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Review Paper

Management of the Financial Potential of Innovative Development of the National Economy in the Context of Digital Transformation

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ABSTRACT

The relevance of the study is conditioned by the need to find ways to improve the financing management of innovative development of Ukraine in the conditions of global digitalisation. The purpose of the study is to analyse the financial support for innovative economic development in the context of digitalisation, identify problems, and develop proposals for its improvement. The methodological approach is based on: analysis of statistical information; comparison; graphical method; generalisation. The main results of the study should be considered: identification of the relationship between the volume of expenditures of industrial enterprises on innovation activities and the dynamics of innovation implementation; analysis and selection of the most significant sources of financing for innovative development of industrial enterprises; identification of the positive impact of informatisation on the introduction of innovations in the economy and improving the well-being of the population; substantiation of the need to increase state financial support for innovative activities of enterprises with the advantage of those innovative ideas that are the most cost-effective and aimed at the use of information and digital technologies, and the innovative product meets the requirements of environmental friendliness and provides for its use in the most necessary ways during the war period, in particular: machine-building, energy, agricultural, defence.

HIGHLIGHTS

- The article aims to analyze the financial support for innovative economic development in the context of digitalization, identify problems, and propose improvements, including increasing state financial support for innovative activities, utilizing venture capital investment, and prioritizing innovative ideas in information and communication technologies.

Keywords: Products sold, latest technologies, Industry 4.0, innovation financing, government support, venture capital

On Ukraine's path to integration into the European Union (EU), taking advantage of global digitalisation is helping to expand opportunities for innovation and build digital infrastructure. The issue of determining the prospects for increasing funding for innovative development and identifying areas of activity in which financing and implementing

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innovation is extremely important and economically profitable during the war period is relevant.

The main advantages of digitalisation for social and economic growth, as well as the level of readiness of business entities to use digital technologies, were studied by O.V. Brechko and A.I. Hutsuliak (2022), who emphasised the need for the state to prioritise those digital tools, the use of which will stimulate the overall growth of the economy. The influence of various economic factors on the financial performance of enterprises and the organisation of their business systems was investigated by Ye. Maslennikov *et al.* (2021) and V. Koval *et al.* (2022), who proved the effectiveness of business process modelling, which is manifested in the improvement of quality management systems. Actual issues of determining the state of development of innovation activity in the context of digitalisation of the economy were studied by N. Tymoshenko and M. Shabanova (2021), N.A. Ishchenko (2020) who analysed the features of the development of innovation activity in Ukraine and proposed measures to activate it in the context of digitalisation. The role of European development financial institutions in supporting the innovation activity of enterprises was studied by S. Clò *et al.* (2022), who investigated the impact of the participation of these institutions, as investors in equity transactions, on the patent activity of firms.

The main purpose of the study is to analyse the factors that influence the introduction of innovations in the activities of enterprises in the context of digitalisation of the economy, and sources of financing for innovative development, and to develop proposals for financing and stimulating the introduction of innovative products taking into account digitalisation, which would allow Ukraine to develop products necessary for the economy during the war period and strengthen its competitive position at the international level.

MATERIALS AND METHODS

The methodological approach in this paper is based on a combination of statistical information analysis methods, comparison, graphical method, and generalisation. The theoretical basis is based on the studies by Ukrainian, Polish, American, Italian, German and researchers from other countries who investigated the problem of financing innovation activities of Ukrainian enterprises and ways to solve it.

The use of the statistical data analysis method allowed considering the dynamics of innovation activity indices of Ukraine for 2017-2022, changes in innovation costs, the share of innovatively active enterprises and the introduction of innovative types of products for 2010-2020. The dynamics of the main indicators of innovation activity of Ukrainian enterprises and sources of innovation financing for 2010-2020 were studied on the basis of data from the State Statistics Service of Ukraine (Science, technology and innovation…, 2020). Data on the part of innovative products in the total volume of products sold for certain types of industry in Poland are taken from the Statistical Yearbook of Polish industry (Rocznik Statystyczny Przemysłu 2020, 2021), and in Germany – based on information from the Leibniz Centre for European Economic Research in Mannheim (Core indicators, 2021). The analysis of the main problems of innovative development in Ukraine at various stages of its implementation is based on the information provided in the strategy for the development of the sphere of innovation activity for the period up to 2030 (Decree of the Cabinet of Ministers of Ukraine No. 526-r…, 2019). Using the graphical method, the paper presented data on: innovation indices by sectors of activity in Ukraine in 2022; dynamics of indicators of innovation activity of industrial enterprises in 2010-2020; and indicators of the introduction of innovative products in 2010-2020.

The application of the generalisation made it possible to: record the information obtained in the course of the study on Ukraine's ranking among other countries in terms of the level of innovation in various sectors of the economy; summarise the indicators on the number of innovatively active enterprises in Ukraine in 2016-2020; formulate conclusions that represent the final reflection of this research, namely: substantiate proposals for improving the financing of innovative activities; determine further approaches to the study of this issue.

RESULTS

In the current conditions of development of the world economy during the "Fourth Industrial

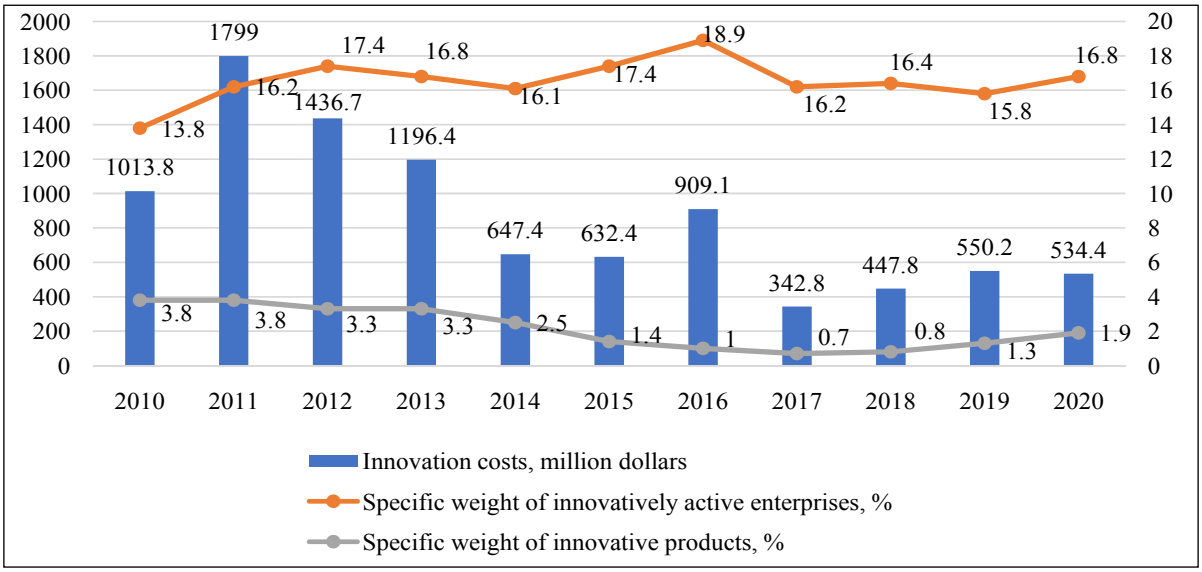
Revolution" (Industry 4.0), digitalisation covers all spheres of society and is a key tool for introducing innovative ideas into production, education, medicine, and other areas of development of any country. One of the main goals of digitalisation is to create new opportunities for the realisation of human capital, increase labour productivity, and develop innovative and creative business industries. According to the World Intellectual Property Organisation, which annually determines the Global Innovation Index (2023) among 132 countries and economies, in 2022, Switzerland was recognised as the most innovative country: Switzerland (1st place), followed by the United States of America (2nd place), Sweden (3rd place), the United Kingdom (4th place), the Netherlands (5th place), and then Korea, Singapore, Germany, Finland and Denmark in the top 10, and China has moved closer to the top 10 innovative economies in the world (11th place). In the Global Innovation Index ranking for 2022, Ukraine ranks 57th, while taking 4th place among 36 low-middle-income countries (1st place – India, 2nd – Vietnam, 3rd – Iran, 4th – Ukraine). Separately, it is possible to analyse Ukraine's place in terms of innovative inputs and results of innovative activity ((Global Innovation Index…, 2023). Since 2018, Ukraine has moved back from 43rd place to 57th place in 2022 according to the overall innovation index. In general, for the entire analysed period, Ukraine has better results in innovation activity than innovative contributions. Different fields of activity in Ukraine also have different innovation indices (Global Innovation Index…, 2023).

In the annual ranking of startup ecosystems Global Startup Ecosystem Index 2022 (2022) from the global research centre for start-ups and innovations, StartupBlink, Ukraine ranks 50th, which is 16 positions lower compared to 2021, when it was on the 34th place, which is conditioned by military operations in the country. Despite the war, 71% of Ukrainian start-ups remained in Ukraine, but 41.1% of them do not have sufficient funds to continue their activities. Of the total number, 51% of start-ups do not generate revenue (The digital state…, 2023). At the same time, the startup ecosystem of Ukraine is relatively young – 87% of it has been working in Ukraine for less than 5 years. For example, the EdTech market is just beginning to gain momentum, but as of 2022, there are already more than 100 Ukrainian EdTech start-ups (The digital state…, 2023). Both during the war and after the end of hostilities, the level of innovation of Ukrainian enterprises is quite important for the development of the economy (Science, technology and innovation…, 2020).

The main volume of innovation belongs to enterprises of the industrial sector. The share of enterprises with technological innovations is highest in the processing industry (more than 15%). The share of innovative products in the volume of industrial products sold in Ukraine in 2020 was 1.9%. At the same time, in Poland this figure was 9.3%, and in Germany – 18% (Rocznik Statystyczny Przemysłu 2020, 2021; Core indicators, 2021). The dynamics of the main indicators of innovation activity of industrial enterprises, including the share of innovative products, can be analysed based on data on innovation costs and the share of innovatively active enterprises and innovative products for certain periods (Fig. 1).

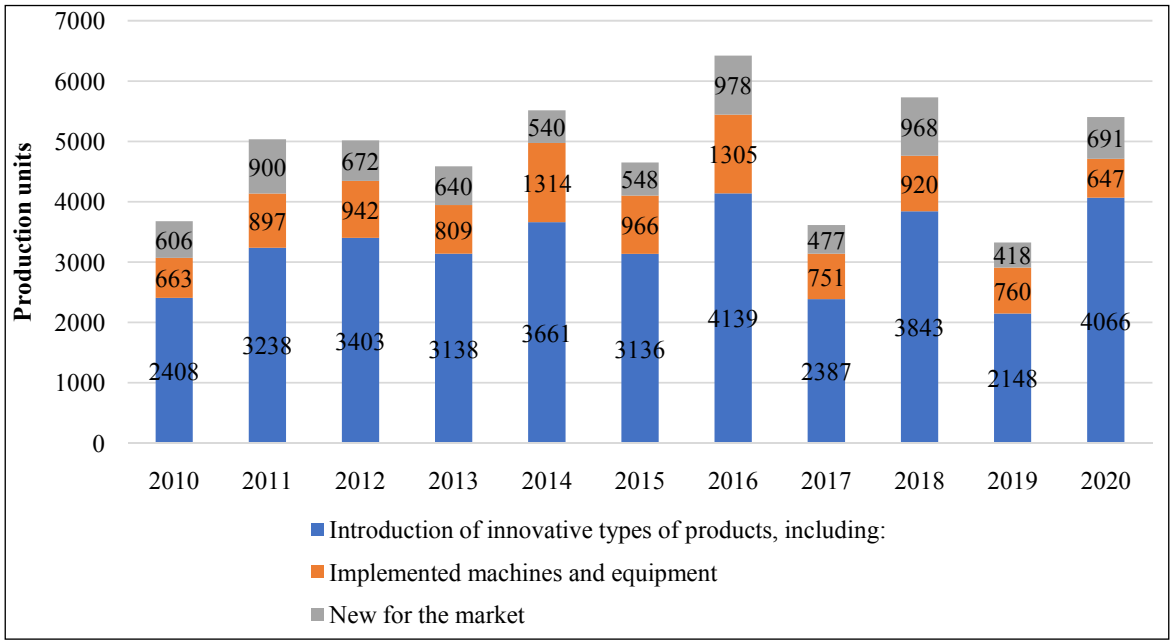
Fig. 1 shows that during 2010-2020, the cost of innovation of enterprises decreased by 1.9 times (from USD 1,013.8 million to USD 534.4 million), which is a negative trend, because the lack of funds hinders the innovative development of business entities. Along with this indicator, the share of innovative products decreased by 2 times, and innovatively active enterprises – by 2.1% since 2016 (Science, technology and innovation…, 2020). In 2022, since the beginning of the war, innovation activity in Ukrainian companies has slightly decreased, only 16% of companies have implemented innovations, but in the EU this figure was 49%. Approximately 40% of small and medium-sized businesses in Ukraine claim that access to finance is the main obstacle to innovation growth (The digital state…, 2023). The introduction of innovative types of products also shows a slowdown in Ukrainian enterprises (Fig. 2).

At the same time, the analysis of innovative products sold showed that out of its total volume in 2018, the volume of products new for the market was 41%, and new only for the enterprise, respectively – 59%, and in 2020, the volume of products new for the market was only 18.1%, and new for the enterprise – 81.9% (Science, technology and innovation…, 2020). Priority areas of innovation development are determined by global trends. The need to optimise



***Source**: Compiled based on (Science, technology and innovation…, 2020).*

Fig. 1: Dynamics of indicators of innovation activity of industrial enterprises in 2010-2020



***Source**: Compiled based on (Science, technology and innovation…, 2020).*

Fig. 2: Indicators of implementation of innovative types of products for 2010-2020

complex processes requires new automated tools. The volume of global artificial intelligence was estimated at USD 93.5 billion in 2022, and it is projected to grow by 38% annually until 2030 (The digital state…, 2023). The growth of data volumes encourages the creation of more efficient methods for processing and storing information. It is projected that by 2025, more than 75% of enterprise data will be processed using cloud and peripheral computing (The digital state…, 2023). The state of innovation financing can be analysed in the context of various sources (Table 1).

One of the sources of financing innovation activities in other countries is venture investment. Thus, for example, to increase investment in innovative start-ups and enterprises that are developing, the European Commission and the European Investment Fund launched the VentureEU initiative,

Table 1: Sources of funding for innovation activities in Ukraine for 2010-2020

Period	Total amount of funding, million UAH	Including:							
		Enterprises' own funds		State budget		Funds of non-resident investors		Other sources	
		Million UAH	%	Million UAH	%	Million UAH	%	Million UAH	%
2010	8,045.5	4,775.2	59.4	87	1.1	2,411.4	30	771.9	9.6
2011	14,333.9	7,585.6	52.9	149.2	1	56.9	0.4	6,542.2	45.6
2012	11,480.6	7,335.9	63.9	224.3	2	994.8	8.7	2,925.6	25.5
2013	9,562.6	6,973.4	72.9	24.7	0.3	1,253.2	13.1	1,311.3	13.7
2014	7,695.9	6,540.3	85	344.1	4.5	138.7	1.8	672.8	8.7
2015	13,813.7	13,427	97.2	55.1	0.4	58.6	0.4	273.0	2
2016	23,229.5	22,036	94.9	179	0.8	23.4	0.1	991.1	4.3
2017	9,117.5	7,704.1	84.5	227.3	2.5	107.8	1.2	1,078.3	11.8
2018	12,180.1	10,742	88.2	639.1	5.2	107	0.9	692	5.7
2019	14,220.9	12,474.9	87.7	556.5	3.9	42.5	0.3	1,147	8.1
2020	14,406.7	12,297.7	85.4	279.5	1.9	125.3	0.9	1,704.2	11.8

***Source**: Compiled based on (Science, technology and innovation…, 2020).*

which would allow many innovative European entrepreneurs to become world market leaders. The funds supported by EU funds in the amount of EUR 410 million should attract up to EUR 2.1 billion of public and private investment. This, in turn, is expected to lead to new investments of EUR 6.5 billion in innovative start-ups and expansion across Europe, thus doubling the volume of venture capital (Wyrwa, 2020). The Ukrainian venture capital industry continues to work during the war and close deals with start-ups. In the first months of the war, 99% of companies needed significant financial support (Lytvyn and Bulak, 2022).

DISCUSSION

The paper emphasises the importance of innovative development for the country, because it is an engine of economic development and contributes to improving the competitiveness of enterprises' products. The essence of innovation potential is studied by I. Lomachynska and I. Podgorna (2018), who emphasise its role in ensuring the competitiveness of the national economy on the example of Germany and Austria. Innovations can be implemented not only in the production process, but also in the management of the company, which gives a positive effect on the results of its activities. E. Öztürk and O. Ozen (2021) investigated the benefits of managerial innovation in implementing originality in products and processes in companies operating in emerging economies.

The impact of financial development on innovation in developing countries was studied by K. Loukil (2020) and A. Kuś and Grego-Planer (2021) namely, the relationship between financial development and innovation. The researcher determined the threshold value of economic development, below which the level of financial development does not have a significant impact on innovation, and above – on the contrary, it has a significant positive impact. Digital innovations are particularly important for economic development. T.U. Kame Babilla (2023) studied how digital innovation affects the access of small and medium-sized enterprises to finance and productivity growth in the monetary union. The author proved that digital innovations reduce credit differences between companies. O. Carboni and G. Medda (2021) note that innovation can encourage additional investment in equipment and machinery. The problems of business innovation and inventions in the EU countries with a focus on the potential effects of business spending on research and development were studied by J. Huňady and P. Pisár (2021), who argued that business spending on such works can play a significant role in their creation. It is worth agreeing with scientists that the cost of such work is associated with certain risks of failure, which can be even greater due to their long-term nature and complexity. The innovative

activities of small and medium-sized enterprises can demonstrate a positive effect on the economy, as the vast majority of them operate. The same opinion is shared by I. Lassas *et al.* (2023) who argued that the use of external financing is crucial, and investigated the possibility of small and medium-sized businesses to innovate in the conditions of obtaining credit. W. Naudé and P. Nagler (2021) studied the evolution of innovation and economic growth in Germany since 1871 and identified areas that should also be paid special attention now, namely: education and managerial skills, venture capital, competitive markets, and the social security system. In addition, the paper notes the need to strengthen financial support for innovation activities from the state. This opinion is confirmed by M.J. Piątkowski (2020), who conducted a comparative analysis of the introduction of innovative investments between enterprises that received financial assistance from the European Union and those that introduced innovations using other sources of financing.

Results of research by M. Bogers *et al.* (2022) also confirm the statement that digital technologies generate continuous innovation in most sectors of the economy and society. The authors emphasise the unprecedented opportunities for digital innovation. In addition, I. Yoo and C.-G. Yi (2022) and T. Ciarli *et al.* (2021) analysed the impact of economic innovations on social systems and proved that digital economic innovations lead to changes in the industrial structure and contribute to increasing productivity and reducing costs in the manufacturing sector. The advantages of digitalisation for the development of innovative activities of enterprises are also considered by B. Gajdzik and R. Wolniak (2021), J. Wyrwa (2020), A. Sorescu and M. Schreier (2021). The authors defines EU financial instruments that promote business innovation in the context of Industry 4.0 with a forecast until 2027. The author emphasises that it is necessary to: encourage the creation of venture capital, support the development of industry infrastructure and adopt legal norms that protect intellectual property and personal data.

CONCLUSION

The analysis of the innovative development of Ukraine showed that its global index over the past 5 years has tended to decline among other countries of the world, and the share of innovative products of Ukrainian enterprises in the total volume of its sales is about 2-5 times lower than in European countries, in particular, Poland and Germany. It is shown that due to military operations, according to the Global Startup Ecosystem Index rating of startup ecosystems in 2022, Ukraine decreased by 16 positions. It is proved that informatisation is a driving force in the process of introducing innovations in the activities of enterprises, in particular, the implementation of start-ups in the field of high technologies, Internet business.

It is established that since 2014, the main source of financing for innovation activities is the enterprises' own funds, and the allocation of budget funds for innovation for the analysed period did not exceed 5.2%. It is proposed to increase state financial support for innovative ideas that provide for the use of information technologies, meet the requirements of environmental friendliness and safety and are aimed at use in important areas during the war period. It is proved that the use of venture investment in innovative start-ups and developing enterprises can support small and medium-sized businesses. The proposed is of practical significance and can be applied by the government of Ukraine in the development of state programmes for financing innovation activities and by enterprise managers in determining priority areas for implementing innovations in their activities. The main areas of further research will be the development of theoretical and methodological foundations for the introduction of innovative development financing processes for small and medium-sized businesses during martial law.

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