalnych. Analiza rozwoju branży ujawnia szereg zagrożeń i wyzwań dla jej rozwoju. Na podstawie przeprowadzonych badań uzasadniono perspektywiczne kierunki dalszego rozwoju krajowej branży chemicznej, do których należą procesy substytucji importu, przyciągania wysokoefektywnych inwestycji, intensyfikacja działalności innowacyjnej, modernizacja urządzeń, optymalizacja struktury eksportu i importu.

Słowa kluczowe: przemysł chemiczny, eksport, efektywność, gospodarka światowa, konkurencyjność produktów

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Sukcesy polskich spółek giełdowych pod kierownictwem kobiet

Streszczenie. Obecnie na polskiej giełdzie tylko niewielka część podmiotów jest zarządzana przez kobiety. Ponadprzeciętne wyniki finansowe osiągane przez przedsiębiorstwa reprezentowane przez płeć żeńską są potwierdzeniem drzemiącego w kobietach potencjału i ogromu kompetencji. Mimo wszystko pracodawcy w dalszym ciągu przejawiają dyskryminację płciową w zakresie obsadzania najważniejszych stanowisk w firmach notowanych na warszawskim parkiecie. Celem artykułu jest przedstawienie sposobów zarządzania przez kobiety spółkami giełdowymi i określenie, jak stosowane przez nie metody kierowania zespołem wpływają na osiągnięcie sukcesu przez organizację. Dokonanie przeglądu najnowszej literatury oraz danych statystycznych potwierdza brak zaawansowania zrównoważonego rozwoju wśród większości podmiotów giełdowych, mimo że udział kobiet we władzach organów statutowych systematycznie się zwiększa. Analizie poddano 140 największych polskich spółek giełdowych, a wnioski z przeprowadzonej analizy krytycznej powinny posłużyć do określenia potencjału kobiet w zakresie zarządzania.

Słowa kluczowe: giełda, kobiety, zarządzanie, kompetencje, zróżnicowanie płciowe, organy statutowe

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Chociaż luka płacowa stopniowo się zmniejsza, a na uniwersytety zapisało się tyle samo kobiet, co mężczyzn, jeśli nie więcej, wiele rad dyrektorów i posiedzeń gabinetów powinno lepiej odzwierciedlać różnorodność świata i czerpać z różnych punktów widzenia i doświadczeń.
CHRISTINE LAGARDE, „The New York Times" 10.05.2010

1. Wprowadzenie

Skuteczne zarządzanie jest wyjątkowo trudnym zadaniem. Odpowiedzialność spoczywająca na osobach podejmujących decyzje wymaga odpowiednich umiejętności, wiedzy, a także cech przywódczych. Nie jest to oczywiście gwarancja osiągnięcia sukcesu, zwłaszcza jeżeli przedmiotem zarządzania są podmioty

narażone na zmianę wyceny spółki w uzależnieniu od opinii publicznej, jednak to właśnie skuteczny lider potrafi doprowadzić do osiągnięcia najlepszych efektów przy najmniejszym nakładzie środków potrzebnych do jego osiągnięcia (Czermiński, Grzybowski, Ficoń, 1999). Odpowiednie kierowanie spółkami giełdowymi jest nadzwyczaj istotne dla utrzymania optymalnej kondycji podmiotu, ponieważ nawet najmniejsze potknięcie może zostać panicznie odebrane przez akcjonariuszy — co z kolei bezpośrednio rzutuje na kapitalizację spółki i jej opinię publiczną.

Celem niniejszego artykułu jest zatem prezentacja metod zarządzania przez kobiety spółkami notowanymi na rynku regulowanym i określenie, w jaki sposób kobiecy styl zarządzania wpływa na sukces całej organizacji. W badanym okresie, czyli w latach 2010–2022, to jednak mężczyźni najliczniej piastowali stanowiska kierownicze, przez co są oni utożsamiani z obrazem wzorcowego lidera, a metody zarządzania stosowane przez kobiety stały się tym samym mniej popularne i mniej pożądane wśród pracodawców. Siła przyzwyczajeń i nadal obecny wysoki poziom dyskryminacji zawodowej w Polsce (Dzioba, 2022) przekłada się na stłoczenie kobiet w innych sektorach zawodowych, w których nie zostają należycie wykorzystane ich umiejętności związane z zarządzaniem. Realizują się natomiast mężczyźni, wśród których pracodawcy doszukują się kompetentnych kierowników lub potencjalnych dyrektorów spółek, a kobiety mimo przywódczych cech charakterologicznych nie są nawet rozpatrywane w kategorii *risk takers*. Unijne dyrektywy i normy prawne wymuszają jednak na spółkach równowagę płci i dążenie do zrównoważonego rozwoju, co pokazuje, jak wysokie korzyści może czerpać organizacja z takich zmian. W dalszym ciągu kobieta na stanowisku prezesa zarządu, dyrektora finansowego lub operacyjnego to rzadki widok, ale zgodnie z danymi statystycznymi — to właśnie one zapewniają ponadprzeciętne wyniki i pozytywnie wpływają na kondycję finansową zarządzanych podmiotów.

2. Polskie spółki giełdowe zarządzane przez kobiety

Jeszcze na początku ubiegłego dziesięciolecia na ponad tysiąc trzysta kierowniczych miejsc pracy w spółkach giełdowych jedynie sto trzydzieści sześć było obsadzonych przez kobiety (Olszewska-Miszuris et al., 2021). W ciągu następnych ośmiu lat udział ten wzrósł z 10,4% do 13,8%, jednak mimo pozytywnego trendu tempo zmian było zbyt powolne i wynikało bardziej z realizacji unijnych dyrektyw i przymusu, aniżeli z odejścia od dyskryminacji płciowej przez pracodawców.
W tabeli 1 została zaprezentowana dynamika zmian we władzach spółek giełdowych na przestrzeni ostatnich kilkunastu lat. Należy przede wszystkim zwrócić

uwagę na zmianę proporcji udziału kobiet w rozbiciu na stanowiska statutowe, największy wzrost odnotowuje się bowiem w radach nadzorczych, a znacznie mniejszy w bezpośrednim zarządzie. Zasadniczo dla każdego z trzech indeksów giełdowych liczebność kobiet w zarządzie spółki była mniejsza niż w radach nadzorczych. Nietrudno zatem wydedukować, że kobiety częściej pełnią funkcję kontrolną lub doradczą prac zarządu, a znacznie rzadziej piastują stanowiska decyzyjne.

Tabela 1. Udział kobiet we władzach spółek giełdowych wchodzących w skład indeksów WIG20, mWIG40 oraz sWIG80 w latach 2011–2019

Lata	Udział kobiet na stanowiskach decyzyjnych wśród spółek giełdowych			Udział kobiet we władzach wszystkich spółek giełdowych*		
	WIG20	WIG40	sWIG80	Zarząd	Rada Nadzorcza	Łącznie
2011	9,9%	12,1%	9,6%	8,7%	11,6%	10,4%
2013	11,5%	12,2%	9,1%	8,7%	11,7%	10,5%
2015	14,5%	12,4%	10,0%	9,8%	12,8%	11,6%
2017	15,9%	13,3%	11,1%	11,7%	13,4%	12,7%
2019	18,1%	14,3%	11,7%	11,1%	15,5%	13,8%
2021	18,8%	15,1%	12,3%	11,9%	16,4%	14,1%

*W tabeli uwzględniono wyłącznie 140 największych spółek giełdowych pod względem ich kapitalizacji na dzień 31.12.2019 r. wchodzących w skład indeksów WIG20, WIG40 i sWIG80.
Źródło: Opracowanie własne na podstawie danych CFA Society Poland i GPW

Powyższe dane wskazują, że najbardziej zdywersyfikowanym pod względem płci indeksem spółek giełdowych jest WIG20, gdzie na dwieście osiemdziesiąt trzy stanowiska w 2015 roku kobiety piastowały dokładnie czterdzieści jeden z nich — co stanowi o ich 14,5-procentowym udziale. Z kolei w gronie spółek z mniejszą kapitalizacją (sWIG80) ten udział wynosił raptem 10%. Impulsem zachęcającym pracodawców do zwiększenia udziału pań w zarządach mogłaby być stale zwiększająca się średnia ogólna liczba osób we władzach spółek giełdowych. W badanym okresie zwiększyła się ona przecież o ponad 8% (Olszewska-Miszuris et al., 2021), jednak mimo wszystko wskazana progresja nie przełożyła się na wzrost udziału kobiet w bezpośrednim gremium zarządczym. Zamiast tego ich udział wzrósł o 10% w innym segmencie *top management*, czyli właśnie w radach nadzorczych.

Historyczna statystyka opisująca strukturę zarządów spółek giełdowych mimo wszystko może brzmieć dosyć pokrzepiająco, ponieważ przedstawia ona pozytywny trend w dążeniu do zróżnicowania płciowego. Jak natomiast wygląda obecna sytuacja kobiet na giełdzie?

Według danych zebranych przez „30% Club Poland" na koniec 2021 roku, udział kobiet w zarządach i radach nadzorczych wynosił 16,6%. Znacznie częściej piastowały one funkcje członków rad nadzorczych (18,9%) aniżeli członków zarządu (13,1%). Z kolei tylko pięć spółek ze stu czterdziestu badanych podmiotów notowanych na warszawskim parkiecie na najwyższym stanowisku w firmie obsadziło kobietę. W tym miejscu należy zaznaczyć, że aż jedna piąta spółek giełdowych w Polsce nie miała ani jednej kobiety w strukturach swoich władz. Mimo wszystko statystyki potwierdzają, że podmioty giełdowe zwiększają udział kobiet na stanowiskach decyzyjnych, ponieważ rok wcześniej ponad jedna czwarta z nich nie miała w swoich organach statutowych żadnej przedstawicielki płci żeńskiej.

Niska różnorodność płci wśród władz spółek giełdowych nie występuje w każdej branży. W sektorze finansowym co czwarta spółka jest reprezentowana przez kobietę i należy zaznaczyć, że właśnie ta branża cechuje się najlepszą koniunkturą w ostatnich latach. Powyższe dane są nader rozczarowujące w kontekście różnorodności płci wśród władz spółek giełdowych, a przecież slogan równouprawnienia można znaleźć w strategii większości z nich. Milena Olszewska-Miszuris, inicjatorka i Co-Chair „30% Club Poland", podkreśla, że jeżeli tempo zmian powyższych władz pozostanie takie jak w latach 2020–2022, to „poziom 30% kobiet na stanowisku prezesa zarządu polskie spółki giełdowe osiągną dopiero za 60 lat". Tak odległy horyzont czasowy jest zupełnie rozbieżny z zakładanym celem parytetu płci Unii Europejskiej w spółkach giełdowych, zgodnie z którym kobiety mają piastować co najmniej 40% stanowisk dyrektorów niewykonawczych do końca lipca 2026 roku[1].

3. Obsadzenie stanowiskowe dyrektorów wykonawczych w Polsce na tle Unii Europejskiej

Rozważając cel UE w zakresie powierzania kobietom roli dyrektorów wykonawczych, należy zaakcentować miejsce Polski na tle pozostałych krajów europejskich. Poruszane problemy nie występują bowiem jedynie w kraju nad Wisłą, ale także w wielu innych, chociaż niezaprzeczalnie Polska pozostaje w dolnym zestawieniu narodów dążących do zrównoważenia płciowego, na co wskazuje tabela 2, prezentująca udział kobiet we władzach spółek w wybranych krajach

[1] Pełna treść założeń dotyczących udziału kobiet na stanowiskach dyrektorskich została opisana w Dyrektywie Parlamentu Europejskiego i Rady Unii Europejskiej z dnia 23 listopada 2022 r. w sprawie poprawy równowagi płci wśród dyrektorów spółek giełdowych oraz powiązanych środków.

OECD. Średnia kobiet we władzach spółek notowanych na giełdzie według stanu na koniec 2021 roku wskazuje, iż zaledwie 28% kobiet piastuje stanowiska zarządcze. Stopień reprezentacji kobiet bardziej różni się na poziomie krajów członkowskich aniżeli w poszczególnych sektorach i mając to na uwadze, należy zaznaczyć, że systemowe rozwiązania mają większą wagę aniżeli specyfika konkretnych branż lub sektorów gospodarki. Wcześniej wspomniana dyrektywa Unii Europejskiej ma na celu zwiększenie udziału kobiet na stanowiskach dyrektorów niewykonawczych do 40% lub dotarcie do poziomu co najmniej 33% wszystkich dyrektorów. Państwa członkowskie mają czas na dostosowanie się do tego wymogu do 30 czerwca 2026 roku. W innym wypadku nawet w trakcie trwania kadencji członków zarządu lub rady nadzorczej nastąpią przymusowe zmiany. O podobnych rozwiązaniach mówiła wcześniej przede wszystkim konwencja z 1979 roku w sprawie likwidacji wszelkich form dyskryminacji kobiet, jednak wszystkie dotychczasowe działania, jak obowiązki sprawozdawcze lub umieszczanie kryterium różnorodności płci w dostępie do środków unijnych, czy też ostatecznie wspominane akty prawne, nie poprawiły stanu rzeczy, ponieważ decydenci znajdowali możliwości ich obejścia. Dobre praktyki spółek notowanych na GPW miały tej zmiany dokonać, rekomendując podmiotom zatrudnianie kobiet na poziomie minimum 30%, jednak zarówno w Polsce, jak i w pozostałych krajach członkowskich rekomendacje instytucji kontrolujących rynek kapitałowy nie stanowiły antidotum.

Tabela 2. Udział kobiet w zarządach największych spółek giełdowych krajów OECD

Kraje	**Udział %**
Austria	34,6%
Belgia	37,9%
Czechy	23,0%
Francja	45,3%
Hiszpania	32,6%
Holandia	38,1%
Litwa	22,3%
Niemcy	36,0%
Polska	**24,7%**
Słowacja	27,7%
Węgry	9,4%
Włochy	38,8%
Średnia dla krajów OECD	**28,0%**

*Dane według stanu na drugie półrocze 2021 roku.

Źródło: Opracowanie własne na podstawie danych Organisation for economic co-operation and development

Wśród dwunastu badanych krajów ponad połowa ma większy udział kobiet we władzach spółek, niż wynosi średnia europejska. Takie państwa jak Polska, czyli znajdujące się właśnie poniżej wymaganego średniego zdywersyfikowania płci narzuconego przez UE, stronią od dokonywania zmian i czekają, aż zmiany legislacyjne wymuszą na nich podjęcie działań. Wzrost z poziomu 24,7% do poziomu narzuconego przez UE (40%) do 2026 roku może stanowić nie lada wyzwanie dla spółek notowanych na krajowym rynku, zważywszy na niską dynamikę zmian prezentowaną w tabeli 1. W wielu z ujętych w tabeli krajów nawet dwukrotne zwiększenie udziału kobiet na stanowiskach dyrektorów wykonawczych nie spełniłoby wymogu narzuconego przez UE, a przecież w opinii analityków i ekspertów ekonomii równość płci sprzyja kreatywności i konkurencyjności, co tym samym wpływa pobudzająco na wzrost gospodarczy. Właśnie dlatego wyższy udział kobiet w organach spółek może mieć pozytywne odzwierciedlenie w niwelowaniu zarówno luki płacowej, jak i zatrudnieniowej pomiędzy płciami.

4. Kompetencje, potencjał i sposób zarządzania przedsiębiorstwem przez kobiety

Docenianie kompetencji kobiet stanowi jedno z największych wyzwań współczesnych lat. Beneficjentami najwyższych stanowisk są zwykle mężczyźni (Kompa, Witkowska, Jarosz, 2015), ponieważ w oczach pracodawców kompetencje kobiet budzą dużą nieufność. Według licznych publikacji naukowych (Zaleska, 2023), podstawą eliminacji tego stereotypu i sposobem na uwolnienie potencjału kobiet na rynku pracy jest przede wszystkim ułatwienie kobietom dostępu do nietypowych dla nich sektorów oraz propagowanie obecności mężczyzn w dotychczas sfeminizowanych branżach (Kolasińska, 2012). Z oporem do takich zmian podchodzą jednak polskie organizacje, które preferują liderów reprezentujących twardy styl zarządzania w przekonaniu, że kobiety mogą okazać się zbyt pobłażliwe wobec pracowników i mało skuteczne w kryzysowych sytuacjach. Podział na tzw. *hard* i *soft management* definiuje właśnie rodzaj wywierania wpływu i sposób osiągania celów w uzależnieniu od płci lidera (Nye Jr., 2008). Pod pojęciem twardego (*hard*) sposobu zarządzania kryją się głównie działania indukcyjne, konfrontacje z pracownikami oraz stosowanie systemu nagród i kar. Literatura wskazuje, że taki sposób zarządzania grupą jest najczęściej praktykowany przez mężczyzn, natomiast kobiety znacznie rzadziej po niego sięgają.

Praktyką stosowaną przez kobiety jest raczej miękki (*soft*) sposób dowodzenia grupą, czerpiący z inherencji, komunikacji i umiejętności perswazji. Pomimo

iż twardy styl zarządzania wydaje się mniej zasadny i słabo akceptowalny przez pracowników firm, to nadal jest najbardziej pożądaną metodą przywództwa przez pracodawców, utożsamianą z gwarancją osiągnięcia celów przedsiębiorstwa. Trudno mówić o uwolnieniu potencjału kobiet w zakresie rozwoju zawodowego i szeroko rozumianego *managementu*, gdy powyższe stereotypy na stałe zagnieździły się w krajowych korporacjach. W tym miejscu warto zaznaczyć, że badania naukowe wskazują na wykreowanie się odmiennego sposobu wywierania wpływu przez kobiety, czyli tzw. *soft power management* (Brzezińska, 2020), który potrafi połączyć obydwa powyższe style zarządzania, a jego początki były opisywane właśnie w odniesieniu do podmiotów giełdowych kierowanych przez kobiety.

Mimo epokowych zmian w interpretacji kobiety jako lidera kobiecy potencjał w zakresie zarządzania dalej nie został w pełni odkryty, niezależnie od tego, jaki styl zarządzania reprezentują. Teorie uprzedzeń osobistych i segregacji zawodowej są w dalszym ciągu aktualne, pomimo historycznie udowodnionych kompetencji pań jako naturalnych liderów. Czy udział kobiet w kierownictwie spółek jest rzeczywiście potrzebny i czy dywersyfikacja płci organów statutowych jest wartością dodaną?

Przeprowadzone badania i sukcesy płci żeńskiej w zarządzaniu na dużą skalę potwierdzają, że obecność kobiet w zarządach przyczynia się do poprawy wyników finansowych spółek, pomimo ich niedostatecznej reprezentacji na stanowiskach zarządczych (Kompa, Witkowska, 2017). Przykładem takich osób mogą być chociażby Hanna Gronkiewicz-Waltz czy też Alicja Kornasiewicz. Dzięki swojemu zaangażowaniu zarówno była prezydent m.st. Warszawy, jak i wiceministra skarbu pozostawiły kobiecy wzór do naśladowania dla młodych kobiet, na przekór wszechobecnym uprzedzeniom płciowym. Odznaczone Orderami Odrodzenia Polski, wielokrotnie udowadniały zarówno możliwości, jak i umiejętności kobiet w podejmowaniu decyzji i ogólnie pojętym zarządzaniu.

Fachowości kobiet można doszukiwać się nie tylko na arenie politycznej, ale także w sektorze finansowym. Maria Pasło-Wiśniewska na fotelu prezeski zarządu banku Pekao S.A. w latach 1998–2003 diametralnie zmieniła bankowość spółki i jednocześnie dwukrotnie znalazła się na liście dwudziestu pięciu najbardziej wpływowych kobiet Europy ogłaszanej przez *The Wall Street Journal*. Podobnie kompetentnych liderek można doszukać się także w innych sektorach, natomiast w tym miejscu warto zaznaczyć, że ich obecność na najwyższych stanowiskach jest krótkotrwała, a fotele prezesek i tak są finalnie przekazywane mężczyznom. Według danych Eurostatu zmiany prezesów mają miejsce najczęściej w sytuacjach kryzysowych dla spółek i nie inaczej jest w przypadku kobiet, które zasadniczo rzadko mają okazję zaprezentować swój potencjał w zarządzaniu ryzykiem (Szczepańska, 2011). Mimo że w ten sposób kreują większą liczbę rozwiązań, to i tak naj-

częściej ich kompetencje (wiedza, umiejętności i doświadczenie) są przyjmowane tylko w formie doradztwa. Powyższe rozważania wskazują zatem, że wizerunek męskiego lidera dalej dominuje we władzach spółek giełdowych.

5. Jakość zarządzania podmiotami rynku regulowanego a cechy charakterologiczne kobiet

W gronie podmiotów notowanych na giełdzie jakość zarządzania jest silnie skorelowana z osobowością przywódcy. Umiejętność podejmowania trudnych decyzji, metody zarządzania organizacją i jej zasobami, a nawet sposób traktowania pracowników jest wymiernie określony poprzez wycenę spółki w jej notowaniach giełdowych. Poprzednio wspomniany sposób wywierania wpływu oraz doświadczenie i wiedza są oczywiście kluczowe do osiągnięcia dobrych rezultatów, jednak równie ważne co kompetencje lidera są także jego cechy osobowościowe.

Omawiając zatem właściwości zarządzania przedsiębiorstwem przez menedżerów, warto zwrócić uwagę na to, jak istotny wpływ na jakość kierowania zespołem mają cechy charakterologiczne zwierzchników. W społecznej świadomości funkcjonują poglądy dotyczące znaczącego zróżnicowania cech osobowościowych wśród mężczyzn i kobiet. Większość przeprowadzonych badań odwołuje się do takich cech kobiecych jak asertywność, impulsywność, ekstrawersja, otwartość, ugodowość, czułość, sumienność i decyzyjność (Mandal, 2005). Mężczyzna najczęściej wizualizowany był jako lider prowadzący grupę do realizacji swoich celów, którego cechowała nieustępliwość, impulsywność i właśnie wspomniana decyzyjność. Jednak w odniesieniu do rynku kapitałowego i kierowania przedsiębiorstwem powyższe cechy wcale nie gwarantują sukcesu. Okazuje się bowiem, że znacznie skuteczniejszym liderem jest osoba sumiennie realizująca swoje obowiązki, ponieważ obniża ona w ten sposób prawdopodobieństwo popełnienia błędu lub zaniedbania. Z kolei połączenie cech decyzyjności i impulsywności, które statystycznie najczęściej cechują mężczyzn, może prowadzić do gwałtownych i nieprzemyślanych postanowień związanych z prowadzeniem przedsiębiorstwa, intensyfikując tym samym prawdopodobieństwo popełnienia błędu.

Najczęściej utożsamianą z kobietami cechą charakterologiczną jest empatia, która nierzadko znajduje swoje odzwierciedlenie w sposobie traktowania swoich podopiecznych. Trudno mówić o skutecznym sposobie prowadzenia zespołu, kiedy pracownicy są sparaliżowani surową atmosferą i nie mają przestrzeni do rozwinięcia kreatywności. Natomiast zespoły, w których atmosfera jest przyjazna, a sposób kierowania zespołem bardziej łagodny niż surowy (bardziej miękki niż

twardy), pozwalają na większą swobodę pracowników, co w rezultacie przekłada się na nowsze i niekonwencjonalne rozwiązania.

Wśród spółek giełdowych prowadzonych przez kobiety można dostrzec nie tylko dobrą kondycję podmiotu wspartą wskaźnikami makroekonomicznymi, ale przede wszystkim przyjazną atmosferę, stabilność i szansę na rozwój. Przykładem takiego przedsiębiorstwa jest chociażby PZU, którego pracami zarządu od marca 2020 roku kieruje Beata Kozłowska-Chyła. W ciągu dwóch kolejnych okresów obrotowych zwiększyła zysk netto grupy z poziomu 1,912 mld do 3,336 mld, stosując jednocześnie politykę efektywnego dialogu z pracownikami (zamiast systemu kar i nagród), który ma doprowadzić do wspólnego budowania angażującego środowiska pracy. Powyższy przykład podkreśla zatem, że spółka stawiająca na dialog, otaczająca troską swojego pracownika i prowadząca z nim aktywny dialog osiąga lepsze wyniki finansowe, aniżeli inne przedsiębiorstwa wchodzące w skład WIG20, w których to zarządzający stosują inne metody zarządzania organizacją. Niestety, w indeksie mniejszych spółek (sWIG80) próżno szukać kobiet na stanowiskach kierowniczych, a zatem nie ma możliwości sprawdzenia, czy ich cechy charakterologiczne przekładają się na ocenę jakości zarządzania przedsiębiorstwem. Na koniec 2022 roku wszystkie spółki wchodzące w skład indeksu sWIG80 były reprezentowane wyłącznie przez mężczyzn.

6. Wnioski

Bazując na rozważaniach przedstawionych w tym artykule i analizie dostępnych danych statystycznych, można wysunąć następujące wnioski:

Kobiety w spółkach giełdowych pełnią najczęściej funkcję doradczą, a kierowanie pracami zarządu w większości podmiotów jest im powierzane incydentalnie.

Pomimo powszechnie stosowanych sloganów równouprawnienia w strategiach spółek notowanych na warszawskim parkiecie zdecydowana większość z nich nie ma w swoich strukturach zarządczych ani jednej kobiety, co potwierdza aktualność dyskryminacji płci na polskiej giełdzie.

Dynamika zmian w zakresie zrównoważonego rozwoju wskazuje, że wzrost udziału kobiet we władzach spółek giełdowych wynika głównie ze wzrostu ich partycypacji w radach nadzorczych.

Osobowość kobiet i ich cechy charakterologiczne sprzyjają zwiększeniu kreatywności podległego im zespołu.

Stosowany przez kobiety *soft* oraz *mixed management style* pozwala rozstrzygnąć problemy organizacyjne, szczególnie w okresie zagrożenia dla funkcjonowania organizacji.

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Podziękowania

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Successes of Polish Listed Companies Led by Women

Summary. Currently, only a small number of entities on the Polish stock exchange are managed by women. The above-average financial results achieved by enterprises represented by the female sex, confirm their potential and the vastness of competence. Despite everything, employers continue to display gender discrimination in filling the most important positions in companies listed on the Warsaw Stock Exchange. The aim of the article is to present the methods of managing listed companies by women and to determine how the

team management methods used by women affect the success of the organization. A review of the latest literature and statistical data confirms the lack of advancement of sustainable development among most listed entities, although the share of women in the authorities of statutory bodies is systematically increasing. One hundred and forty largest Polish listed companies were analysed, and all conclusions from the conducted critical analysis should be used to determine the potential of women in the field of management.

Keywords: stock exchange, women, management, references, gender diversity, statutory bodies

ZESZYTY NAUKOWE
WYŻSZEJ SZKOŁY BANKOWEJ W POZNANIU
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Strategia polityki pieniężnej NBP od 1998 roku do wybuchu pandemii COVID-19

Streszczenie. W okresie pandemii COVID-19 oraz po inwazji Rosji na Ukrainę w światowej literaturze ekonomicznej rozpoczęła się burzliwa dyskusja o strategii polityki pieniężnej, jaką powinny prowadzić banki centralne na świecie. Kanony polityki pieniężnej banku centralnego kształtowane są od powstania w XVII wieku pierwszych banków centralnych w Szwecji i Anglii. Zdaniem autora artykułu polityka pieniężna nie bierze się znikąd, ale ma swoje historyczne korzenie, dlatego analizie poddana została strategia polityki pieniężnej NBP przed wybuchem pandemii COVID-19, stanowiąca fundament obecnych działań NBP i Rady Polityki Pieniężnej w zakresie stabilizacji cen i walki z inflacją.

Słowa kluczowe: polityka pieniężna, agregat pieniężny M3, stopa inflacji, strategia polityki pieniężnej

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1. Wprowadzenie

W okresie 1990–1992 Narodowy Bank Polski zajmował się tłumieniem hiperinflacji, która w styczniu 1990 roku przekroczyła 1000%. Począwszy od 1992 roku, NBP rozpoczął okres stopniowej dezinflacji i do 2004 roku przeprowadzono następujące działania:

1. W 1997 roku uchwalono nową konstytucję, w której zapewniono niezależność NBP jako banku centralnego, wprowadzono zakaz finansowania deficytu budżetowego bezpośrednio w banku centralnym oraz przede wszystkim powołano konstytucyjny organ władzy monetarnej, tj. Radę Polityki Pieniężnej. W 1997 roku uchwalono również Ustawę o NBP, która precyzuje działalność NBP jako niezależnego banku centralnego Polski i działalność Rady Polityki Pieniężnej.

2. W czerwcu 1998 roku Rada Polityki Pieniężnej I kadencji ogłosiła decyzję o porzuceniu — w polityce pieniężnej NBP — **strategii monetarno-kursowej** na rzecz **strategii bezpośredniego celu inflacyjnego**.
3. Zgodnie z artykułem 24 Ustawy o NBP z 29 sierpnia 1997 roku Rada Ministrów w porozumieniu z Radą Polityki Pieniężnej 11 kwietnia 2000 roku podjęły decyzję o upłynnieniu kursu złotego wobec walut obcych z dniem 12 kwietnia 2000 roku.
4. W 2002 roku inflacja CPI spadła poniżej 2%, co uważa się za koniec okresu dezinflacji w Polsce.
5. W lutym 2003 roku Rada Polityki Pieniężnej I kadencji przyjęła Strategię polityki pieniężnej po 2003 roku, w której zapowiedziała wprowadzenie od 1 stycznia 2004 roku ciągłego celu inflacyjnego na poziomie 2,5%. Rada Polityki Pieniężnej II kadencji, która rozpoczęła działalność na przełomie stycznia i lutego 2004 roku (nie wszyscy z dziewięciorga członków objęli członkostwo w RPP w styczniu 2004 roku) w pełni zaakceptowała rozwiązania zawarte w tej Strategii.
6. Od 2004 roku rozpoczął się w Polsce okres stabilizacji inflacji wokół celu inflacyjnego NBP na poziomie 2,5% (Noga, 2017, s. 118–119).

W roku 2007 doszło do upadku Lehman Brothers. Wówczas banki centralne na świecie zaczęły odchodzić od strategii bezpośredniego celu inflacyjnego (BCI) i rozpoczęło się stosowanie niekonwencjonalnej polityki pieniężnej z różnym zakresem instrumentarium tej polityki, gdzie właśnie narzędzia polityki pieniężnej stały się wyróżnikiem, czy dany bank centralny stosuje jeszcze strategię BCI, czy już całkowicie od tej polityki pieniężnej się oddalił.

W niniejszym artykule postawiono hipotezę badawczą, że przejście przez banki centralne do niekonwencjonalnej polityki pieniężnej musi uwzględniać dotychczasowe doświadczenia w stosowaniu narzędzi i standardów polityki pieniężnej banków centralnych na świecie.

2. Decyzje Rady Polityki Pieniężnej w okresie 1998–2020

Analizując decyzje podejmowane przez Radę Polityki Pieniężnej w okresie od 1998 do 2020 (NBP, 2023), można wyraźnie wyróżnić 15 etapów realizowanej w praktyce polityki pieniężnej:

Etap 1. Od 26.02.1998 do 21.01.1999 — **etap luzowania** polityki pieniężnej, gdy stopa referencyjna obniżała się gradualnie od 24% do 13%.

Etap 2. Od 21.01.1999 do 23.09.1999 — **etap neutralnej** polityki pieniężnej na poziomie 13% stopy referencyjnej.

Etap 3. Od 23.09.1999 do 1.03.2001 — **etap zacieśniania** polityki pieniężnej, podczas którego stopa referencyjna była podwyższana gradualnie od 13% do 18%.

Etap 4. Od 1.03.2001 do 26.06.2003 — **etap luzowania** polityki pieniężnej; stopa referencyjna była obniżana z poziomu 18% do poziomu 5,25%.

Etap 5. Od 26.06.2003 do 1.07.2004 — **etap neutralnej** polityki pieniężnej; stopa referencyjna przez 13 miesięcy była na poziomie 5,25%.

Etap 6. Od 01.07.2004 do 26.08.2004 — **krótki etap zacieśniania** polityki pieniężnej; stopa referencyjna wzrosła z poziomu 5,25% do 6,50%, czyli o 125 punktów bazowych.

Etap 7. Od 26.08.2004 do 31.03.2005 — **etap neutralnej** polityki pieniężnej; stopa referencyjna NBP utrzymywała się na poziomie 6,50%.

Etap 8. Od 31.03.2005 do 01.03.2006 — **etap luzowania** polityki pieniężnej; spadek stopy referencyjny NBP z poziomu 6,50% do 4,00%.

Etap 9. Od 1.03.2006 do 26.04.2007 — **etap neutralnej** polityki pieniężnej; stopa referencyjna NBP na poziomie 4,00%.

Etap 10. 26.04.2007 do 26.06.2008 — **etap zacieśniania** polityki pieniężnej; stopa referencyjna NBP wzrosła gradualnie z poziomu 4,00% do 6,00%.

Etap 11. 26.06.2008 do 25.06.2009 — **etap luzowania** polityki pieniężnej; stopa referencyjna NBP gradualnie spadała z poziomu 6% do poziomu 3,50%.

Etap 12. 25.06.2009 do 9.06.2011 — **etap zacieśniania** polityki pieniężnej; stopa referencyjna NBP rosła z poziomu 3,50% do poziomu 4,50%.

Etap 13. 9.06.2011 do 10.05.2012 — **etap neutralnej** polityki pieniężnej; stopa referencyjna na poziomie 4,50%.

Etap 14. 10.05.2012 do 8.11.2012 — **etap zacieśniania** polityki pieniężnej, opartej na jednej podwyżce stopy referencyjnej z poziomu 4,50% do 4,75%.

Etap 15. 8.11.2012 do 29.05.2020 — gradualnie 13 razy obniżono stopę referencyjną NBP z poziomu 4,75% do poziomu 0,1%, co było historycznie **najdłuższym etapem luzowania** polityki pieniężnej NBP. Nie było to najgłębsze luzowanie! Na pierwszym etapie luzowania doszło do obniżenia stopy referencyjnej o 1275 punktów bazowych, a na etapie piętnastym „tylko" o 474 punkty bazowe.

W tabeli 1 pokazano, jak wyglądała inflacja w Polsce w okresie 1950–2021. Analizowany tutaj okres od 1998 do 2020 roku pokazuje, że inflacja mieściła się w przedziale +11,8% w roku 1998 do −0,9% w roku 2015.

Tabela 1. Wskaźniki inflacji konsumenckiej CPI w Polsce w ujęciu rocznym dla okresu 1950–2021

Rok	Wskaźnik cen przy podstawie rok poprzedni = 100	Rok	Wskaźnik cen przy podstawie rok poprzedni = 100	Rok	Wskaźnik cen przy podstawie rok poprzedni = 100	Rok	Wskaźnik cen przy podstawie rok poprzedni = 100	Rok	Wskaźnik cen przy podstawie rok poprzedni = 100
1950	107,5	**1965**	100,9	**1980**	109,4	**1995**	127,8	**2010**	102,6
1951	109,6	**1966**	101,2	**1981**	121,2	**1996**	119,9	**2011**	104,3
1952	114,4	**1967**	101,5	**1982**	200,8	**1997**	114,9	**2012**	103,7
1953	141,9	**1968**	101,6	**1983**	122,1	**1998**	111,8	**2013**	100,9
1954	93,7	**1969**	101,4	**1984**	115,0	**1999**	107,3	**2014**	100,0
1955	97,6	**1970**	101,1	**1985**	115,1	**2000**	110,1	**2015**	99,1
1956	99,0	**1971**	99,9	**1986**	117,7	**2001**	105,5	**2016**	99,4
1957	105,4	**1972**	100,0	**1987**	125,2	**2002**	101,9	**2017**	102,0
1958	102,7	**1973**	102,8	**1988**	160,2	**2003**	100,8	**2018**	101,6
1959	101,1	**1974**	107,1	**1989**	351,1	**2004**	103,5	**2019**	102,3
1960	101,8	**1975**	103,0	**1990**	685,8	**2005**	102,1	**2020**	103,4
1961	100,7	**1976**	104,4	**1991**	170,3	**2006**	101,0	**2021**	105,1
1962	102,5	**1977**	104,9	**1992**	143,0	**2007**	102,5	**2022**	114,5
1963	100,8	**1978**	108,1	**1993**	135,3	**2008**	104,2	**2023**	
1964	101,2	**1979**	107,0	**1994**	132,2	**2009**	103,5	**2024**	

Źródło: GUS (2022)

Rada Polityki Pieniężnej od 1 stycznia 2004 roku przyjęła do realizacji Strategię bezpośredniego celu inflacyjnego z punktowym celem inflacyjnym na poziomie 2,5%. Przyjęto również dopuszczalne pasmo odchyleń ±1%, aby inflację rzeczywistą w średnim okresie sprowadzać do celu 2,5% w sposób gradualny, a nie za pomocą jednego kroku.

Tabela 1 pokazuje, że w okresie od 2004 roku, gdy przyjęto cel inflacyjny 2,5%, do 2020 roku, CPI tylko w 2008 roku i w 2011 roku była poza pasmem 1,5–3,5%. W pozostałych latach analizowanego okresu inflacja była zakotwiczona w pobliżu celu 2,5%. Przedstawiona powyżej analiza etapów prowadzenia polityki pieniężnej przez NBP i jego organy ukazuje, że polityka ta była skuteczna w tym znaczeniu, iż inflacja w Polsce znajdowała się pod kontrolą Rady Polityki Pieniężnej i w średnim okresie nie wymknęła się spod kontroli władzy monetarnej. W literaturze przedmiotu twierdzi się, że polityka pieniężna będzie skuteczna wtedy, gdy agregat szerokiego pasma pieniądza M3 nie będzie rósł szybciej niż tempo rocznego wzrostu PKB (Jacyszyn, 2005). Tę zależność literatura przedmiotu nazywa prawem Benetta Mc Calluma (Mc Callum, 2004, s. 365–372).

3. Relacje pomiędzy dynamiką PKB a dynamiką agregatu M3

Do upadku Lehman Brothers w 2007 roku banki centralne prowadziły konwencjonalną politykę pieniężną. Po 2007 roku zaczęto stosować strategię niekonwencjonalną w polityce pieniężnej, inaczej określanej jako polityka monetarna. Niekonwencjonalna polityka monetarna jako relacja banków centralnych na globalny kryzys gospodarczy, polegająca na długofalowym utrzymywaniu niskich stóp procentowych bliskich zeru, miała cały szereg negatywnych następstw. Literatura przedmiotu wymienia tutaj następujące negatywne skutki:

1. Niska stopa zwrotu z inwestycji, np. takich jak rządowe papiery wartościowe, zachęca zarządzających bankami, towarzystwami ubezpieczeniowymi i funduszami emerytalnymi do podejmowania większego ryzyka, które często staje się ryzykiem nadmiernym.
2. Często instytucje finansowe podejmują zobowiązania długookresowe obligujące je do osiągania stosunkowo wysokiej stopy zwrotu, którą nie zawsze da się osiągnąć.
3. Niskie koszty kapitału mogą sprawić, że firmy zaczną preferować inwestycje pracooszczędne, co doprowadzi do wzrostu bezrobocia. W konsekwencji może jeszcze pojawić się tutaj taki skutek, że nadmiernie wzrosną nakłady na budownictwo w stosunku do wydatków na maszyny i urządzenia.
4. Luźna polityka pieniężna może opóźnić akomodację wolno reagujących aktywów, szczególnie takich jak nieruchomości, co utrudni wyjście z recesji.
5. Długo utrzymujące się w polityce banków centralnych niskie stopy procentowe prowadzą do aprecjacji waluty, wzrostu kursów akcji, niestabilnych boomów kredytowych i deficytów na rachunku obrotów bieżących (Mackenzie, Stella, 1996; Park, 2012; Caruana, 2013).

W tabeli 2 przedstawiono zależności pomiędzy tempem wzrostu M3 i tempem wzrostu PKB w latach 1994–2020. Analiza danych zawartych w tej tabeli pokazuje, że w ciągu 22 analizowanych lat prawo Mc Calluma spełnione było tylko w roku 2003 i 2018.

Jeżeli przyjąć przedział odchylenia od 0% do 5%, to w tym przedziale mieści się dziesięć, czyli prawie połowa wszystkich analizowanych lat.

Tabela 2. Porównanie tempa wzrostu agregatu pieniężnego M3 (r/r) z tempem wzrostu PKB (r/r) dla Polski

Lp.	Rok	TEMPO WZROSTU M3 w % r/r	TEMPO WZROSTU PKB w % r/r	RÓŻNICA (M3 – PKB)
1	1999	27,0	4,1	22,9
2	2000	15,4	4,0	11,4
3	2001	14,6	1,2	13,4
4	2002	8,0	1,4	6,6
5	2003	−0,6	3,9	−4,5
6	2004	5,6	5,3	0,3
7	2005	10,9	3,6	7,3
8	2006	11,9	6,2	5,7
9	2007	19,2	6,7	12,5
10	2008	12,9	3,9	9,0
11	2009	17,6	2,6	15,0
12	2010	6,4	3,7	2,7
13	2011	8,2	5,0	3,2
14	2012	13,7	1,6	12,1
15	2013	4,5	1,3	3,2
16	2014	5,4	3,3	2,1
17	2015	8,5	4,2	4,3
18	2016	10,2	3,1	7,1
19	2017	8,5	4,8	3,7
20	2018	4,8	5,4	−0,6
21	2019	8,9	4,7	4,2
22	2020	9,3	−2,2	11,5

Źródło: Obliczenia własne na podstawie NBP (2023) i Roczników Statystycznych GUS (2008, 2015, 2022)

4. Wnioski

Od 1998 roku NBP realizuje swój mandat za pośrednictwem strategii celu inflacyjnego. Początkowo Rada Polityki Pieniężnej wyznaczyła średniookresowy cel polityki pieniężnej, zakładający obniżenie inflacji poniżej 4% na koniec 2003 roku. W realizacji tego zadania pomagały cele inflacyjne ustalane na koniec każdego kolejnego roku. Wyznaczały one ścieżkę dezinflacji, a jednocześnie były podporządkowane średniookresowemu celowi (poniżej 4% na koniec 2003 r.). Od 2004 roku cel inflacyjny NBP jest określony na poziomie 2,5% ±1 pkt proc. Strategia celu inflacyjnego realizowana przez Radę Polityki Pieniężnej w kolejnych kadencjach

była nieznacznie modyfikowana, choć od 2004 roku jej fundamenty (a więc poziom celu oraz reżim płynnego kursu walutowego) nie uległy większym zmianom. Modyfikacje strategii dotyczyły natomiast większego uwzględniania w polityce pieniężnej ryzyka dla stabilności finansowej, co pozwalało RPP prowadzić politykę pieniężną bardziej elastycznie. Dowodem tej elastyczności jest częstsze niż przed kryzysem globalnym 2007–2009 stosowanie interwencji walutowej (Grostal et al., 2016, s. 19).

Z przeprowadzonej w niniejszym artykule analizy wynika, że obecnie prowadzona polityka pieniężna Narodowego Banku Polskiego odbiega od tej , którą NBP stosował od 1998 roku do wybuchu pandemii COVID-19. W badanym okresie inflacja w Polsce była pod kontrolą NBP. Dzisiaj trudno stwierdzić, że inflacja jest pod kontrolą NBP, gdy Raport o inflacji z marca 2023 roku, sporządzony przez analityków NBP pokazuje, że cel inflacyjny 2,5% osiągnięty zostanie dopiero po 36 miesiącach, a najpóźniej powinno to się stać po 24 miesiącach. To po pierwsze. A po drugie, w tym Raporcie stwierdza się, że inflacja w Polsce ulega persystencji, co oznacza jej długotrwałe występowanie. NBP, zgodnie z Konstytucją i Ustawą o NBP, powinien rzeczywistą inflację sprowadzić do celu 2,5% w średnim okresie, który jest określany na maksimum 24 miesiące.

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NBP Monetary Policy Strategy from 1998 to the Outbreak of the COVID-19 Pandemic

Summary. During the COVID-19 pandemic and after Russia's invasion of Ukraine, a heated discussion began in the global economic literature about the monetary policy strategy that should be pursued by central banks around the world. The canons of central bank monetary policy have been shaped since the creation of the first central banks in Sweden and England in the seventeenth century. According to the author of the article, monetary policy does not come "out of nowhere" but has its historical roots. Therefore, in this article, I analyse the NBP monetary policy strategy before the outbreak of the COVID-19 pandemic, which is the foundation for the current activities of the NBP and the Monetary Policy Council in the field of price stabilization and the fight against inflation at the current stage of development of the Polish economy.

Keywords: monetary policy, monetary aggregate M3, inflation rate, monetary policy strategy

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