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Economic Models of Innovation Activity Based on Digital Platforms

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ABSTRACT

The relevance of the topic of economic models of innovative activity based on digital platforms is due, firstly, to the importance of the transition of the modern economy to an innovative development path; secondly, the importance of analyzing international experience in the development of innovative systems in order to possibly use the approaches that have developed in the world to form a national model of innovative development. **The purpose of this study** is to determine the possibility of using the experience of implementing innovative activity models in individual countries of the world in shaping the directions for the development of the economy of the Russian Federation in order to improve the indicators of its socio-economic development. **The object of the study** is the development of innovative activities of economic entities in the context of digitalization; **the subject of research** is digital platforms. The authors analyzed the ranking of the most innovative countries in the world; the types of models of innovative activity of developed countries are identified (leadership in science, dissemination of innovations, stimulation of innovations); the authors also traced the relationship, for which model of innovation, what types of platforms are most characteristic. The article substantiates the fact that a significant number of effects from innovation activity is achieved through the use of certain technologies and the modernization (restructuring) of individual business processes in the implementation of inter-company interactions based on digital platforms. Based on the characteristics and features of each considered type, the authors propose the most appropriate types of digital platforms for use in the implementation of one or another model of innovative activity. **The practical significance** of the proposals lies in the fact that, depending on the chosen development strategy, the use of one or another type of digital platform will be effective for a particular economic entity.

Keywords: innovation activity; digital platforms; economic models; innovative development; global innovation index

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INTRODUCTION

As evidenced by world experience, the greatest socio-economic growth is achieved by countries that form a special attitude to innovation, research and development, and knowledge-intensive industries as the basis of their development strategy.

According to this, innovation is "a social-technical-economic process, which through the use of practical ideas and inventions leads to the creation of better products and technologies. If the innovation is oriented towards economic benefit, its appearance on the market can bring added income" [1].

Such foreign researchers as G. Dosi, C. Freeman, B. Lundvall, R. Nelson, G. Silverberg, and others, made a great contribution to the study of innovation systems. [2–4].

The experience of implementing models and stimulating innovation activity, as well as innovation policy strategies of Japan, the USA, EU countries are analysed in their works by T. V. Kolesnikova, D. L. Malyutin, A. P. Kokhno, R. Scott, G. S. Khromov and others. [5–9].

There are also many publications by domestic researchers summarising the experience of industrially developed countries [10–12].

Despite this, the issues of innovative development of the Russian Federation require further research.

Complexity theory, which is gaining increasing popularity, allows us to consider the problems of managing organisations in today's environment using a new scientific approach. One of the key concepts of this theory is to treat organisations as networks. From the perspective of various theoretical studies, organisations can be represented using different types of hierarchies, but in recent years researchers have tended to believe that in practice all organisations are networks in one way or another. The complexity theory of socio-economic systems shows that management should focus primarily on inter-firm interactions rather than on organisational structures and maximising the effects of managing them. Thus, at the present stage, organisations should adhere to management principles based on the scientific provisions of network structure research.

At the same time, the methodological basis of management is most often represented as systems thinking, the focus of which is on cyclical inter-firm interactions and non-linear intra-network relations. The effectiveness of systems thinking in organisational management lies in the fact that through it the interaction problem can be viewed from different angles [13].

And if systems thinking acts as a theoretical basis for management, then digital platforms become an adaptor, a practical tool in modern conditions, according to the authors. Since any digital platform is a unified information environment that enables a significant number of participants of relations to interact mutually beneficially through a system of algorithms, it allows to provide economic entities with benefits not only of economic, but also social nature. The high potential of using digital technologies in general and digital platforms in particular to improve the efficiency of economic entities' functioning generates interest in this topic not only among domestic but also foreign scientists [14–17].

Thus, the relevance of the topic of economic models of innovation activity on the basis of digital platforms is conditioned, firstly, by the need for effective and comprehensive modernisation of the economy, secondly, by the importance of the analysis of international experience in the development of innovation systems with the aim of its possible use for the formation of the national model of innovation development, thirdly,

Table 1

Global Innovation Index 2012–2022

Country	Place in the 2012 GII.	Place in the 2022 GII.	Change in ranking over 10 years
Australia	23	25	↓ –2
Austria	22	17	↑+5
Belgium	20	26	↓–6
Bulgaria	42–43	35	↑+7
Great Britain	5	4	↑+1
Hungary	31	34	↓–3
Vietnam	76	48	↑+28
Germany	15	8	↑+7
Greece	66	44	↑+22
Denmark	7	10	↓–3
Israel	17	16	↑+1
India	64	40	↑+24
Ireland	8–9	23	↓–15
Iceland	18	20	↓–2
Spain	29	29	0
Italy	36	28	↑+8
Canada	12	15	↓–3
Cyprus	28	27	↑+1
China	34	11	↑+23
China, Hong Kong	8–9	14	↓–6
Latvia	30	41	↓–11
Lithuania	38	39	↓–1
Luxembourg	10–11	19	↓–9
Mauritius	49	45	↑+4
Malaysia	32	36	↓–4
Malta	16	21	↓–5
Netherlands	6	5	↑+1
New Zealand	13	24	↓–11
Norway	14	22	↓–8
UAE	37	31	↑+6
Poland	44	38	↑+6
Portugal	35	32	↑+3

Table 1 (continued)

Country	Place in the 2012 GII.	Place in the 2022 GII.	Change in ranking over 10 years
Russia	51	47	↑+4
Romania	52	49	↑+3
Singapore	3	7	↓–4
Slovakia	40	46	↓–6
Slovenia	26	33	↓–7
USA	10–11	2	↑+8
Thailand	57	43	↑+14
Turkey	73	37	↑+36
Finland	4	9	↓–5
France	24	12	↑+12
Croatia	42–43	42	0
Czech Republic	27	30	↓–3
Chile	39	50	↓–11
Switzerland	1	1	0
Sweden	2	3	↓–1
Estonia	19	18	↑+1
South Korea	21	6 (Республика Корея)	↑+15
Japan	25	13	↑+12

Source: compiled by the authors on the basis of data from the Global Innovation Index. URL: https://www.wipo.int/global_innovation_index/ru/2022/

by the significance of the transition of modern economy to the innovation path of development.

THE GLOBAL INNOVATION INDEX

It should be noted that the waves of innovation activity characteristic of the digital age, if effectively harnessed in the activities of economic actors, can have a significant positive impact on the growth of innovative labour productivity and national welfare. Based on the essence of the term "labour productivity", we can state that the key effect will be expressed in the increase in the efficiency of people's activity in the process of creating innovations: the number of innovations will increase, while the time spent on their creation will decrease.

Table 1 shows the change in the ranking of individual countries in the Global Innovation Index (GII) over the last 10 years.

Analysing the experience of the developed and developing countries, we can conclude that a successful transition to innovative models of functioning requires a fundamental restructuring of economic mechanisms of the country's economy by reforming innovation processes and programmes.

Statistics show that only a small number of economies demonstrate consistently high innovation performance (*Fig. 1*).

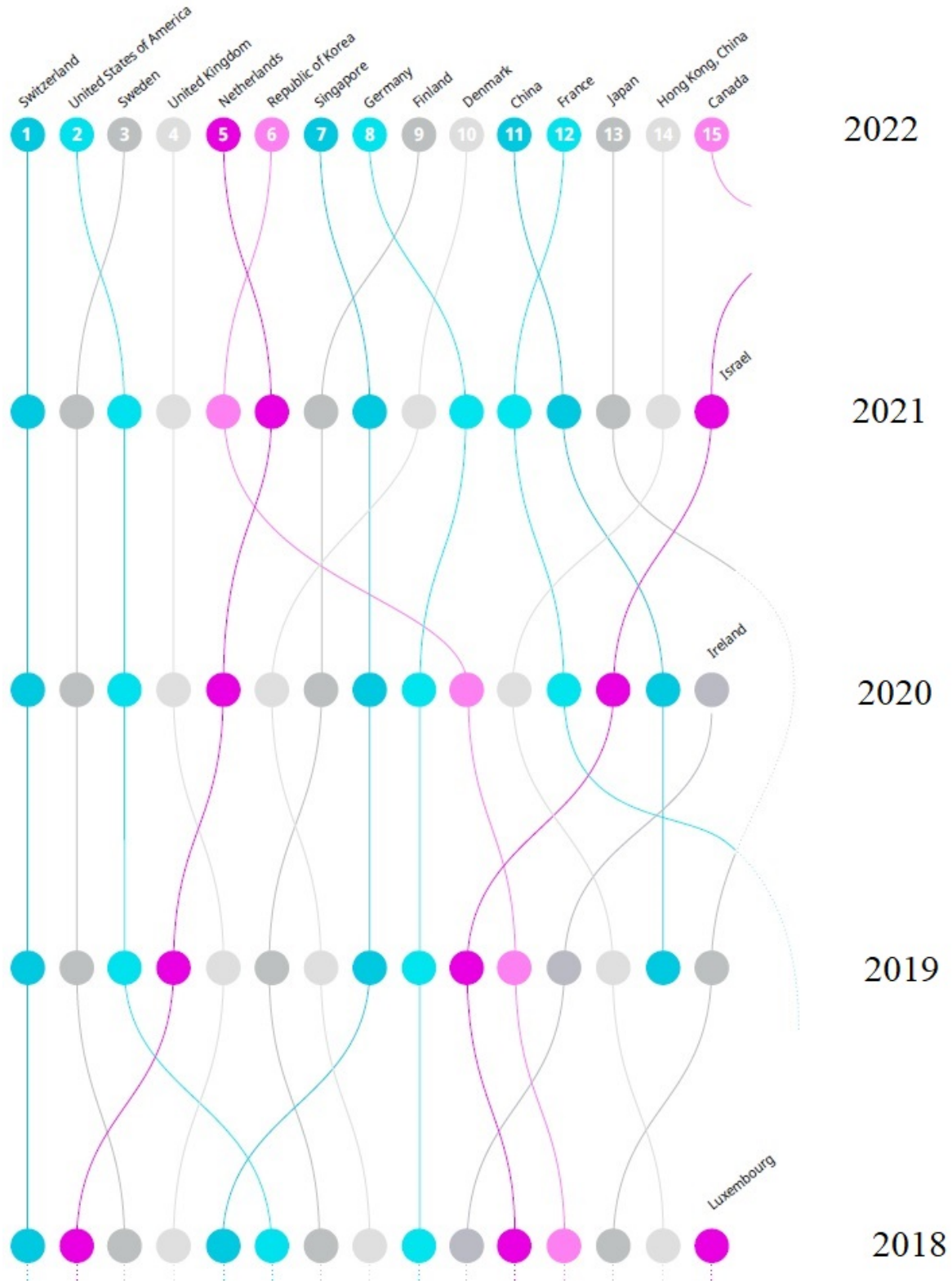

Fig. 1. **Change in the ranking of the top 10 GII economies, 2018–2022**

Source: compiled by the authors on the basis of data from the Global Innovation Index: URL: https://www.wipo.int/global_innovation_index/ru/2022/

Digital platforms by software product typology / Digital platforms by ownership of the asset and setting of terms and conditions	Instrumental DP - at the core is a hardware and software system	Infrastructure DP - based on an ecosystem of participants to automate their activities	Applied DP - at the core is the business model for running business operations
Centralised DP - owns the asset and sets the terms and conditions, ensures standardisation and scalability	A Examples: Google; Bing; Yahoo; Baidu; Mail; Java; Yandex: Rambler; MacOs; Sputnik: Windows: Linex; KasperskvOS: Bitrix	B Examples: WhatsApp; Telegram: WeChat Tamtam; Apple iOS; Skape; Aviton; Farechat; Android; SailfishOs: WindowsPhone	C Examples: Zipcar; Tripadvisor; Rent the runway; Aviasales; Tourvisor; Travelata; Skyscanner; Kayak: Gosuslugi
Decentralised DP - the owner sets the terms and conditions and offers the asset directly to the user	D Examples: Facebook; Twitter; Instagram; Linkedin; Chrome; Vk; Odnoklassniki: Firefox; Opera; Safari	E Examples: AirBnB; HomeAway; Cian; Hostel-world; Udacity; Domo-fond: Coursera; Stepik; Universarium: Edx	F Examples: Groupon; Kickstarter; Planeta; IndieGoGo; Starttrack; Boomstarter; Biglion; Crowdfunder
Hybrid DP - ownership and risk are decentralised while standardisation and service levels are centralised	G Examples: Youtube: Vimeo; MetaCafe; Rutube; Ozon: Ivi; Aliexpress; Amazon; Ticketland; Etsy	H Examples: WePay; PayPal; Amazon Pay; Apple Pay; Robokassa; QIWI; eBay	I Examples: Lyft; Uber; Blablacar; City-mobil; Indeed; Job; Upwork; Rentmania; CareerBuilder

Fig. 2. **Cross-classification of digital platforms**

Source: compiled by the authors.

Studying the peculiarities of innovation policies of countries showing significant changes in the GII ranking, we can distinguish active and passive behaviours.

Countries that use "active" policies (North American, East Asian, and Western European countries) ensure their development not only by acquiring more advanced foreign developments, but also through their technological and research base. The degree of dependence on innovative imports is influenced by the size and level of domestic development of countries. For example, the United States can dictate the innovation policy of less developed countries, as it has a large share of the world's R&D. In countries such as Denmark, Belgium, Canada, Greece, Portugal and Spain, a much larger share of innovation is consumed from abroad.

In Latin American, Central European, and post-Soviet countries, innovation policy is passive, while in Russia it is rather passive-active.

The development model currently being promoted in our country envisages a gradual build-up of innovation capacity together with a dosed use of innovation from outside. This allows Russia to pay more attention to improving its own innovation performance.

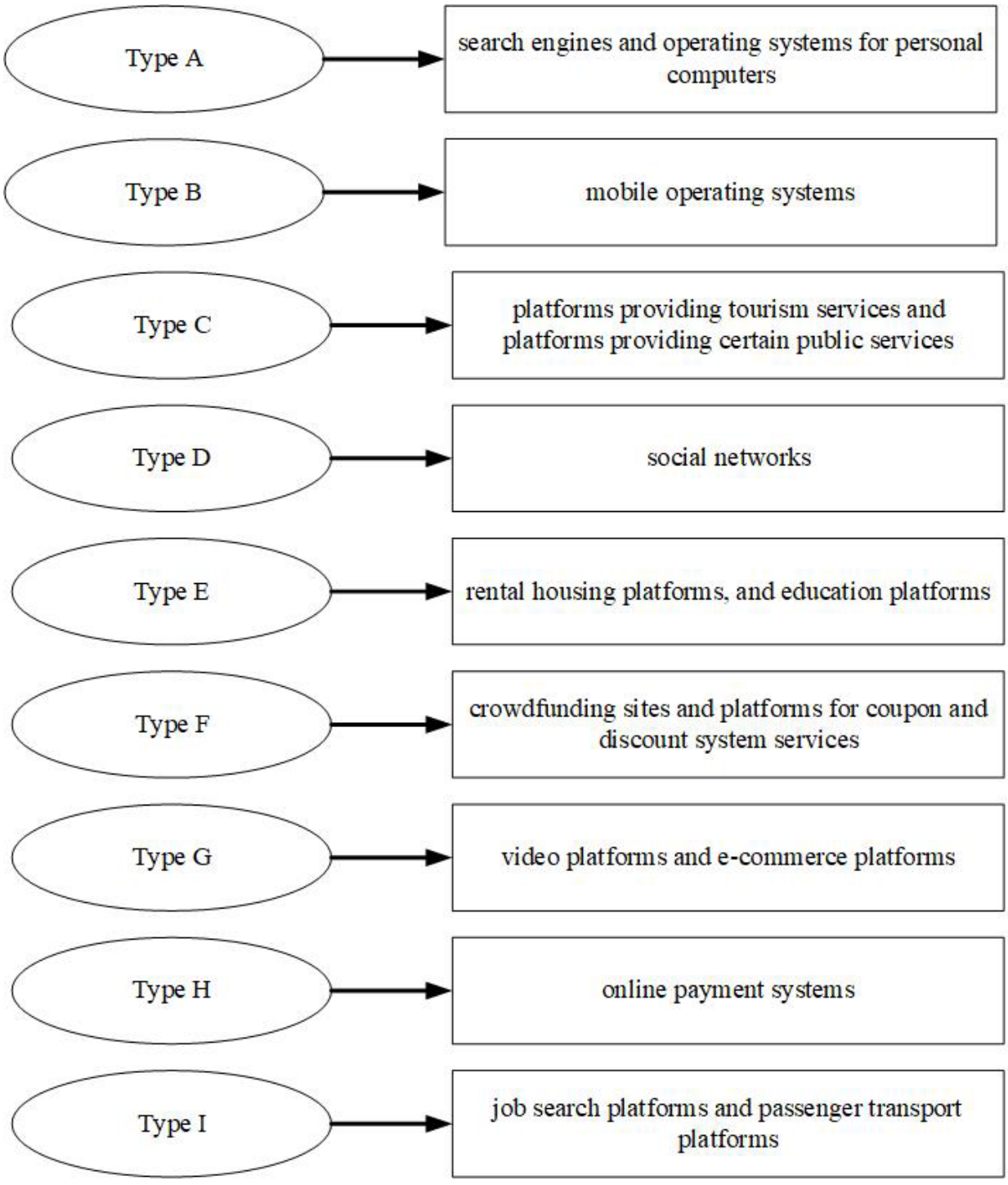

Fig. 3. **Examples of different types of digital platforms**

Source: compiled by the authors.

Researchers propose to distinguish three main types of innovation activity models [18]:

• Leadership in science (England, USA, France), when activities are aimed at the implementation of large, targeted projects (covering all stages of the scientific and production cycle) and innovation potential in the MIC (military-industrial complex).

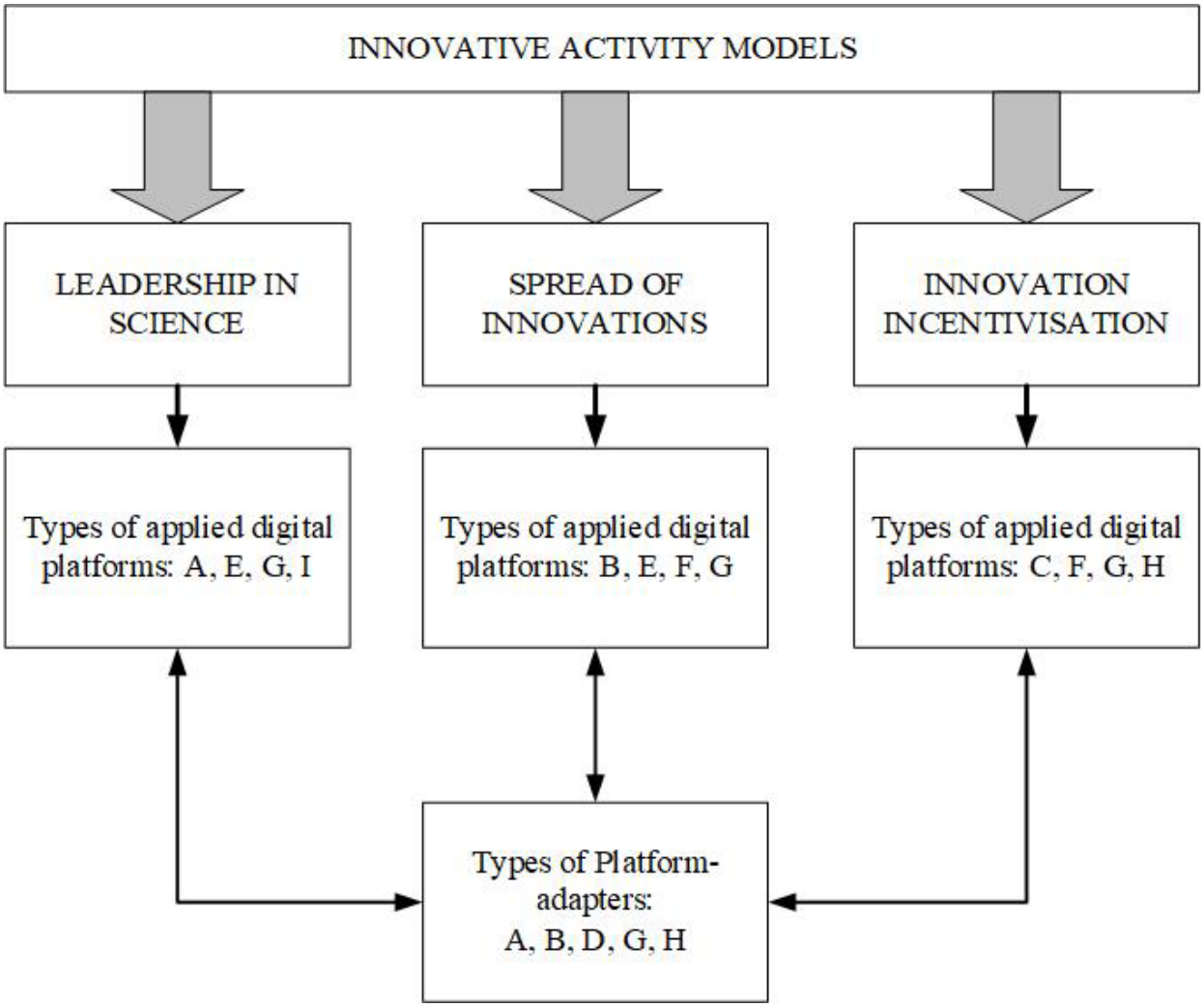

Fig. 4. **Economic models of innovation activity based on digital platforms**

Source: compiled by the authors.

• Diffusion and spread of innovation (Switzerland, Sweden, Germany), with activities aimed at creating a favourable innovation environment and rationalising the entire economic structure.

• Stimulation of innovations (Japan, South Korea). In this case, the activities are aimed at the development of innovation infrastructure. The policy helps to ensure the country's receptivity to the achievements of scientific and technological progress, and also helps to coordinate the actions of different regions and sectors of the economy in the field of science and technology.

Further research suggests identifying the types of digital platforms that are most appropriate for countries to use according to their innovation model.

DIGITAL PLATFORMS IN INNOVATION ACTIVITIES

Digital platforms in current research are classified and typologised depending on the goals of the analysis being conducted. Different schools of thought offer different classifications and their scientific justifications [19]. There are often schematic subdivisions of platforms according to the format of their use [20]: housing

rentals, video platforms, government services, Internet browsers, crowdfunding, messengers, operating systems, passenger transport, payment systems, job search, search engines, social networks, travel services, e-commerce, etc.

The approach of A. V. Polyanin and I. A. Dokukina, who consider cross-classification of digital platforms, is of the greatest interest [21]:

- according to ownership of the asset and setting of terms and conditions: centralised, decentralised, hybrid;
- according to software product typology: infrastructural, instrumental, applied (*Fig. 2*).

According to this categorisation, each type of digital platform has a number of features.

Type A. In this case, the entity that owns the asset sets the conditions in the areas of pricing, scaling, standardisation, quality control. The key advantage of this type of platform is access to data through a documented interface. The reusable data processing toolkit reduces the cost of production at the same time.

Type B. Is characterised by a high proportion of scaling costs.

Type C. The activity of the asset owner is to collect, process and store data on the conclusion/execution of a transaction between multiple economic actors.

Type D. The asset owner offers the asset directly to the user. The key advantage of this type of platforms is the facilitation of transactions through communication interactions between stakeholders. At the same time initial costs are significantly lower compared to other types of platforms, but there are difficulties in constantly involving economic actors in interactions to ensure normalised supply.

Type E. The asset is also offered directly to the user, however it is the platform operator that "brings together" the participants of interactions. A fee is charged for facilitating the transaction process. The advantage here is the aggregation of several automated processes in one transaction, which leads to significant business effects.

Type F. In this case, the maximum number of interested participants is involved, the number of transactions is maximised, and the exchange procedure is facilitated and simplified through algorithmic and highly transparent processes.

Type G. Provides low capital costs, with the stakeholder engagement process being a key influence on efficiency.

Type H. Platforms of this type are characterised by decentralised ownership of the asset, as well as less control. The operator sets and manages the service standard. The advantage is flexible pricing, where the initial terms are set by the asset owner, but the operator and the information provider have the ability to adjust them.

Type I. The service level is centralised, but the risks are decentralised. The advantage is a significant network effect due to the link between the growth of the consumer base and the supplier base.

Thus, the presented classification allows us to apply the different types of digital platforms to the different models of innovation identified earlier.

FINDINGS AND CONCLUSIONS

Based on the given characteristics of the different types of digital platforms, typical examples for each class can be given (*Fig. 3*).

Based on the characteristics and peculiarities of each type considered, the authors suggest the most appropriate types of digital platforms to be used when implementing a particular model of innovation activity (*Fig. 4*).

However, it should be emphasised that the type of platforms in any innovation

model should be as diverse as possible — it is impossible to limit oneself to one of the proposed types and standardise the types of platforms for a particular model. In complex systems there is no single right way of management, therefore, there can be no single optimal strategy for the development of innovation activity. The constant change in the external and internal innovation environment requires flexibility in the application of digital platforms, their constant modernisation and improvement of their quality characteristics [22].

The distribution of platforms by models of innovation activity proposed in the article reflects only the main guidelines for the introduction of digital platforms in the chosen development strategy, the use of a particular type of digital platform will be effective in a particular situation and may not coincide with the authors' vision. However, depending on the typical characteristics of innovation activity models, the authors propose the most appropriate types of digital platforms for application, taking into account the analysed world experience.

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REFERENCES

1. Szántó B. Innováció a gazdaság fejlesztésének eszköze: A műszaki fejlesztés elméleti-módszertani vizsgálata. Budapest: Műszaki Könyvkiadó; 1985. 264 p. (Russ. ed.: Szántó B. Innovatsiya kak sredstvo ekonomicheskogo razvitiya. Moscow: Progress; 1990. 296 p.).
2. Dosi G. The nature of innovation process. In: Dosi G., Freeman C., Nelson R., Silverberg G., Soete L., eds. Technical change and economic theory. London: Pinter; 1988:221–238.
3. Freeman C. Technology policy and economic performance: Lessons from Japan. London: Pinter Publishers; 1987. 155 p.
4. Lundvall B.-Å., ed. National systems of innovation: Towards a theory of innovation and interactive learning. London: Pinter Publishers; 1992. 342 p.
5. Kolesnikova T. The innovation component of the Chinese economy. *Ekonomicheskii zhurnal = Economic Journal.* 2012;(4):31–39. (In Russ.).
6. Kokhno A.P. Efficiency of R&D financing. *Rossiya: tendentsii i perspektivy razvitiya*. 2013;(8–2):459–464. (In Russ.).
7. Malyutin D.L. Analysis and assessment of forming innovative environment in Japan. *Kreativnaya ekonomika = Journal of Creative Economy*. 2013;(5):65–69. (In Russ.).
8. Scott R. UK innovation strategy. *Forsait = Foresight and STI Governance.* 2009;(4):16–21. (In Russ.).
9. Khromov G.S. Current state of scientific and technical systems of industrialized countries. In: Scientific research: Coll. sci. pap. Moscow: INION RAS; 2013:32–56. URL: http://inion.ru/site/assets/files/1555/2013_naukovedcheskie_issledovaniia.pdf (In Russ.).
10. Volostnov B.I., Kuz'mitskii A.A., Polyakov V.V. Innovative and technological development: Strategies, priorities, regularities. Moscow: Vash poligraficheskii partner; 2011. 351 p. (In Russ.).
11. Glaz'ev S. Yu., Gubanov S.S., Pogosov I.A. et al. Innovative development of the economy: International experience and problems of Russia. St. Petersburg: Nestor- Istoriya; 2012. 351 p. (In Russ.).
12. Mindeli L.E., Khromov L.E. Scientific and technical systems of industrialized countries at the beginning of the global economic crisis: 2007–2009. Moscow: Institute for the Development of Science RAS; 2012. 183 p. (In Russ.).

13. Ozimina L. A., Plotnikov V. A. Digital promotion: Theoretical aspects. *Uchenye zapiski Mezhdunarodnogo bankovskogo instituta = Scientific Notes. International Banking Institute*. 2019;(1):35–45. (In Russ.).
14. Chod J., Trichakis N., Tsoukalas G., Aspegren H., Weber M. On the financing benefits of supply chain transparency and blockchain adoption. *Management Science*. 2020;66(10):4378–4396. DOI: 10.1287/mnsc.2019.3434
15. Cong L. W., Li Y., Wang N. Tokenomics: Dynamic adoption and valuation. *The Review of Financial Studies*. 2021;34(3):1105–1155. DOI: 10.1093/rfs/hhaa089
16. Fatehi S., Wagner M. R. Crowdfunding via revenue-sharing contracts. *Foundations and Trends in Technology, Information and Operations Management*. 2017;10(3–4):407–424. DOI: 10.1561/0200000071
17. Malinova K., Park A. Tokenomics: When tokens beat equity. *SSRN Electronic Journal*. 2018. DOI: 10.2139/ssrn.328682
18. Vasilyeva N. F., Kavura V. L. The model of the economy innovative development: International experience of implementation. *Vestnik Instituta ekonomicheskikh issledovanii = Vestnik of Institute of Economic Research*. 2016;(3):74–82. (In Russ.).
19. Golovina T. A., Polyanin A. V., Avdeeva I. L. Development of digital platforms as a competitiveness factor of modern economic systems. *Vestnik Permskogo universiteta. Seriya: Ekonomika = Perm University Herald. Economy*. 2019;14(4):551–564. (In Russ.). DOI: 10.17072/1994–9960–2019–4–551–564
20. Lovchikova E. I., Solodovnik A. I. Digital economy and financial infrastructure support: Relationship, problems and prospects. Banking sector: state, trends and development prospects. Proc. Int. sci.-pract. conf. Oryol: Oryol GAU; 2018:103–107. (In Russ.).
21. Polyanin A. V., Dokukina I. A. Digital platforms in public administration based on Agile management. *Vestnik Voronezhskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravlenie = Proceedings of Voronezh State University. Series: Economy and Management*. 2020;(1):126–131. (In Russ.). DOI: 10.17308/econ.2020.1/2763
22. Vertakova Yu.V., Klevtsova M. G., Polozhentseva Yu. S. Indicators for assessing digital transformation of economy. *Ekonomika i upravlenie = Economics and Management*. 2018;(10):14–20. (In Russ.).

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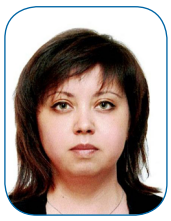

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Authors' contributions:
E. V. Popov — development of the general concept of the article.
V. L. Simonova — preparation of literature review, design of the article.
A. D. Tikhonova — development of author's typology of economic models of innovation activities based on digital platforms.

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