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INVESTMENT SECURITY IN THE DEVELOPMENT OF THE DIGITAL ECONOMY

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Introduction. Investment security in the development of the digital economy forms the basis for enhancing the digital competitiveness of European countries, ensuring the development of a pan-European data space, strengthening cybersecurity, stimulating the activity of underdeveloped economic sectors, and driving the digital transformation of public healthcare services.

Aim and tasks. The study aims to determine the strategic directions and challenges of enhancing investor support to establish favourable circumstances for the growth of the digital economy in European countries.

Results. The advantages of the digital economy as a basis for further human development are identified. According to the analysis of the dynamics of the digital skills indicator, a trend of increasing individual digital skills among people in EU countries with four and five out of five indicator components was observed in 2023 compared to 2021 (an increase ranging from 0.57 to 1.64 percentage points). The leaders in the increase in Internet usage frequency are Romania, Belgium, and Montenegro, with increases of 19.98%, 18.29%, and 17.31%, respectively. The benefits of using digital technologies to enhance business competitiveness and the need to promote digital investment in regions with low levels of digitalisation, which consequently have low investment attractiveness, were identified. This will help counteract the imbalance of digital resources and data exchange, and form the potential for developing competitive digital advantages for European countries' economies.

Conclusions. Obstacles to digitalisation in European countries include an aging population, which contributes to a low level of skilled labour availability and disparities in the adoption of digital technologies. There is a need for continuous monitoring of the implementation of digital transitions in European countries. Digitalisation serves as the main driver of technological innovations and services, productivity growth in economic sectors, and reduced efforts in data analysis and decision-making. Investment security in the digital economy should promote the acceleration of digital transitions in regions with low-capacity levels. The rationality of investment decisions can expedite the development of digital infrastructure as the primary potential for the growth of less-efficient industries on the path to sustainability.

Keywords: business development, innovative technology, investment security, digital economy, strategy, environment.

1. Introduction.

The irrational use of natural resources and excessive environmental pollution has led to changes in economic activity. Opportunities for further positive changes in the development of the national economy lie in the innovations and technologies embodied in the need to develop a digital economy.

Investments in new technologies in the digital economy (such as artificial intelligence and quantum computing) form the basis for sustainable development. This is manifested in the transformation of jobs and an increase in skills and knowledge levels, which contribute to prosperity and strategies to combat poverty.

In recent years, EU countries have increased their investments in the digitalization of their businesses, especially during the 2019 pandemic (Digitalization in Europe, 2023). Digital firms have a higher level of resilience to economic change. Using the potential of digital technologies, business can implement more efficient types of work with a higher level of labour productivity and the ability to adapt to constant social changes (Kalinin et al., 2024).

The aging population and industrial challenges from China and the USA create the need to accelerate efforts in the direction of the growth of the digital economy in European Union countries.

European companies require measures to adopt new technologies. This is one of the main challenges faced by the EU in unlocking its digital potential. A major problem for EU countries is the aging population, which creates a geographic imbalance in the distribution of workers with digital skills.

Modern innovative and technological European companies need to expand their innovative capabilities. Corresponding businesses require long-term and high-level investments to advance innovation. Comprehensive solutions to these problems require long-term reforms.

The EU's digital economy faces several unresolved issues that require comprehensive research and solutions. In particular, the following can be noted (European Commission, 2024):

- Increased international digital competition;
- Lack of a qualified workforce in the digitalisation sector, which hinders investment and innovation processes;
- Insufficient development of cybersecurity, threatening the effective functioning of the digital infrastructure;
-Disparities in the adoption of digital technologies by representatives of EU organisation.

Investment security in the development of the EU's digital economy is based on long-term financing using clearly defined development strategies. Comprehensive research into the main obstacles to digitalisation in the EU will allow for the adjustment of investment flows, identification of necessary boundaries of societal needs in this area, and an increase in the productivity of EU countries' economies. The relevance of the identified problem has led to research on investment security by utilising European countries' research on investment security in the expansion of the digital economy.

2. Literature review.

The digital transition requires changing the existing business structures of various sectors of the economy, which creates a number of costs and obstacles for business. This dynamic, long-term process requires comprehensive research and the identification of clear development directions for rational investment flows (Kwilinski et al., 2020). Researchers addressing the issue of digitalisation in the economy include the following.

Rachinger et al. (2018) focus on defining the concept of digitalization as a comprehensive concept that reflects the latest innovative trends in economic relations.

Brodny and Tutak (2022) explore directions for stimulating the development of the digital economy, which launches transformation processes in various sectors of the economy. Their research revealed a high differentiation in the level of digital development, with the level depending on the size of the enterprises. Larger enterprises had a higher level of business digitalisation. In contrast, medium and small enterprises had lower levels, which is essential in shaping further strategies for transformational changes on the path to digital transition.

Brynjolfsson et al. (2021) investigated the impact of social changes on economic relations, which could be triggered by modifications in technological education.

Gaggl et al. (2023) participated in studies regarding the variety of consequences and potential risks of implementing digitalization for specific units of economic activity. According to their findings, information and communication technologies yield influential outcomes when combined with core work functions. Increased investment in business digitalization may provoke significant changes within it and potential further negative consequences.

Rossato and Castellani (2020) made an analytical review and analyzed the competitive advantages of introducing and using ICT in business. Their research identified the benefits of implementing digitalization in enterprises and forming long-term strategic network relationships.

Lee et al. (2023) conducted research on the level of impact of the digital economy on the food security of countries. They focused on the geographical location and regional development of countries, combining the results of increased investments in digital infrastructure with strategic changes in the development of the digital economy.

All stages of forming and developing the digital economy, as well as research on the implementation of various policy measures, require investment. Comprehensive research into digitalisation enables a more effective and rational direction of digital investments, which calls for further research in this field by scholars.

3. Methodology.

The research was conducted using scientific-theoretical methods, including synthesis, to understand digitalisation and its components as a modern process of economic development; analysis to study the processes of development and investment in the digital economy; and abstraction to identify the main strategies for further development of the digital economy and the main directions of financing for this process.

It is advisable to analyse the innovative activities of business structures regularly and based on the results of the enterprise's activities over several years.

A long-term study identifies the development trend of the process over a certain period by examining the practical effectiveness of innovative implementation and its advantages and disadvantages.

According to the results of the conducted research (EU Funding Portal, 2024; Fedulova, 2013; Ilyash et al., 2020; Zakharchenko et al., 2012), the following recommended indicators for studying the effectiveness of enterprises' innovative activities were identified:

- *The profitability of an innovative project:*

$$PIP = NP / TCIP \quad (1)$$

where PIP – profitability of an innovative project; NP – net profit from the implementation of innovative activities; TCIP – total costs of implementing an innovative project.

- *The economic efficiency of innovations:*

$$EEI = NII / IC \quad (2)$$

where EEI – economic efficiency of innovations; NII – number of implemented innovations; IC – cost of innovation expenditure.

- *The indicator of innovation activity:*

$$IIA = AIAC / GC \quad (3)$$

where IIA – indicator of innovation activity; AIAC –- innovation expenditure; GC – total enterprise costs.

- *The profitability of innovations:*

$$PI = PIP / IA \quad (4)$$

where PI – profitability of innovations; PIP – profitability of innovative projects; IA – indicator of innovation activity.

Research on investment security in the development of the digital economy was conducted using the example of European countries. The analysis was based on static data from the European Commission (2021) and Eurostat (2024).

4. Aim and tasks.

The conducted research aims to determine the direction of investment support for creating favourable conditions for the development of the digital economy.

To achieve the research aim, the following tasks were set: to analyse the availability of ICT using the example of European countries; to identify the trend of individual digital skills of individuals in these countries; to investigate changes in their Internet usage frequency; to schematically depict the directions of digital investment implementation and the process of promoting business development through digital investments; and to outline unresolved tasks and directions of the investment process in the digital economy.

5. Results.

Positive effects of digitalization are observed in virtually all sectors of the economy. It contributes to increased worker productivity, rational use of resources, and reduced production costs, among other benefits. Digitalization enables the business management to shorten decision-making times and ensure transparency in business processes, among other advantages (Du et al., 2023; Broccardo et al., 2024).

The 2019 pandemic accelerated the need for the development of the digital economy in EU countries. These years have seen an increased demand for rapid workforce retraining. It is necessary to promote the accessibility of information and communication technologies. This fosters the development of the digital economy, expanding societal opportunities and enhancing professional digital competence. According to the analysis of essential characteristics when purchasing ICT devices for buyers in EU countries in 2022, a preference for device cost was identified (Fig. 1), narrowing users' options for choosing the necessary equipment. Therefore, it is relevant to develop policies aimed at increasing ICT accessibility for EU citizens.

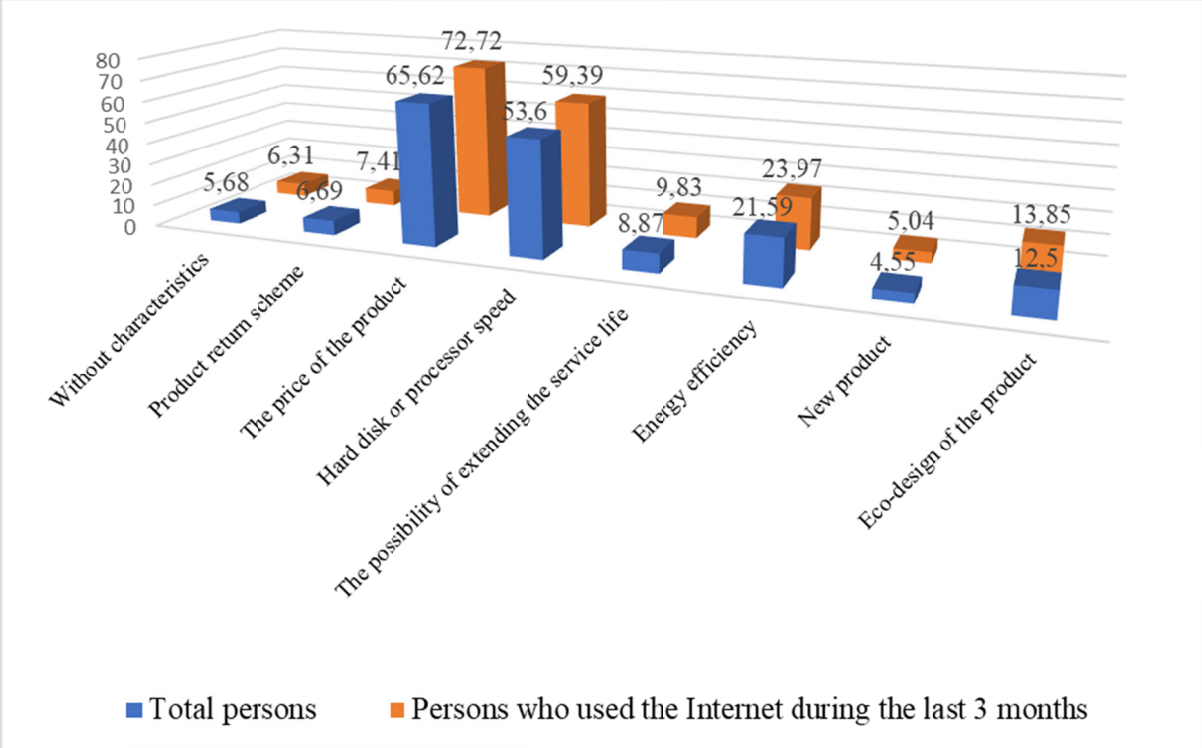

Fig. 1. Important characteristics when purchasing ICT devices for buyers in EU countries in 2022, % of individuals.

Source: constructed based on Eurostat (2024).

Expanding the possibilities of European consumers with regard to digital goods, ensuring the same digital conditions and innovative services for all users, stimulating the development of digital potential is included in the strategy of social and economic development growth of the digital economy of the EU Single Digital Market Strategy. As part of the "Digital Compass to 2030" Program the development of the digital transformation of the economy and society of the European Union is planned (European Commission, 2021). The implementation of the program should be supported by investments in competitive and innovative economies, societies and public institutions, as well as the development of cyber security, digital resilience and transformation.

The development of digital technologies changes the world and penetrates into all spheres of human life, setting requirements for the needs of society in obtaining new digital skills and competencies. The implementation of the Digital Compass by 2030 Program aims to provide at least 80% of adults with basic digital skills.

The Digital Skills Indicator 2.0 (DSI) is a composite indicator based on selected types of activities related to Internet use or software usage performed by individuals aged 16–74 in five specific areas (information literacy and data, communication and collaboration, creating digital content, security and problem-solving). It is assumed that individuals who perform certain activities possess corresponding skills. Therefore, the indicators can be regarded as proxies for people's digital skills (Eurostat, 2024). An analysis of the dynamics of the digital skills indicator reveals a trend of increasing individual digital skills among persons in EU countries who have four or five out of five indicator components by 2023 compared to 2021 (Fig. 2.). The number of individuals with fewer than three indicator components will decrease from 2021 to 2023. Therefore, it can be concluded that society is eager to acquire digital skills, raise their level, and implement them in practice, which constitutes prospects for the development of digital transformation in the economy.

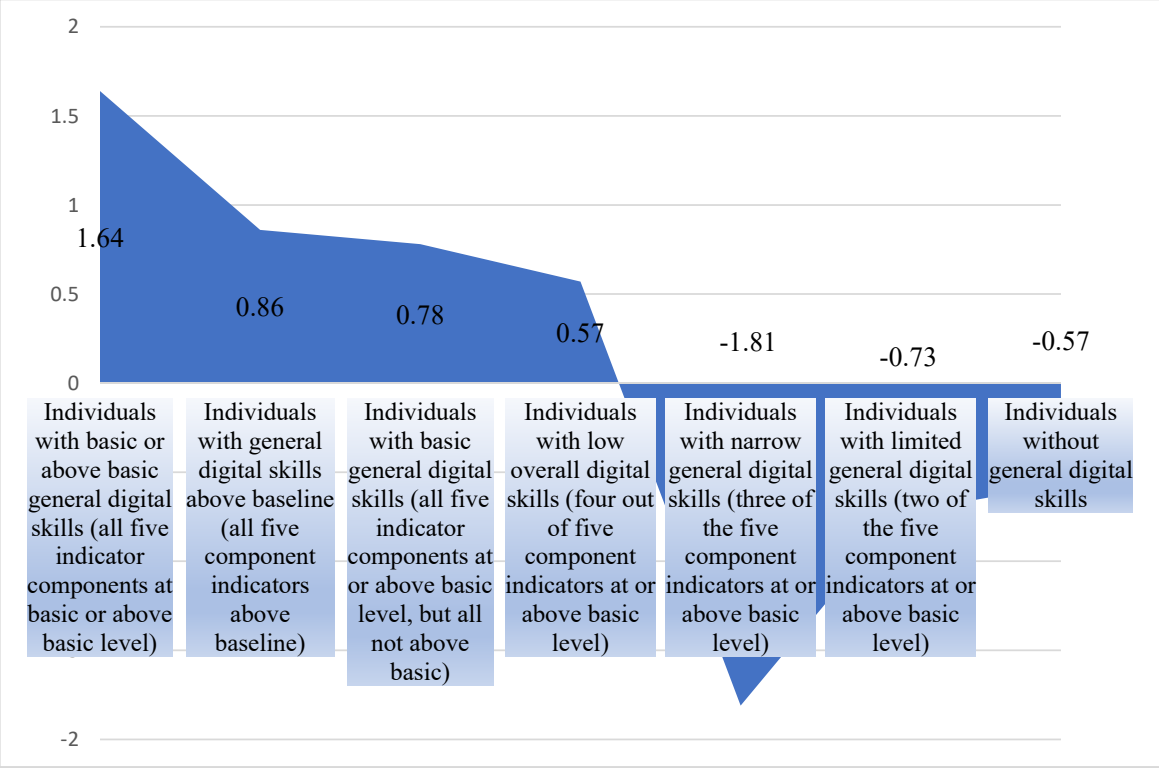

Fig. 2. Trend of individual digital skills among persons in EU countries in 2023 compared to 2021, percentage points.

Source: based on European Commission (2021; 2024).

The growth trend of individuals with digital skills continues (Koval et al., 2022). The Netherlands, Finland and Ireland are the leaders of the corresponding highest indicators among the EU countries. Moreover, 5% of them reached the level of a digital specialist. The corresponding indicator increased by 1.5 percentage points in 2023, compared to 2013.

The Internet increases individuals' and businesses' online presence by utilising ICT solutions to optimise their daily operations. High-speed Internet access is recorded in the EU: 94% are SMEs, and 99% are large businesses. Internet usage rates have increased owing to a shift in society's work behaviour, leading to increased online work-from-home time (Table 1).

Table 1. Dynamics of Internet usage frequency by individuals in EU countries during 2020 – 2023, percentage points.

Country name	1 time per week (including every day)	Daily	At least once a week (but not every day)	Less than once a week
Belgium	3,39	18,29	-1,88	-0,29
Bulgaria	10,65	14,98	-4,33	-0,42
Czech Republic	3,89	5,31	-1,42	0,55
Denmark	0,77	1,4	-0,63	-0,63
Germany	-1,82	-1,78	-0,04	0,06
Estonia	4,34	5,13	-0,79	-0,2
Ireland	3,86	7,21	-3,36	-1,59
Greece	7,67	11,38	-3,64	-0,78
Spain	3,23	6,91	-3,69	-0,98
Croatia	4,91	4,95	-0,03	0,17
Italy	9,02	8,88	0,15	-0,05
Cyprus	0,67	2,41	-2,03	-0,25
Latvia	4,62	7,94	-3,31	-1,18
Lithuania	5,54	8,89	-3,36	-0,09
Luxembourg	0,5	1,4	-0,9	0,4
Hungary	6,74	9,7	-2,96	-0,06
Malta	5,08	6,37	-1,29	0,13
Netherlands	5,62	6,96	-1,25	-0,58
Austria	6,07	3,02	3,04	1,74
Poland	3,96	7,17	-3,22	-0,73
Portugal	7,95	10,67	-2,72	-0,42
Romania	11,86	19,98	-8,13	-1,1
Slovenia	4,04	10,38	-6,34	-0,26
Slovakia	-2,11	2,27	-4,39	-0,6
Finland	0,21	0,9	-0,69	0,49
Sweden	1,47	2,98	-1,51	-0,57
Norway	2,52	1,34	1,18	-0,53
Bosnia and Herzegovina	10,57	12,94	-2,37	-0,4
Montenegro	11,64	17,31	-5,67	-0,89
Serbia	7,16	10,07	-2,91	-0,91
Turkey	8,73	11,47	-2,74	-0,43

Source: based on European Commission (2024).

In 2023, on average across EU enterprises, only 33.2% of them conducted data analysis either by employees or by an external provider (Figure 3.). The highest figures are observed in Hungary (53.2%), Croatia (51.7%), and Denmark (49.5%), while the lowest are in Turkey (14.5%), Norway (19.0%), and Slovenia (19.1%).

Analysing the use of services by structure, it was found that approximately 60.9% of EU enterprises used social networks, 45.2% used cloud computing services, and 22.9% conducted e-sales. A relatively small share of EU enterprises, 12.8%, use fixed internet connections of over 1Gbit/s (European Commission, 2024).

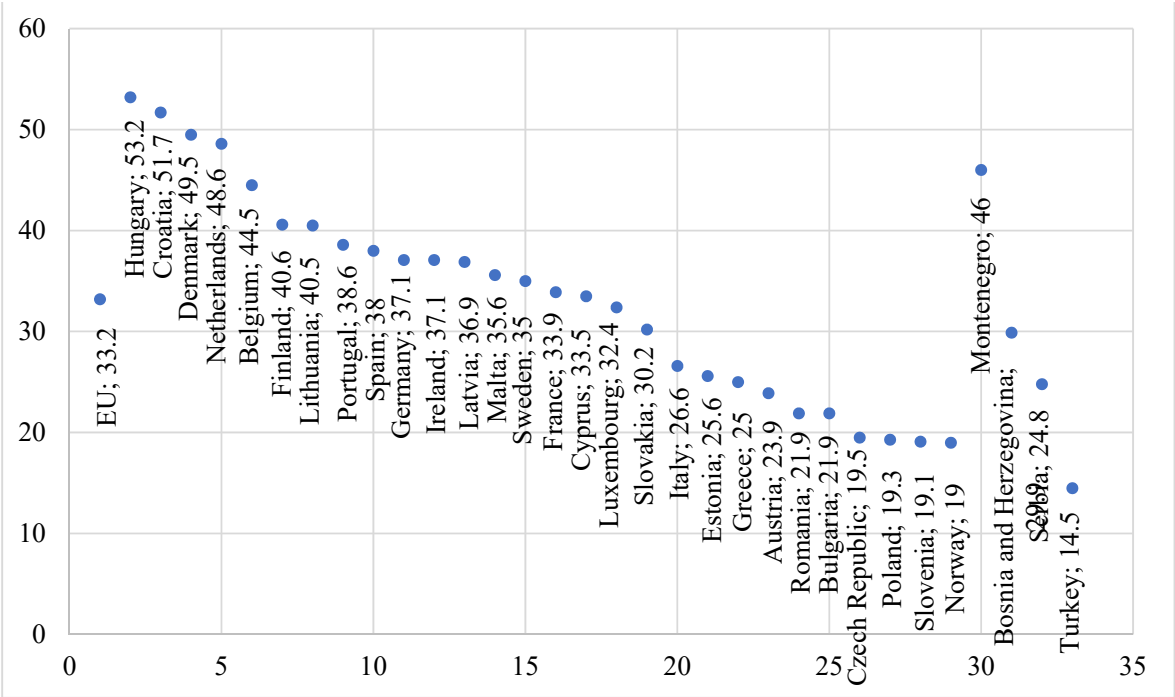

Fig. 3. Enterprises conducting data analysis by employees or external providers in 2023, % of enterprises.

Source: constructed based on European Commission (2024).

Investments in innovation and sustainable development are strategic directions for developing the digital economy of European countries (Prokopenko et al., 2021; Brucoli, 2023). Investment is required to maintain competitiveness and to develop the latest digital trends in the EU, including:

- Expanding the availability of applications based on artificial intelligence in such areas of the economy as: health care, transport and production.
- Sustainable societal development dictates progress and updated rules for developing cross-enterprise measures towards renewable energy development, eco-friendly transport, waste reduction.
- Digital and technological strategic autonomy increasing clean technologies is relevant.
- Enterprises and individuals annually increase their focus on organizing measures for data protection, confidentiality, and transparency.
- Data processing and storage determine the competitiveness of any business and shape the demand for development and investment in corresponding directions.
- Digital identification development is driven by the rapid demand for digital services, the need for security and confidentiality, and the attempt to create a single internal market.
- Ensuring transparency in political advertising.
- Expansion of 5G networks and research into 6G, reducing the disparity between urban and rural areas in the EU.
- The EU focuses on developing the next generation of the most powerful supercomputers for research, AI, quantum computing, climate change modelling, innovation promotion.
- Popularization of the metaverse includes promoting the formation and acquisition of digital skills and expanding business opportunities to sell products and services in the metaverse.

- Activating actions to counter the development of the design that causes addiction to online services.
- The development of the digital economy requires the active involvement of working personnel with digital skills.
- Development of blockchain-based digital verification solutions.
- Cloud computing.

The European Union implemented a number of digital policies aimed at expanding the digital space: the Digital Services Act, the Digital Markets Act, the Data Act, the Data Management Act and the proposed AI. Alongside fostering the development of digital capabilities and opportunities, the European Union has made efforts towards digital recovery by stimulating specific innovations, ensuring investment in faster Internet, enhancing industrial and technological presence in strategic parts of the digital supply chain, building the economies of EU countries as engines of innovation, ensuring a skilled workforce, and assisting small and medium-sized businesses in utilizing digital tools (Fig. 4).

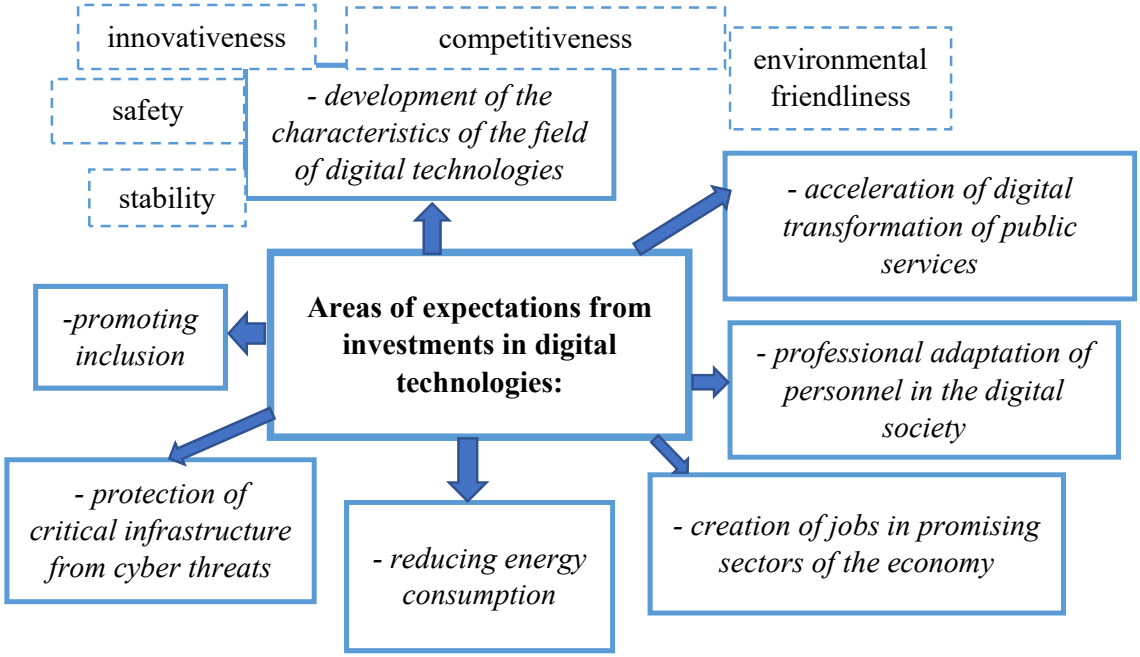

Fig. 4. Directions of implementing digital investments.

Businesses with digital technologies are more resilient to economic changes (Davydenko & Pasichnyk, 2017; Tepliuk et al., 2023). It has higher efficiency and adaptability to crises and other external factors. In 2023, 70% of EU companies were using digital technologies. In 2023, the percentage of companies that took measures to become more digital increased to 77%, 24 percentage points higher than the 2022 figure.

Access to high-speed internet, a skilled workforce, and an innovative environment stimulate digitalization.

Accordingly, businesses located in regions with developed infrastructure have higher performance from investments in digitalization. There needs to be more stability in providing digital infrastructure in EU regions. There is also a higher concentration of digital companies in regions with high-speed internet. The availability of employees with digital skills is also an advantage for investing in digitizing business activities. It is relevant to support improving education and training systems, upskilling workers, and the development of digital infrastructure (Fig. 5).

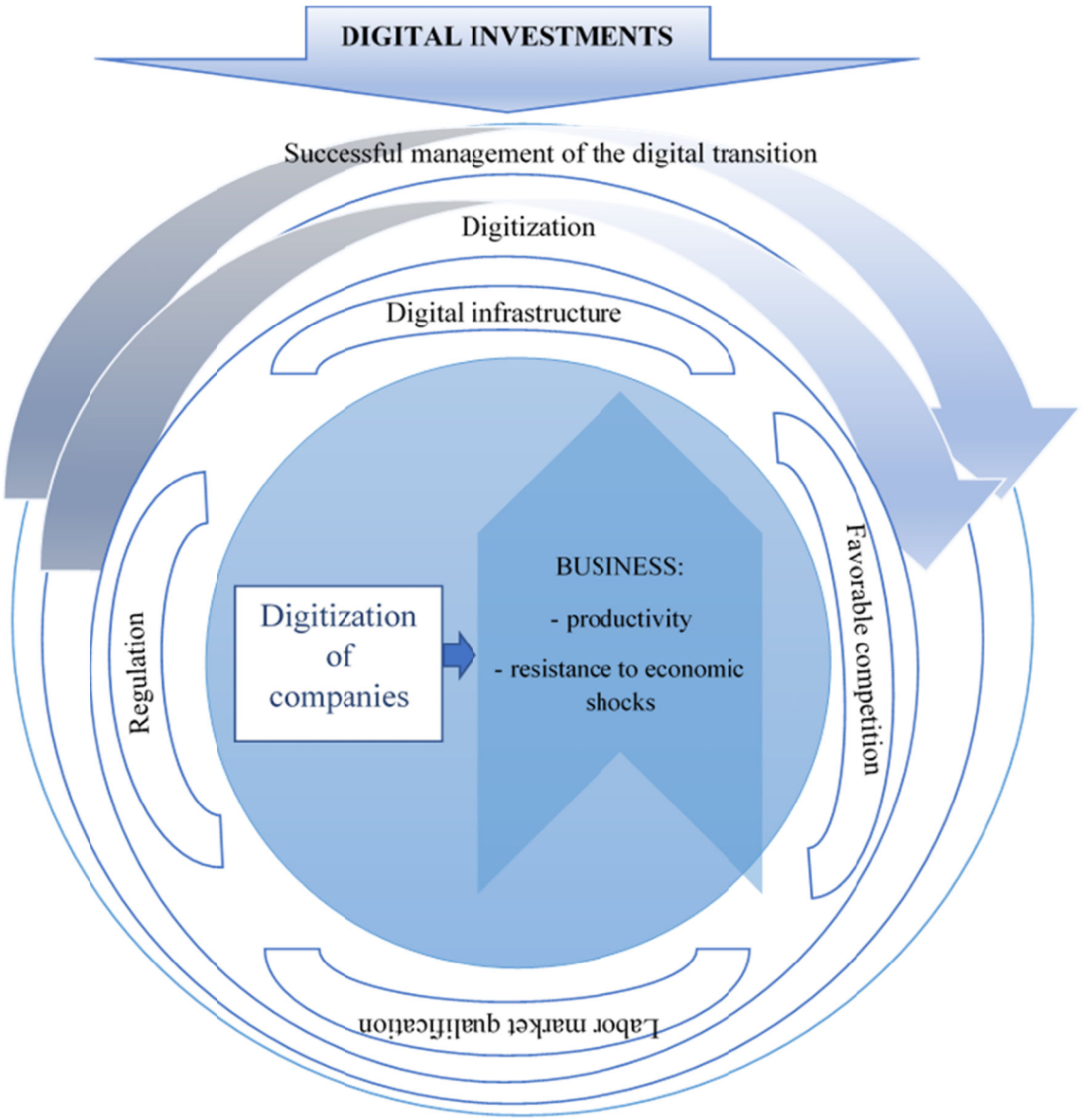

Fig. 5. Process of facilitating business development through digital investments.

The presented goals of digitalisation in the EU determine a phased plan for their implementation, which will provide the labour market with trained personnel to meet modern requirements and, at the same time, will contribute to solving the most critical social problems and lead to innovation in economic processes. In this regard, at all levels of management, there is a need for rational distribution and investment decisions, especially for start-ups.

Effective implementation of EU digital projects is possible thanks to the cooperation of resources and digital capabilities of EU countries.

Achieving rational distribution and investment decision-making in digital projects can incentivise developed economic sectors to recover, develop, and transform medical services using cost-effective digital tools.

6. Discussion.

The digital economy of the Europe exerts an active positive influence on technological development and the growth of business productivity. Business are becoming increasingly digital, prompting forms of digitalisation such as broadband networks, software development, cybersecurity, and innovative digital technologies to attract investments.

Their smart allocation will contribute to developing "green" digital technologies as factors for climate action and environmental sustainability: rational resource distribution, emission reduction, pollution prevention, biodiversity loss prevention, and environmental degradation prevention.

Investing in digital business support is important. This provokes the development of digital business models, modern equipment, innovative digital technologies, and research. Together, this will ensure the development of digital infrastructure (Mann & Püttmann, 2023).

The rational approach to the investment process in the EU's digital economy is a relevant issue today, which involves solving several tasks of the following type:

- Concentration of startup implementation in the EU and its territories. The tendency to increase the number of European young businesses. Unfortunately, most of them fail in their development in the territories of Europe and adapt to the USA. This resulted in a 10.5 percentage point drop in the EU's global digital ranking in 2022 compared to 2013 (European Commission, 2024).

- Development of digitalisation among small businesses in the EU. Small businesses often have ideas for increasing productivity but need more opportunities to implement digital technologies in their business activities (European Investment Bank, 2023).

- Promotion of developing stable and integrated capital markets in the EU. Only some investors are willing to support high-risk digital ideas with a high potential for a sufficient amount of time to expand the scope of the development of relevant firms. The EU partially compensates for some investment programmes and projects to develop the capital market.

- Enhancement of digital skills in the EU workforce. EU demographic difficulties, characterised by population ageing and migration, contribute to the insufficient development of digital self-improvement of the population.

- In an environment of increasing digitalization, a gap remains in providing access to stable digital services to rural communities (European Investment Bank, 2023).

This hinders the realisation of the potential of many of the poorest and least communicative territories, creating obstacles to investment in digitalisation.

The digital economy of the EU creates favourable conditions for boosting economic growth in its countries (European Commission, 2024).

7. Conclusions.

Society demonstrates a desire to acquire digital skills, enhance their level, and implement them in practice, which contributes to the prospects of development for the digital transformation of the economy. This is indicated by the growth of the dynamics of the digital skills indicator of individuals in EU countries, which has four and five out of five indicator components in 2023, compared to 2021.

Business awareness of the benefits of digitalization grows every year, which encourages it to digitalize its business activities. The number of digital companies is constantly growing. In 2023, the corresponding indicator increased to 77%, which is 24 percentage points higher than in 2022.

Successfully managing the digital transition has long-term benefits over the technology implementation process. Digital transformation takes place within the framework of changes in social development and requires the right technological balance, a complex process in the EU.

Investment in the EU's digital economy requires caution and reasoned decision-making. Significant attention should be paid to measures that facilitate the use of digital technologies and address potential issues, such as task automation.

There has been an increase in the productivity of digital technologies, which requires the corresponding development of digital solutions in business and other societal relations. The main task of investing in the EU's digital economy is to improve society's digital skills, providing favourable internal conditions for technological innovation and maximum benefits from digital transformation in the European Union.

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