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IMPACT OF DIGITAL TRANSFORMATION ON BUSINESS STRUCTURES

Purpose. To study the impact of digital transformation on business structures and to substantiate prospective directions of development.

Methodology. During the research, the authors used a systematic and comparative analysis to ensure a comprehensive understanding of the current state of digital transformation of Ukrainian business structures. Besides, such scientific methods as the method of deduction, logical research and the graphical way of presenting information were used to demonstrate the significant results of the research topic.

Findings. In the process of the research, the digital transformation of manufacturing enterprises was considered. It has been proven that the digital transformation of Ukrainian enterprises must be carried out in various sectors of the economy. Leaders of the mining, processing and transport industries are recommended to determine the most promising areas of using "Industry 4.0" technologies from the point of view of increasing the efficiency of their business. On the basis of this they should develop long-term strategies for the digitalization of their enterprises, taking into account the specifics of their industries. In addition, enterprises can contribute to the development of corporate venture funds, business incubators and digital factories, which will help support innovative startups and accelerate their development. It is also possible to organize technological competitions at the national and international levels to draw attention to domestic technological developments and promote them to the world market.

Originality. The impact of digital transformation of business structures in Ukraine is substantiated. A study on the vision of the concept of digital transformation, effective ways of involving innovation in development and transformation in Ukraine and in the countries of the European Union was conducted, and conclusions were drawn that the concentration of resources and the development of common standards will help to overcome the lag. Business structures are invited to enter into strategic partnerships or to create consortia in order to jointly develop innovations in terms of standards and solutions. In addition, it is recommended to establish infrastructure sharing and implement training programs. It is also important that market participants interact with government agencies, educational and research institutions in the field of development and implementation of new digital technologies.

Practical value. The results of the conducted research have the potential to be used by economists, scientists and practitioners in order to develop further perspectives. This data can be used to analyze and understand current trends in the field of digital technologies, which will create a knowledge base for the development of new strategies and solutions. In general, the interaction between enterprises, educational and research organizations and government authorities in the field of digital technologies has great potential to promote the development of innovation, increase the efficiency and competitiveness of enterprises.

Keywords: *digital transformation, economic development, business structures, data processing*

Introduction. Every day, the digital transformation of business structures is gaining new momentum, both in Ukraine and in other countries of the world. In the near future, the competitiveness of companies will be determined by the level of their digitalization.

Understanding this trend, leading participants in market relations are actively implementing digital tools in various sectors of the economy, including in the mining industry.

In the oil and gas and mining industry, the use of digital technologies opens wide opportunities for increasing work efficiency and cost optimization. For example, with the help of modeling deposits, it is possible to get more accurate information about their structure and properties, which allows reducing risks and increasing the productivity of mining.

Also, digital technologies make it possible to increase the efficiency of repair work and drilling processes through the use of sensors and real-time monitoring. This allows one to quickly identify problems and take the necessary measures to solve them, which reduces downtime and improves work productivity.

The use of digital technologies also helps to reduce energy consumption and optimize the use of resources. By taking sensor data into account and analyzing it, businesses can more effectively manage energy consumption and reduce their negative impact on the environment.

The possibility of using drones to monitor remote deposits is another advantage of digital technologies. This allows receiving up-to-date information about the state and development of deposits, which helps to make informed decisions and ensures greater efficiency of project management.

In addition, digital technologies allow the analysis of raw products, which allows identifying potential issues regarding quality and optimization of production processes. Such analysis helps to improve technological processes and ensure high quality of products.

As a result of the use of digital technologies in the oil and gas and mining industries, business owners are opening new opportunities to optimize costs and increase profitability. Reducing energy consumption, increasing productivity and efficiency of work, as well as establishing dynamic and local pricing make it possible to achieve better results and ensure the successful development of enterprises in these industries.

In other industries, business structures actively invest in the creation of data processing centers and the implementation of specialized systems for collecting, storing, and processing information about business operations and customers,

which increases the efficiency of business processes and helps to better understand the needs of customers.

Literature review. The digital transformation of all branches of business and economy provides new opportunities for business structures in terms of participation in innovative research activities. According to Valenduc G., Vendramin P., digitally modified information can become a strategic resource in the future, while the network becomes an all-encompassing principle of organizing the economy and business structures or the network society [1].

Scientists Legner C., Eymann T., Hess T., Matt C. were engaged in the study on digitalization of enterprises, who described "digitalization" as a process that reflects the pace of changes in business structures and society, which are caused by digital technological development [2].

As it is noted in the works by Legner S., Eymann T., Hess T., Matt C., there were several stages of digitalization that irreversibly changed both business structures and society [2].

Brodny J., Tutak M. describe the process of digital transformation of the global economy and business structures, which is a natural stage of evolutionary changes, and which is the result of the dynamic development of information and communication technologies [3].

Trushkina N., Rynkevich N. in their works describe the theoretical and practical aspects of digitalization of business processes of entrepreneurial structures [4].

The authors revealed the consequences of digitalization, which consist in radical changes in the complex of business processes of entrepreneurial structures, starting from product development and ending with customer service [4].

Shkodina I., Serdyuk T. in their works analyzed the peculiarities of the implementation of digitalization and digital transformation by international business in business structures under the conditions of COVID-19 [5].

According to scientists Rajnai Z, Kocsis I. digital transformation of the global economy and business structures as a whole is a process closely related to the idea of Industry 4.0 [6]. Industry 4.0. is associated with the digital transformation of the economy, which has a significant impact on the activities of certain industries [6].

Bagatska K., Heydor A. in their works considered the problems of digital transformation of business structures, the possibilities of building models of digital transformation and the impact of digital technologies on business development and the organization of business processes of enterprises [7].

Digital transformation should be considered as a complex systemic phenomenon in the development of business structures.

We agree with the views of scientists that digital transformation consists not only in the full implementation of technologies, but also in a thorough transformation of the business strategy, building a model, and in a radical update of the current business model of the enterprise [8].

All these factors lead to a growing transformation in the digitalization of manufacturing, service and commercial enterprises, which has been observed for several years all over the world.

These changes are a consequence of technological progress, which forces a new approach to production itself and the organization and management of enterprises (new business models), as well as to social and environmental problems [9].

It is difficult for business structures to keep up with the changes taking place due to digital transformation.

Siedler C., Dupont S., Zavareh M.T., Zeihsel F., Ehemann T., Sinnwell C., Aurich J.C. note in their work that for the successful implementation of digital transformation, business structures must take into account their existing technical systems, organizational structures and processes, as well as social aspects [10].

By supporting the maturity model, it is possible to assess the enterprise-specific level of digital transformation and the possibility of building a digitalization model to give manufacturing enterprises an initial idea of their specific status quo; it can become a starting point for future optimization and digital transformation projects [10].

Nadkarni S., Prügl R., working on the subject of digital transformation, describe additional units of analysis that help disentangle the peculiarities of digital transformation processes and thus highlight the most influential and unique prerequisites and consequences [11].

According to M. Shmelyov, the success of the digital transformation of business structures rests on:

- readiness of the enterprise to change in terms of the technological component;
- business strategies of the enterprise, focused on ensuring its competitiveness at the market [12].

We agree with Lazebnyk L. that when making a decision to introduce digital technologies in order to optimize business processes, it is important for enterprises to adequately assess the specifics of their implementation, as well as the potential and actual level of effectiveness of their use [13].

To help break down disciplinary divides and strengthen a managerial perspective, scholars have added to the resulting state of the art of digital transformation by integrating interdisciplinary contributions from technology disruption and corporate entrepreneurship paper reviews.

Unsolved aspects of the problem. A review of the literary sources of scientists indicates the identified needs in the research on building a model of digital transformation of business structures in Ukraine.

The available scientific publications do not fully reflect the modern views of scientists regarding the peculiarities of digital transformation management in Ukraine.

At the same time, a significant number of problems regarding the vision of the concept of digital transformation, effective ways of involving innovations in development and transformation, remain insufficiently researched and disclosed in scientific sources.

The purpose of the article is to study the impact of digital transformation on business structures and to substantiate prospective directions of development.

Methods. During the research, the authors used a systematic and comparative analysis to ensure a comprehensive understanding of the current state of digital transformation of Ukrainian business structures; the state of digital transformation of business structures in the countries of the European Union was studied.

Also, such scientific methods as the method of deduction, logical research and the graphical way of presenting information were used to demonstrate the significant results of the research topic.

Results. One of the most valuable assets in today's economy is digital platforms. Digital platforms are beginning to be used as primary channels for customer interaction and transactions, as well as a means of creating innovative business models, including traditional industries.

For example, buyers of appliances use digital platforms to compare appliances online before making a purchase, leaving online information about benefits that dealers and manufacturers can later take into account to increase sales [14].

More and more traditional forms are getting digital components. It has become the norm to equip cars and machinery with satellite navigation, security and warning systems, means for connecting to mobile devices via Bluetooth, as well as multimedia complexes.

The use of tracking devices in containers, which are installed at production enterprises, allows one to significantly increase the ratio of their utilization and reduce the current costs of container transportation, loading and shipment.

Installation of monitoring devices in industrial equipment together with advanced analytics methods ensures its more efficient operation and maintenance [15].

Business structures are at the forefront of the digital revolution, as they receive significant benefits, but at the same time bear increased risks. In the USA during 1993–2018, the sectors of the economy where the most noticeable positive dynamics of profitability were observed were also characterized by the active use of digital technologies.

However, within these industries, the profitability indicators of leaders and outsiders differed by a factor of 2–4. In other words, the most digitally advanced sectors of the economy operate on a winner-takes-all basis.

The introduction of digital transformation and digital technologies is causing increased competition, creating threats to existing market leaders from new waves of innovation.

The reasons are that in the pre-digital era, economies of scale were achieved by building large production complexes, increasing production volumes, and increasing sales volumes.

The deployment of such productions requires considerable expenditure of time and resources and carries significant incremental costs. As for digital companies, the combination of low incremental costs with easy scalability of IT platforms allows the most successful of them to reach previously impossible scales in record time.

The social network Facebook was created in 2004, and within ten years the number of its active users exceeded the population of China. The economic advantage of digital platforms has a positive effect on the profitability of software developers, which reaches more than 70 % – one of the highest profitability indicators among all industries.

Platforms that have gained a dominant position in the market are a window to the Internet for millions of people, allowing the collection, aggregation, analysis and monetization of data about users, their behavioral characteristics and consumer preferences.

According to the measurements of the company SimilarWeb, for the top 100 world news and media sites, the share of traffic redirected from social networks is 6.5 %, and for some sites that specifically adapt their content for users of social networks, the share of such traffic can even reach 50 %.

Digital platforms are taking the place of traditional intermediaries in business structures. In consumer markets, the introduction of digital technologies allows reducing the costs of searching and processing orders, contributes to the optimal selection of products that meet the requirements of the consumer, and ensures increased transparency [16].

Users can compare prices, features, services, and product reviews with a few clicks of the mouse.

In addition, digitalization causes digital platform owners to displace traditional intermediary companies from the market.

Thanks to digital technologies, business structures can increase efficiency by dividing functions into smaller, highly specialized tasks. Something similar happens at the industry level, when manufacturers develop individual offers for small markets within the ecosystem [17].

As digital companies take leading positions in one market, they increasingly seek to develop related areas, which then often become core ones.

For example, at one time Amazon.com went beyond the sale of books, starting to offer buyers a wide range of consumer goods, later created its own publishing platform, began to provide cloud and logistics services to other players and produce electronic consumer goods (e-books and products for the "smart home").

Digital companies are not only entering into partnerships with traditional car manufacturers, but are also developing their own self-driving cars (Google, Apple, Uber).

In recent years, Google has created a number of businesses in new industries, including biotechnology, smart home products and high-speed Internet access.

Salesforce.com and Philips are jointly developing a cloud-based platform for remote monitoring of patients with chronic diseases.

In 2016, Uber acquired the company Otto, which is engaged in the development of technologies that allow the transformation of conventional trucks into self-driving cars. Uber's competitors in the struggle for the future trucking market – Tesla, DHL and Amazon.com – are making similar attempts.

In terms of the level of digital transformation of private business structures, Ukraine still lags behind the leading countries. The private sector does not take advantage of the active development of digital technologies by consumers, it invests poorly in the use of technological achievements, in improving productivity and creating new products and services.

The volume of investments of private companies in digitalization is so far only 2.2 % of GDP, while in the USA it reaches 5 %, in the countries of Western Europe – 3.9 %, in Brazil – 3.6 %.

As a result, the ability to support the competitiveness of Ukrainian companies is lower not only on an international scale (insignificant volume of high-tech exports), but also in the country (the displacement of Ukrainian players by foreign companies in the segments of e-commerce, social networks, and search engines).

In addition, the low level of investment from customers of digital solutions limits the development opportunities of Ukrainian companies – providers of digital solutions, since the domestic market is the first step in the growth of future digital leaders.

In terms of the level of digitalization, the most important industries for Ukraine – mining, processing industry and transport (Fig. 1) – lag behind the EU countries the most.

Indeed, the lack of investment in the development of digital technologies by Ukrainian companies and the government may have negative consequences for the level of digitization of various sectors of the economy. This can be shown by comparing the level of digitization of individual industries, which is shown in Fig. 1.

But it is worth noting that to ensure the accuracy and relevance of the comparison of the levels of digitization of industries, specific data and research are needed. Therefore, providing Fig. 1 without relevant data may be an assumption and may not take into account the latest trends and realities of the Ukrainian market.

However, in general, it can be argued that investment in digital technologies is an important factor for achieving a high level of digital transformation of economic sectors. Invest-

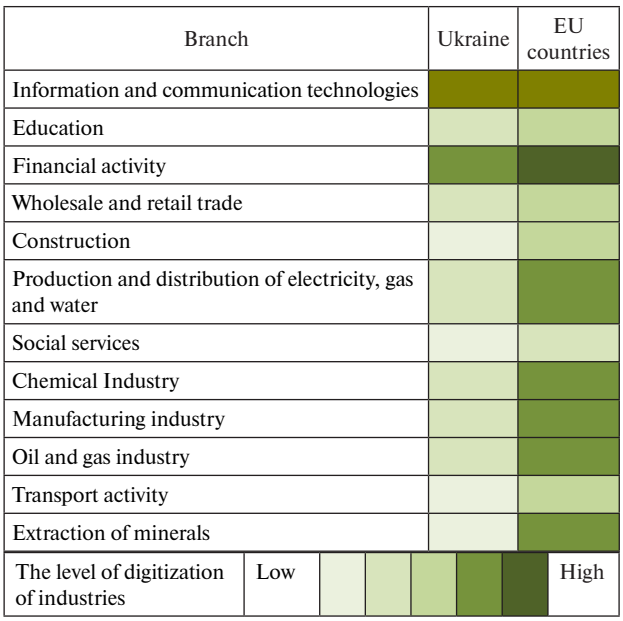

Fig. 1. The difference in the level of digitalization between EU countries and Ukraine

ments in research and development of new technologies, implementation of innovative solutions, training of specialists and creation of a favorable environment for the development of digital startups have great potential for strengthening Ukraine's position in the global digital market.

Therefore, to improve the level of digitalization of the Ukrainian economy, including certain industries, it is necessary to attract more investments, both from the private sector and from the government. This will help create the necessary infrastructure, support research and innovation, develop the digital competencies of specialists, and ensure the rapid implementation of digital technologies in all spheres of the economy.

Despite the fact that in terms of the level of digitalization, some industries are approaching the world level (for example, information and communication technologies, education, finance), in many key industries, Ukraine still lags behind the leading European countries.

Currently, the level of digitization of mining and processing industries around the world is relatively low.

Industry 4.0 technologies should change this situation. For our key industries, "Industry 4.0" is an opportunity to make a qualitative leap and quickly catch up with the leaders. In order to fully realize this potential, it is necessary to act quickly.

However, since the beginning of the 2000s, Ukrainian business structures in a number of sectors of the economy, including financial and telecommunications, have achieved a lot in the field of automation of activities and the introduction of industrial-scale information systems.

According to state statistics:

1. The share of organizations that implemented ERP (Enterprise Resource Planning) class systems increased by 1.8 times from 2010 to 2020.

2. The share of organizations that implemented CRM (Customer Relationship Management) class systems increased by 2.4 times over the same period.

3. The share of organizations that use electronic data exchange between their own and external IT systems has increased by 1.9 times since 2018.

The largest Ukrainian business structures have successfully mastered systems of interaction with customers, management of finances and purchases, management of operations and production, which contributed to the large-scale growth of the domestic market of system integrators and service companies [18].

Every year in Ukraine, more than a thousand projects are realized for the implementation of electronic systems of various levels of complexity.

Despite the high rates of growth, according to official statistics, the share of organizations using ERP and CRM systems remains extremely small and is about 10 % of the total number.

This may indicate that medium-sized and small enterprises are slow to master new technologies, or that a part of information systems is not taken into account in official statistics.

Practice shows that it is difficult for industries lagging behind in the level of digitalization to overcome the gap with leading industries [19].

This is due to the fact that companies with a low digital culture are unattractive to the relevant specialists.

Additionally, laggards lack the skills and resources to develop, implement, and scale new digital tools, products, and services.

To eliminate this lag, enterprises will have to introduce digital technologies into production activities at an anticipatory pace [20].

This especially applies to Industry 4.0 technologies. This is especially important for industries such as mining and manufacturing, transport and logistics.

These sectors are at the initial stage of digital transformation, which opens wide opportunities for changing the situation in the market. Anticipatory rates of development do not foresee the gradual "catch-up" implementation of technologies of the previous generation, for example, solutions for automating operations, which were actively implemented at the end of the *20th* century [21].

Such a "catch-up" approach will not only leave Ukrainian companies and industries in the position of eternal laggards, but will also lead to significant risks for their business, as players with fundamentally new business models may enter the market.

For anticipatory development, it is important for the management of companies to form an idea of which trends in the field of digital technologies will affect the appearance of the industry as a whole and which of them will allow them to benefit in the next 5–10 years, and already with this understanding will look for new solutions.

Currently, business structures in Ukraine have a chance to reduce the technological lag behind foreign leaders and to step over one technological level, promptly using the most modern digital solutions [22].

The concentration of resources and the development of common standards will help to overcome the backlog.

To this end, Ukrainian enterprises seeking to increase the level of digitalization can enter strategic partnerships or create consortia for joint development of standards and solutions, joint use of infrastructure, and implementation of personnel training programs [23, 24].

In addition, market participants need to constantly interact with government bodies, educational and research organizations in the field of development and implementation of new digital technologies [25].

Business structures leading in the mining, processing and transport industries are recommended to take a number of important steps in order to achieve a successful digital transformation:

1. Determination of the most promising areas of application of "Industry 4.0" technologies: Companies should conduct a detailed market analysis and identify areas where the application of digital technologies can most effectively increase business productivity and competitiveness. These can be areas such as the automation of production processes, the introduction of smart management and monitoring systems, the use of artificial intelligence for data analysis, etc.

2. Development of long-term digitization strategies: Companies should create strategies that take into account the selected areas of application of "Industry 4.0" technologies. This includes defining specific goals and tasks, developing plans for the implementation and expansion of digital solutions, and assessing the risks and resources required to implement the strategies.

3. Ensuring the development of digital culture and the involvement of specialists in digital technologies: Enterprises must create a favorable environment for the development of digital culture among their employees. This may include training in digital competencies, holding seminars and trainings, as well as actively involving digital specialists in project teams.

4. Promoting the development of corporate venture funds, business incubators and digital factories: Companies can create and support such institutions that promote the development of startups and innovations. This will speed up the implementation of new digital solutions and attract talented entrepreneurs and specialists to cooperation.

5. Carrying out necessary transformations in companies: Companies should consider the need to restructure and optimize their organizational structure to increase cross-functional interaction and speed up the decision-making process. This may include reducing levels of management, implementing flexible communication systems and ensuring transparency in decision-making.

In general, successful digital transformation requires companies to take a systemic approach and actively participate in

the development of digital technologies. Implementation of these recommendations will help enterprises to achieve increased business efficiency, expand their capabilities and take leadership positions in the market.

Predicting how technology will evolve is difficult, so companies should experiment with different solutions and discard those that prove ineffective. It is important to review the policy of investing in digital solutions.

Currently, in Ukraine, investments in information technologies make up only 6.5 % of the total volume of private investments, which is approximately half as much as the average for Western European countries, and four times less than in the USA.

At the same time, the share of Ukraine in the global consumption of information and communication technologies in the corporate sector is 1 %, while a similar figure for Great Britain is 7 %, China – 6 %, and Germany – 5 %.

Digital transformation opens interesting perspectives for business structures to increase efficiency in the field of managing warehouse stocks and logistics processes of the enterprise.

The implementation of automated supply chain management systems allows for significant optimization of stocks of finished products, raw materials, and spare parts stored in the company's warehouses.

Digital tools also reduce logistics costs, help plan routes more efficiently, control the loading of vehicles, and more accurately prioritize logistics operations across the entire business structure (Fig. 2).

The process of developing new types of products can also be improved with the help of digital transformation tools and Industry 4.0.

On the basis of the analysis of data on the actual use of products by customers, the development of new types can be carried out, as well as the improvement of the efficiency of the pre-sales analytics process when introducing new products to the market.

The implementation of certain elements of modern IT systems can also allow achieving improvements in the field of personnel productivity.

Modern systems with access to data coming from production lines make it possible to reduce the number of errors made by employees due to the optimal supply of raw materials, ensure more complete loading of production equipment and reduce the amount of waste.

Conclusions. Thus, it can be concluded that the concentration of resources and the development of common standards will help to overcome the backlog.

To this end, Ukrainian enterprises seeking to increase the level of digitalization can enter strategic partnerships or create consortia for joint development of standards and solutions, joint use of infrastructure, and implementation of personnel training programs.

Market participants need to constantly interact with government bodies, educational and research organizations in the field of development and implementation of new digital technologies.

Entrepreneurial structures – leaders of the mining, processing and transport industries need:

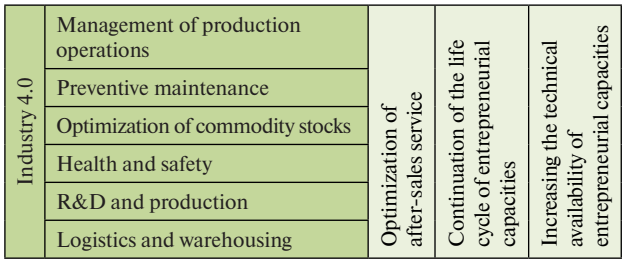

Fig. 2. Annual effect of the implementation of Industry 4.0 elements

- to determine the most promising (from the point of view of improving business efficiency) fields of application of "Industry 4.0" technologies;
- to develop long-term digitization strategies taking this into account;
- to ensure the development of digital culture and actively attract and develop specialists in digital technologies;
- to promote the development of corporate venture funds, business incubators and digital factories, and even conduct technological competitions at the domestic and global level.

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Вплив цифрової трансформації на підприємницькі структури

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Мета. Дослідити вплив цифрової трансформації на підприємницькі структури та обґрунтувати перспективні напрями розвитку.

Методика. Під час проведення дослідження авторами були використані системний і порівняльний аналіз для забезпечення всебічного розуміння існуючого стану цифрової трансформації підприємницьких структур України. Також були використані такі наукові методи як метод дедукції, логічних досліджень і графічний спосіб подачі інформації для демонстрації значущих результатів тематики дослідження.

Результати. У процесі дослідження розглянута цифрова трансформація виробничих підприємств. Доведено, що цифрову трансформацію українських підприємств необхідно проводити в різних галузях економіки. Лідерам гірничодобувної, обробної та транспортної галузей рекомендується визначити найбільш перспективні напрями використання технологій «Індустрії 4.0» із точки зору підвищення ефективності свого бізнесу. На основі цього вони повинні розробити довгострокові стратегії цифровізації своїх підприємств, ураховуючи специфіку своїх галузей. Крім того, підприємства можуть сприяти розвитку корпоративних венчурних фондів, бізнес-інкубаторів і цифрових фабрик, що сприятиме підтримці інноваційних стартапів і прискоренню їхнього розвитку. Також можна організовувати технологічні конкурси на національному й міжнародному рівнях, щоб привернути увагу до вітчизняних технологічних розробок і просунути їх на світовий ринок.

Наукова новизна. Обґрунтовано вплив цифрової трансформації на розвиток підприємницьких структур в Україні. Проведені дослідження бачення концепції цифрової трансформації, ефективних способів залучення інновацій у розвиток і трансформацію в Україні та в країнах Європейського союзу, та зроблені висновки, що подолати відставання допоможуть концентрація ресурсів і вироблення загальних стандартів. Підприємницьким структурам запропоновано вступати у стратегічні партнерства або створювати консорціуми з метою спільної розробки нововведень у частині стандартів у рішень. Крім того, рекомендується встановлювати спільне використання інфраструктури та реалізувати програми підготовки кадрів. Також важливо, щоб учасники ринку взаємодіяли з державними органами, освітніми й дослідницькими установами в галузі розробки та впровадження нових цифрових технологій.

Практична значимість. Результати проведеного дослідження мають потенціал для використання економістами, науковцями та практиками з метою розвитку подальших перспектив. Ці дані можуть бути використані для аналізу й розуміння сучасних тенденцій в галузі цифрових технологій, що дозволить створити базу знань для розробки нових стратегій і рішень. Загалом, взаємодія між підприємствами, освітніми й дослідницькими організаціями та державними органами управління в галузі цифрових технологій має великий потенціал для сприяння розвитку інновацій, підвищення ефективності й конкурентоспроможності підприємств.

Ключові слова: *цифрова трансформація, розвиток економіки, підприємницькі структури, обробка даних*

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