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# Innovation ecosystems: Research of corporate innovation ecosystems and prospects for the formation of intercorporate ecosystems in Russia

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## Abstract

The author examines the ecosystem approach, corporate innovation ecosystems and intercorporate innovation ecosystems. Considering the importance of their development for achieving the required pace of innovative development of Russian companies and the Russian economy, the study of their condition and development prospects determines the purpose of this paper. An analysis of the literature revealed an increase in the number of studies on innovation ecosystems and their diversity, indicating the potential for further development of the concept of innovation ecosystems. The analysis of the innovative activity of Russian companies shows that the main indicators reflecting the degree of innovative development in Russia in 2019-2022 are growing, but not enough. The average share of innovation costs in 2020-2022 was 2.1%, and in industry - only 1.7%, there was a reduction in the volume of inter-enterprise cooperation on the development of innovations. The author formulated the definition of a corporate innovation ecosystem as a singular innovation ecosystem established by a given company to create innovative value necessary for its development. The author has also formulated the features of its configuration that determine the logic of its functioning. The results of the study show the high potential for scientific and technological cooperation between Russian companies. Therefore, the author formulated the concept of an Intercorporate Innovation Ecosystem, which is a singular innovation ecosystem created on the initiative of two or more participants by partially integrating their corporate innovation ecosystems into an Intercorporate Innovation Ecosystem. Their aim is to carry out joint innovation activities and then independently commercialise the results. The proposed concept, implemented in accordance with the principles of the ecosystem approach, in terms of contractual relations, as well as implying the development of a single platform or functioning on a multi-platform basis, has theoretical validity and seems applicable in the practice of Russian companies and significant for the development of the Russian economy.

**Keywords:** innovations, corporate innovation ecosystem, intercorporate cooperation, intercorporate innovation ecosystem, scientific and technological alliances.

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# 创新生态系统：对企业创新生态系统的研究及在俄罗斯形成跨企业生态系统的展望

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## 简介

研究生态系统方法、企业创新生态系统和企业间创新生态系统对于俄罗斯企业和整体经济实现必要的创新发展速度至关重要，这也确定了本文的目标。文献分析表明，对创新生态系统的研究数量增加并且涵盖的方面多样化，这表明了创新生态系统概念发展的潜力。

通过对俄罗斯企业的创新活动进行分析表明，2019年至2022年间反映俄罗斯创新发展程度的主要指标有所增长，但增长速度仍然不够快：2020年至2022年间，俄罗斯经济整体的创新支出占比平均为2.1%，而工业领域仅为1.7%。此外，企业间合作开发创新的规模也出现了缩减。基于这一情况，提出了将企业创新生态系统定义为一种特殊的创新生态系统，由企业形成，旨在创造对其发展至关重要的创新价值，并阐明了其构造特点，确定了其运作逻辑。进行的研究表明，俄罗斯企业之间的科技合作潜力巨大。这促使提出了跨企业创新生态系统的概念，它是一种特殊的创新生态系统，由两个或更多参与者发起，通过部分整合它们的企业创新生态系统形成跨企业创新生态系统，旨在共同开展创新活动并进而独立商业化其结果。提出的这一概念符合生态系统方法的原则，基于合同关系，同时暗示着开发统一平台或运行在多平台基础上，具有理论基础，并可在俄罗斯企业实践中应用。

**关键词:** 创新生态系统、创新、企业间合作、企业间创新生态系统、 科技联盟。

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## Introduction

The current stage of economic development is characterised by intensifying competition, an increasing complexity of business processes, and the rapid development of digital technologies. These factors have created conditions conducive to the formation of an ecosystem approach to the organisation of business processes in the practical sphere and the emergence of a theoretical concept of innovative ecosystems. The a posteriori nature of knowledge about innovative ecosystems - this interesting phenomenon - places researchers in the position of an analyst observing its development. Many, however, strive to form a priori knowledge about this phenomenon, which has led to the formation of a significant number of approaches to its study and selected emphases. This indicates that the theoretical design of innovative ecosystems (henceforth referred to as IES) is still evolving, with new emphases, models, and approaches being continually added. At the same time, the relevance of studying these ecosystems and the ecosystem approach itself will only increase.

IES is an intriguing research object due to its multifaceted conceptualisation. In some studies, it is conceptualised as an ecosystem specifically designed for innovation. In contrast, in other studies, it is conceived as a business ecosystem, which is not necessarily created for the purpose of innovation. In this regard, it is necessary to clarify that IES (in any variation) continue to represent an innovative form of organising business activities. While there are positions according to which the degree of innovativeness of business ecosystems is questionable at a fundamental level, their platform organisation - in the modern economy - allows us to consider that these are innovative forms of organising business activities. A review and analysis of this topic can be found in [Matkovskaya, 2021]. Secondly, it is necessary to formulate a postulate, or at the very least, to make a note of it. It is erroneous

to assume that every business ecosystem is innovative and that every business ecosystem is formed with the explicit intention of creating innovations. While there is a clear need to differentiate between business ecosystems and IES, it is nevertheless evident that business ecosystems possess considerable innovative and technological potential (Matkovskaya et al., 2022). In light of the above, it is proposed that the existing criteria for classifying ecosystems be expanded to include the presence or absence of a goal of creating innovations, namely innovative values (hereinafter IV), among the initiators of their formation. It is therefore the intention of this study to examine in detail the specific case of the IES, which has been deliberately created with the objective of generating IV.

The focus on the study of corporate innovation ecosystems (hereinafter referred to as CIES) and inter-corporate innovation ecosystems (hereinafter referred to as ICIES) makes the subject of the study even more interesting. It is assumed that the development of ICIES through the partial integration of two or more CIES will make it possible to utilise the potential of enterprises and obtain a synergistic effect from inter-firm cooperation, and may become one of the key factors in accelerating the innovative growth of the Russian economy. In addition, the aim of the 'co-opetition'/'com-operation' (i.e. a combination of cooperation and competition) based ICIES is to create conditions firstly for the joint creation and separate use of information resources (and their exchange), and then to increase the competitiveness of companies cooperating within the ICIES. As a result, research becomes not only transdisciplinary but also transconceptual, based on the sum of knowledge embedded in concepts such as open innovation, digital economy, knowledge economy, innovation economy, sharing economy, concepts of 'corporate' and 'factory' science, network interactions, platform models, knowledge ecosystem, intellectual ecosystem, multi-agent networks, as well as scientific and technological alliances and consortia, inter-enterprise cooperation, etc.

All this determines the relevance of the topic, and it is also extremely significant that the development of CIES and cooperation between Russian companies within the framework of ICIES can create conditions for accelerating the achievement of the goals of import independence at a minimum, and the goal of accelerating innovative development - at a maximum. At the same time, the results are quite universal and can be applied by companies in other countries.

The article aims to carry out a study of ideas about IES, to study the characteristics of CIES, to characterise the specifics of its configuration and the logic of its operation, thereby establishing a foundation for developing the ICIES concept.

The article begins with the concept of IES and views on it, then presents the results of a study of the innovative activity of Russian enterprises, their experience in the creation and operation of CIES, the state of inter-enterprise scientific and technical cooperation of Russian enterprises, and also proposes a model of ICIES.

It can be seen that the structure of the article is designed to stimulate interest among those engaged in the fields of CIES formation, corporate governance, and innovation policy. Additionally, the study's findings can guide the development of strategies to advance IES at both corporate and inter-company levels, while also shaping the direction of state scientific and technological policy.

## 1. Research object and theoretical review

The research object characteristics are varied and have been explored by numerous researchers who have concentrated on specific aspects. In this work, however, we will highlight the nine most critical points (noted in brackets). For example, in [Plata et al., 2021] it is stated that IES is usually understood as a complex system in which different firms, organisations, and support mechanisms are combined to carry out knowledge dissemination activities (1), and that the purpose of their creation is to generate value and deliver a focal product or service (2).

The work [Akberdina, Vasilenko, 2021] points out that 'many authors working with the concept of IES repeat Moore's postulates and add an innovative component to them' (3). Based on a broad analysis of IES, the same researchers rightly state that IES is a 'multi-component concept' (4) and formulate a point of view, fully shared by the author of this work, that 'the emergence of this concept marks a transition to a new paradigm in management...'. For theorists, this paradigm encapsulates the latest achievements in management as a science and becomes the basis for subsequent research; for practitioners, it simplifies the implementation of modern management knowledge by dealing with one complex concept rather than a dozen disparate ones. The articles [Smorodinskaya, 2013; 2014] formulate that the knowledge economy presupposes a new 'architecture' of connections between economic entities and the formation of new types of systems based on network cooperation and network interactions. The scale of these changes is so significant that we can describe it as a 'civilisational shift' and a change in the development paradigm. This marks the emergence of a new universal method for producing public goods (5), as agreed upon by the authors of the study [Tolstykh et al., 2020]. The ecosystem approach emphasises the interactions among participants (collaborations) that facilitate the generation and dissemination of knowledge, which is then transformed into innovations' (6).

Criticism of the concept of IES 'should not be perceived as a signal of the inconsistency of the concept, but as a vector for further research' and 'the concept of IES itself is a starting point for many different approaches designed to solve specific practical problems in certain conditions, including in a relatively narrow segment' (7) [Akberdina, Vasilenko, 2021].

The next point (8) is that a number of works use numerous variations that have formed a whole family of terms, including ecosystems: 'entrepreneurial' [Venchurnye Investitsii.., 2011], 'stakeholder' [Da Silva et al., 2019], 'platform' [Volkova, Yakovleva, 2017], 'universal' [Kleiner, 2019], 'network' [Smorodinskaya, 2014], 'digital' [Tolstykh et al., 2018], 'nuclear' [Brito, 2018], 'regional' [Plakhin et al., 2020], 'smart' [Ciasullo et al., 2020]; many of the above, as well as 'unitary', 'multi-actor networks' and others, are explored in [Popov et al., 2022]. The authors of [Tolstykh et al., 2020], on the other hand, distinguish between 'innovative' and 'industrial' ecosystems, noting that they are 'generally implemented independently and in parallel', while raising the 'status' of these research objects to the level of 'theories', highlighting respectively the 'IES theory' and the 'industrial ecosystem theory' (9) and summarising that, in general, 'ecosystem theory is still at the stage of methodological development'. This opinion is also expressed in [Plata et al., 2021], where it is emphasised that the IES concept is 'still under development'.

Thus, the peculiarities of IES as an object of research are determined by its 'young' age, its direction, which is in the stage of methodological formation, and its multi-component nature, which together create conditions for the development of the concept of IES (both in scientific and practical activities). At the same time, the author of this article is increasingly convinced that the distinction between concepts will not contribute to the development of 'ecosystemic thinking' with the same dynamism and effectiveness that is currently being observed and which is progressive in nature.

Turning to the details of the content of the theoretical review, I would like to draw attention to the fact that the team of authors [Tolstykh et al., 2020; Tolstykh et al., 2020], referring in particular to [Chesbrough et al., 2006; Tsujimoto et al., 2018], notes that 'five theoretical directions of research on IES have been formed' and that 'many modern works are devoted to the study of initial barriers that negatively affect the implementation of sustainable practices'.

At the same time, the author's study of the works published in the last decade, and especially since 2019, has revealed an increasing number of research angles. These are presented in Table 1.

In concluding the theoretical review, it is necessary to pay attention to some more important points. Firstly, it should be noted that the author belongs to the group of researchers who are convinced that the creation of the IC is one of the key aspects that predetermined the formation of the IES and the goal of any IES. This highlights the growing importance of developing a value-based approach and underscores the significance of research focusing on the concept of value. The article by A.V. Trachuk, N.V. Linder, and V.O. Tuaev is undoubtedly such a work, which systematises the key aspects of the understanding of value. The author of this article, considering the analysis conducted in it to be extremely thorough, refrains from conducting her own analysis of this category and relies on the results of the study [Trachuk et al., 2022], additionally emphasising the great practical significance of the model for creating a successful value proposition formulated by them.

Secondly, it is important to note that the journal 'Strategic Decisions and Risk Management' has already published research related to, but not identical with, the subject of this article. Among them, it is particularly worth highlighting the works devoted to identifying the impact of digital platforms on the study of industrial enterprises [Trachuk, Linder, 2023]; studying management education, as well as formulating a position that fully agrees with the author's position that management science must understand the changes that are taking place [Gitelman et al., 2022; 2023]; studying the strategic aspects of the functioning of digital platforms and the interaction of their participants [Kuznetsova, 2022; Khovalova, 2022].

The methodological basis for studying the problem under investigation was a combination of general scientific methods (analysis and synthesis, scientific abstraction, generalisations, analogies), methods of economic analysis, classification and grouping, ranking and structuring, and quantitative and qualitative analysis of data, as well as methods of systemic, logical, structural, and comparative analysis, graphical analysis, and design methods.

## 2. Characteristics of the ecosystem and their structure

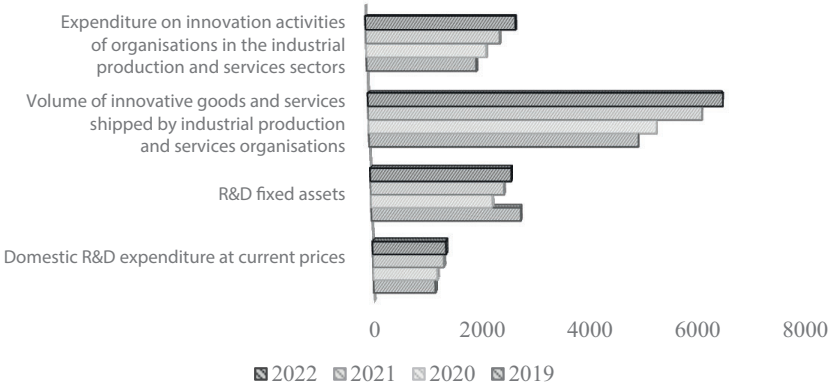
This section presents an understanding of IES and CIES. The review carried out and the previous studies of the author of this article have allowed us to form our own integral understanding of the IES, the key points of which are as follows:

1) IES aim to create ICS and create attractive conditions for their participants through the possibility of optimising their transaction costs;
2) IES are based on a new form of ('non-combative') competition - co-opetition/com-operation;
3) IES are developing thanks to advances in ICT and the growing demand for digital products;

Table 1
The most interesting views on Innovation Ecosystems (IES) and approaches to their research in the scientific literature, 2019–2024

| Context (focus, emphasis, or angle of research), source | Vision |
|---|---|
| Identification of significant features [Tolstykh et al., 2020]. | Key features: complementarity and coordination of companies from different sectors, united by the principle of common specialisation. |
| In the context of Society 5.0 [Fukuda, 2020; Weerasinghe et al., 2024]. | An ecosystem view of the model of scientific, technological, and innovative activity (STI) in Society 5.0, associated with the transition from a STI ecosystem based on push methods to an STI ecosystem based on pull methods. The authors also examine the socio-economic risks. |
| Transformational aspects of the transition to a green economy [Konietzko et al., 2020; Yan et al., 2023; Zhang et al., 2023]. | Innovative ecosystems as a tool for transforming linear economies into circular ones Green Ecosystems and Green Innovation Ecosystems |
| Digital IES [Beltagui et al., 2020]. | Digital IES |
| Talent orientation [Huang et al., 2023] | The study of the conditions of the IAS, which ensures high competitiveness of talents, and the differentiation of types of UES on this basis |
| Generation of new metaphors for NIS [Ghazinoory et al., 2021; Ghazinoory et al., 2023] | Introducing new metaphors:<br>– Ecotone, not ecosystem;<br>– National innovation biomes |
| Standardisation in platform ecosystems [Nylund, Brem, 2023] | The influence of dominant platforms on standardisation in IES at the level of technologies, firms, and societies |
| Social ecosystems [Catala et al., 2023] | Key characteristics of social economy ecosystems are the balance between economic objectives and the creation of social value and social innovation, collective social entrepreneurship, and specific institutional components |
| Platform capitalism [Srnicek, 2020] | The concept of platform capitalism |
| Global IES [Cho, Park, 2022] | On the Interaction of NIS and Global Innovation Systems (GIS) |
| Proposal for the application of a ‘holographic strategy’ [Barile et al., 2022] | The ‘holographic strategy’ is another typical pattern that characterises a platform IES that transcends existing market boundaries |
| Responsibility of the IES [Stahl, 2022] | It is assumed that the influence of IES extends beyond their immediate technical environment, which determines the need for responsible behaviour of these IES (the concept of RRI - Responsible Research and Innovation) |
| Co-evolutionary aspect, limits, and value proposition [Breslin et al., 2021; De Vasconcelos Gomes et al., 2021] | IES are complex adaptive systems in which patterns of change emerge from co-evolutionary interactions between actors at the micro level, providing ‘co-evolutionary rules of interaction’.<br>Innovation supports and stimulates change in IES |
| Variable Innovation Ecosystems [Liu et al., 2022] | IES provide access to additional resources such as knowledge of advanced science and technology and ‘intensive market knowledge’. |
| IES as complex networks, or meta-networks [Plata et al., 2021; Robertson et al., 2023] | IES are composite systems of innovation meta-networks and knowledge meta-clusters that act as building blocks for the creation of knowledge and innovation architectures |
| Transformational Governance of Innovation Ecosystems [Könnölä et al., 2021] | Transformational governance, aimed at increasing the adaptability and resilience of the ecosystem, organises socio-technical transformations based on the balanced presence of diversity, interconnectedness, poly-centricity, redundancy, and orientation |
| Technological learning and small states [Petraite et al., 2022] | Technological education is at the heart of technological modernisation, particularly important for small countries with open economies facing the challenges of innovation-driven growth |
| Transfer [Shmeleva et al., 2021] | A study of the experience of creating technology transfer networks in Russia and the development of a promising national technology transfer model based on the concept of an innovation ecosystem and open innovation |

Fig. 1. Dynamics of some indicators of innovation development in Russia in 2019–2022 (billion roubles)




*Source:* compiled by the author on the basis of: Brief Statistical Compendium (2023). Moscow: IPRAS RAS. P. 11.

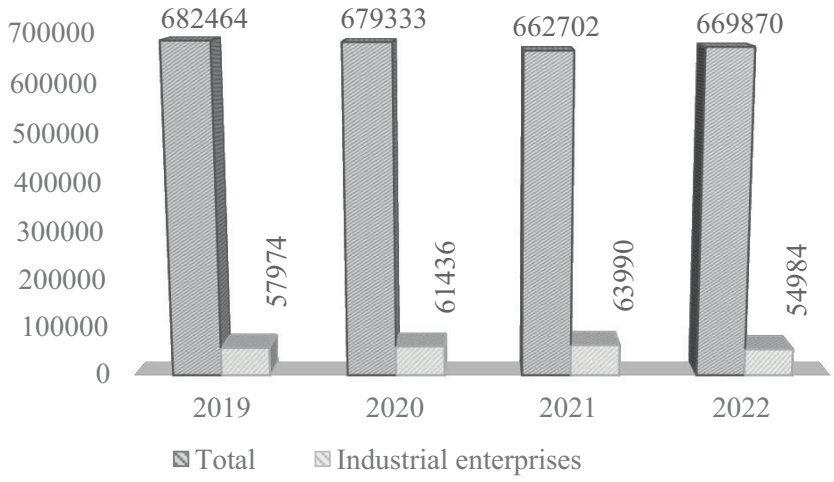
4) IES represent a particular analogue-digital continuum of business organisation;
5) IES mark the emergence of a new form of management - orchestration;
6) IES are self-sufficient;
7) IES involve participants connected by 'co-creation of value', as presented in [Breslin et al., 2021], and determine co-innovation activities [Matkovskaya, 2021; Matkovskaya, et al., 2022; Lafuente et al., 2023; Matkovskaya 2023a; 2023b]. The presented understanding of IES correlates primarily with the understanding of IES formulated in works such as [Scott et al., 2015; Adner, 2017] and others.

Given the multi-component nature of the IES, it should be noted that they can be differentiated according to a number of criteria. In this regard, it is necessary to supplement the previously presented criteria [Matkovskaya, 2021] with other criteria relevant to the study:

1) by industry, region;
2) by level (CIES, MCIES, macro and global);
3) by economic activity (industry, finance, education, etc.);
4) by scalability;
5) according to the initiators and the composition of participants (state, business groups, companies, individuals)
6) by the number of digital platforms involved (single-platform and multi-platform), etc.

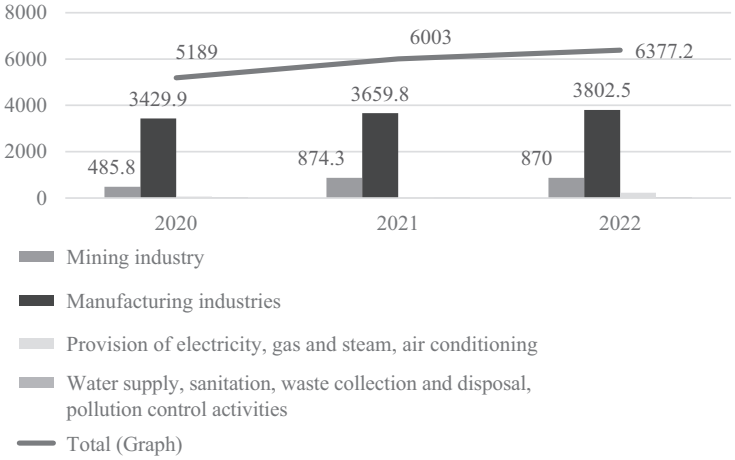
Based on all the above, it can be concluded that a CIES is an IES created by a company for the purposes of its innovative and technological development, which can: operate within the framework of a separate company

Fig. 2. Share of personnel engaged in R&D in industrial enterprises and in the economy as a whole in Russia, 2019–2022 (%)




*Source:* compiled by the author on the basis of: Brief Statistical Compendium (2023). P. 22.

Fig. 3. Volume of shipped innovative goods and services provided by industrial production and service organisations by type of economic activity in 2020-2022 prices (excluding the scope of scientific R&D) (billion roubles)




*Source:* compiled by the author on the basis of: Brief Statistical Compendium (2023). P. 89.

or holding (in the latter case, it can be a network structure); be a formalised or informal structure.

The peculiarities of the logic and configuration of a CIES are that any IES (including the CIES) implies:

1) the presence of a platform or is in varying degrees of digitisation of business processes;
2) has a synergistic nature;
3) allows the implementation of a deep collaboration model according to [Mezentseva, 2023].

In the study of KIES in this article, the author does not consider the direct involvement of academic science organisations and universities in KIES, although she does not deny the importance of such cooperation. The focus is on the company's work on the use and development of its innovative potential for the creation of the ICT.

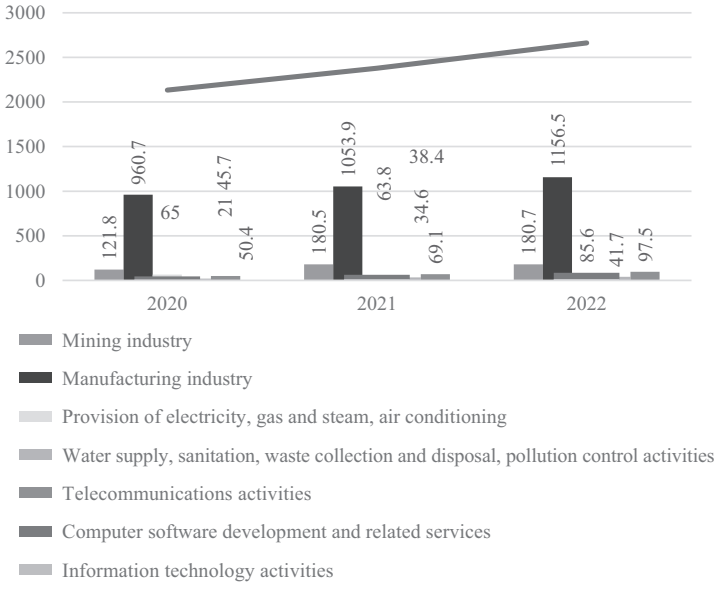
## 3. Results of the empirical study

### 3.1. Study of the innovative activity of Russian companies and the availability of CIES among them

In order to assess the level of innovative activity of Russian enterprises, some significant parameters characterising the innovative potential of the economy were studied in order to identify the problems that can be largely solved in the context of the formation of the CIES.

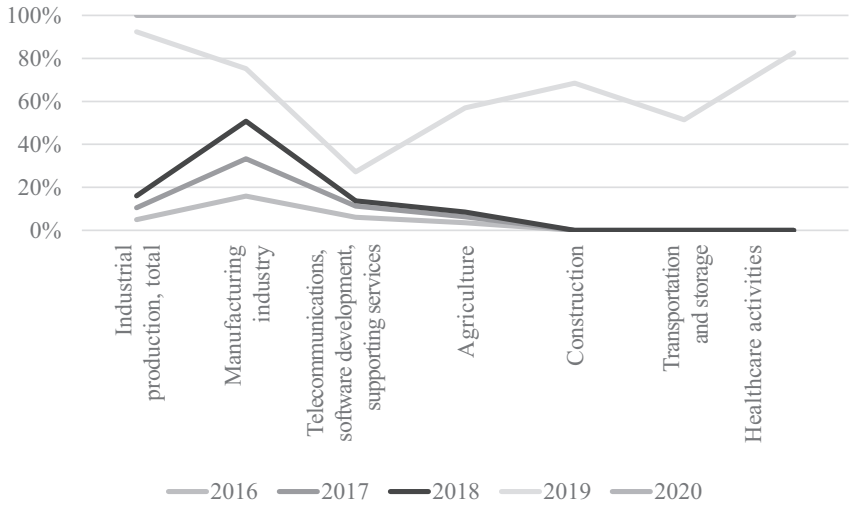
Thus, Figure 1 shows the dynamics of some indicators of innovative development in Russia in 2019-2022. The graph shows that there is an increase in all

Fig. 4. Innovation costs of industrial production and service organisations by type of economic activity in 2020-2022 prices (excluding R&D) (billion roubles)




*Source:* compiled by the author on the basis of: Brief Statistical Compendium (2023). P. 91.

Fig. 5. Joint projects for R&D in 2016–2020 (%)



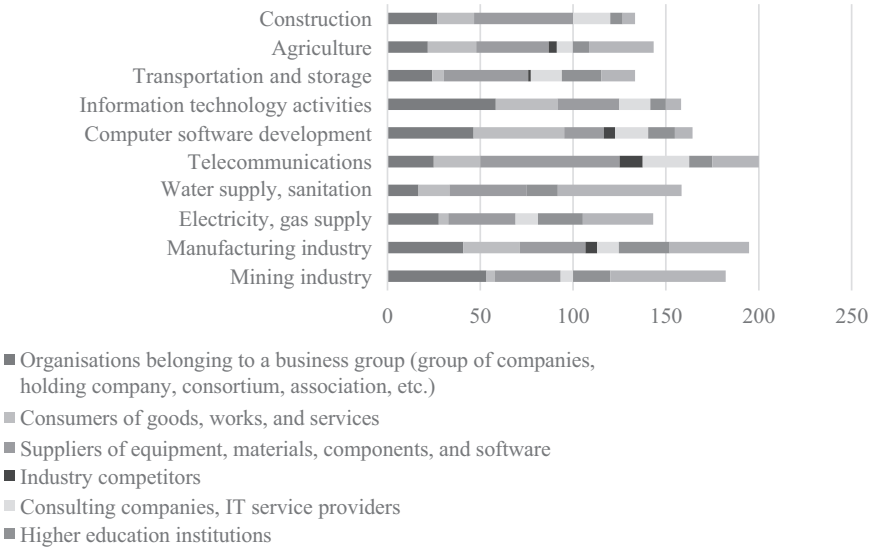

*Note.* Indicators are calculated for organisations that have engaged in innovative activities; prior to 2019, this applied to organisations with technological innovations.
*Source:* compiled by the author on the basis of Indicators of Innovation Activity: 2022 (2022). Moscow: National Research University Higher School of Economics. P. 168.

analysed indicators, which can only be recognised as a positive phenomenon, although the growth rate remains extremely low.

However, it should be noted that the share of innovation costs in the volume of goods shipped by industrial production and services organisations by type of economic activity is low. On average, in 2020-2022, it was 2.1% in the economy, 1.7% in industry as a whole, 3.6% in telecommunications, 4.2% in computer software development and related services, 1.77% in information technology, and the highest rates were in scientific research and development - 35.9% (which is natural, but also insufficient)[1].

On the negative side, in 2018-2020, 5.4% of Russian organisations seriously delayed their innovation activities, 5% suspended them, and 5.6% did not start any projects. During the same period, there were 29,672 uninitiated innovation projects, 27,509 projects that were halted, and 28,772 projects that experienced significant delays. The highest rates of uninitiated projects are found in the manufacturing industry, particularly in low-

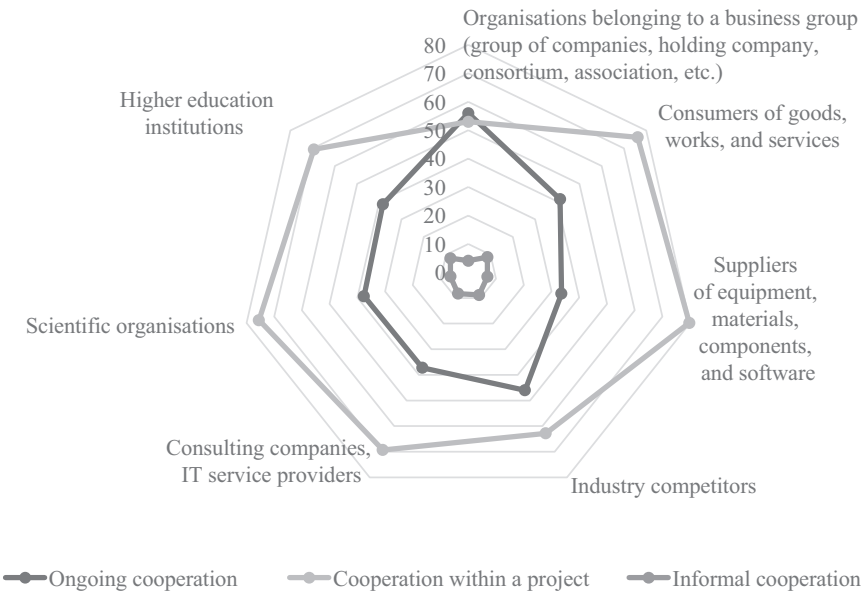
Fig. 6. Distribution of organisations involved in joint R&D projects, by type of partner and by type of economic activity, 2020 (number)




*Note.* Indicators are calculated for organisations that have engaged in innovative activities; prior to 2019, this applied to organisations with technological innovations.
*Source:* compiled by the author on the basis of Indicators of Innovation Activity (2022). P. 171-175.

[1] Short statistical summary (2023). Moscow: IPRAS RAS. P. 93.

Fig. 7. Cooperation in performing R&D by type of cooperation relationship, 2020 (% of the total number of organisations involved in joint projects)




*Note.* Indicators are calculated for organisations that have engaged in innovative activities; prior to 2019, this applied to organisations with technological innovations.
*Source:* compiled by the author on the basis of Indicators of Innovation Activity (2022). P. 190.

tech and mid-tech sectors, and in the service sector, especially in transportation projects and activities related to law, accounting, and healthcare[2].

The largest contribution to scientific and technological development comes from the field of science and education. Figure 2 shows the dynamics of the number of persons employed in research and development (R&D) in industrial enterprises and their share in the total number of persons employed in the economy.

The low number of personnel engaged in R&D in industrial enterprises reflects the insufficient activity of Russian companies in the field of innovative development; the growth rate needs to be increased. In order to clarify the details of this problem, Figure 3 shows the industrial distribution of the production of innovative goods, and Figure 4 shows the costs of innovation of industrial production and service organisations by type of economic activity in current prices for 2020-2022.

The data presented raises the question of the prospects for increasing the pace of innovative development of Russian enterprises. While there is potential, it is essential to boost the management's motivation and foster an understanding that enhancing the company's innovative capabilities is crucial for its sustainability and competitive growth.

It can be concluded that the formation of CIES should become a condition for the growth of innovative activity of Russian enterprises. At the same time, it should be noted that the practice of using CIES tools is already being carried out by domestic companies, and we can observe quite effective experience in a number of cases. At the same time, open innovation tools are quite actively used to develop their CIES, including competitions of innovative projects, business accelerators, business incubators, business technology parks, scouting, etc. According to [Mezentseva, 2023], such methods are used by the State Autonomous Institution of the Russian Scientific and Technical Complex BashTechInform, PJSC Severstal, PJSC United Aircraft Corporation, SC Rostec, PJSC United Machine-Building Plants, PJSC Sibur, JSC Russian Railways, EFKO, JSC Tatneft, Rusal, and according to [Matkova, 2018], open innovation models are being developed by state corporations Rostekhnologii and Rosatom, and open innovation principles are being implemented by Sberbank, Lukoil, Russian Railways, and MTS.

When addressing the issue of the mechanism of IES formation, which is significant for the development of IES by Russian companies, it is worth paying attention to the work of [Wiki et al., 2021], who proposed a concept for the formation of IES of a large company. They note that large companies need to stop thinking and acting as if they were monolithic organisations with a single business model and start applying an ecosystem approach to their activities. Every modern company needs to have a balanced mix of existing products that are in high demand and new products that are looking for a profitable business model. Managing

[2] Innovation indicators: 2022: Statistical Summary (2022). Moscow: National Research University Higher School of Economics. P. 202-204.

such an innovative portfolio requires the use of the right management tools depending on where the new products are in their innovation journey. Wiki et al. [Wiki et al., 2021] formulate five principles of CIES that should go through a cycle: create - evaluate - learn. It seems that this approach should be used when Russian companies create their CIES - of course, taking into account cultural characteristics, traditions, macro- and microeconomic situation, and adaptation to the specific conditions in which they operate.

The short conclusion of this sub-clause is that the innovative development of Russian companies has not yet reached the required growth rates; the existing potential must be developed within the framework of CIES, which will allow the use of own resources, thereby improving the quality of corporate culture, not to mention increasing competitiveness.

### 3.2. Research on the cooperative activity of Russian companies and inter-company cooperation in the creation of the IC

The original plan for writing this article did not include addressing the issues of the degree of readiness of Russian companies to form inter-company IES and develop a corresponding model. However, the study of the innovative potential and practice of Russian IES has forced us to pay attention to the most important point (which can also be presented as a research hypothesis). Perhaps, the establishment of an IES is difficult for a single company, and this gives reason to assume that the initiation of the formation of ICIES is relevant for the Russian economy. Incidentally, the works [Xie, Wang, 2020; Akberdina, Vasilenko, 2021] emphasise that a company's membership in an innovation ecosystem expands its capabilities; the authors identify six types of configurations of open innovation ecosystems.

The above allows us to conclude that in the current situation there are two options. The first is to postpone the decision on creating conditions for intensifying cooperation between Russian companies through the creation of intercompany IES. The second is to develop a set of measures to create conditions for overcoming disunity and creating such IES in the country. Of course, the state should also be involved in the process of creating ICIES.

At the same time, it should be noted that Russian companies have been engaged in inter-firm cooperation in R&D for quite some time. For example, in [Ezangina, 2013] evidence of the prospects for institutionalising inter-company relations, their clustering and a number of examples are given, including the organisation of the Union of Pharmaceutical and Biomedical Clusters... the creation of the Russian Union of Innovative Territorial Clusters in the field of information technology and electronics.

Despite such positive experiences, a number of data show a decline in the activity of enterprises in the field of innovative cooperation (Fig. 5).

Figure 6 shows the distribution of organisations involved in joint R&D projects by type of partner and by type of economic activity in 2020, and Figure 7 shows R&D cooperation by type of collaboration in 2020.

The statistical data and their analysis indicate a decline in the cooperative activity of Russian companies across various sectors; however, this decline does not imply a complete absence of cooperation, as there is still collaboration among competing companies. In this regard, it is necessary to assume the high potential of inter-firm cooperation in the conduct of R&D and the formation of ICIES. There is already a request from practitioners to representatives of the scientific community to develop a methodology for creating a structure that ensures the implementation of effective inter-firm interaction in the creation of innovations. The approach to the formation of ICIES can be implemented, inter alia, with the help of the model proposed below and its conceptual description.

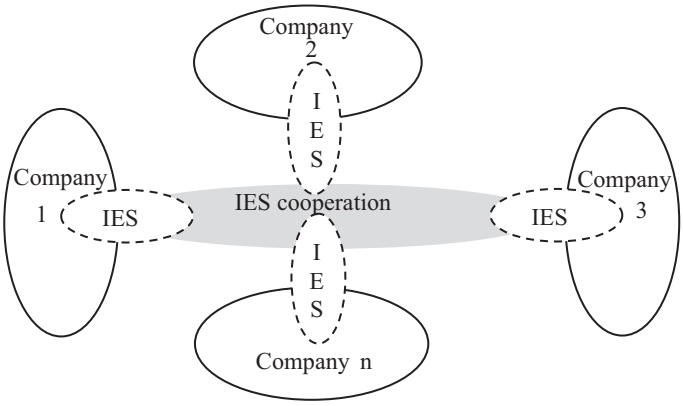
## 4. ICIES model

As for the presentation of the ICIES model, it must be emphasised that the author is only announcing her development of this concept and intends to continue this work in subsequent studies. Thus, this article presents only the beginnings of the formation of the ICIES concept.

At this stage of the research, the MCIES concept is based on the following postulates:

1. The feasibility of constructing the model is justified by the need to develop proposals for Russian enterprises (the real sector of the Russian economy) to develop their innovative potential and accelerate the pace of innovative and technological development of the Russian economy.
2. The feasibility of using the ICIES in practice is justified by the effectiveness of the ecosystem approach in implementing inter-company scientific and technical cooperation, carried out with the aim of creating economically significant joint ICs, the commercialisation of which is carried out independently by the ICIES participants (within the framework of their CIES).
3. The conceptual foundations of the ICES integrate the concepts, theories, and approaches of open innovation, the ecosystem approach (and the IES), inter-firm interaction (scientific and technological strategic alliances), neo-institutionalism, contract theory, multi-agent systems, network interactions, and cluster and project approaches.
4. The ICIES implies the interest of the parties that unite in accordance with the theory of ecosystem

Fig. 8. Intercorporate innovation ecosystem (IES) model




*Source:* compiled by the author.

contractual relations (disclosed in [Matkovskaya, 2023a]) and is based on the co-ompetition/com-operation of several independent participants who may be competitors in their product (and resource) markets.

5. The ICIES is called upon (functions): (1) to facilitate the effective unification of the efforts of the CIES of competing companies to solve problems and create joint ICs and can be implemented on a project basis; (2) to serve as the most effective way to consolidate the efforts of participants in creating joint ICs; (3) to optimise the costs of creating IICs. In addition, the ICIES envisages the possibility of creating a bank of technological solutions for the development of these companies.

6. Participants: (1) have their own IES that can be integrated into the common platform, or have the ability to be fully or partially integrated; (2) are independent organisations and are independent in their decision to join the ICIES; (3) are interested in creating innovation, are willing to make the necessary investments, recognise the presence of specific ecosystem risks, and are willing to hedge against them.

The ICIES model is shown in Figure 8.

The author does not imply that all companies in a sector of a given economy should be included in the ICIES or that their number should be limited to four companies, as shown in Figure 8. The number of companies included in the ICIES can vary from 2 to n (where n is all national companies or all companies operating in the national market), which also implies the likelihood of healthy competition between different ICIES within a country.

Thus, the ICIES is a special IES promoting the development of an ecosystem approach and possibly representing a new way of implementing the concept of open innovation created on the initiative of two or more participants by integrating their ICIES (partly under contractual agreements) into a common IES (ICIES) with the aim of carrying out joint R&D and subsequent independent commercialisation of the results of the innovative activities, implemented in accordance with the principles of the ecosystem approach and under the conditions of contractual relations [Matkovskaya, 2021], implying the development of a single platform or functioning on a multi-platform basis.

The development of ICIES can be facilitated by two key factors: first, the findings from authors who have studied inter-organisational relations (IOR) management issues related to innovative cooperation [Cropper et al., 2008; Mesquita et al., 2017; Lumineau, Oliveira, 2018; Aagaard, Rezac, 2022]; and second, the results from the study [Wei et al., 2020] that examined the IOR of Haier, Chery, and Siemens.

## 5. Discussion of findings, controversies, and directions for future research

The study of theoretical issues allowed us to establish their a posteriori nature, which makes the studies considered relevant from both a practical and theoretical point of view. The analysis of the literature has allowed us to note the growth in the number of studies on IES and their multi-aspect and multi-directional nature, which determines the potential for the development of the IES concept and allows us to believe that we are witnessing the formation of a new management theory.

The study of the theoretical foundations of IES presented in this article and the author's previous studies allowed to formulate her own vision of the concept of IES and CIES, to record their features and specific aspects, and to develop approaches to the typology of CIES. The analysis of the innovative activity of Russian enterprises revealed a still insufficient level, with a decline in the pace of innovation, a reduction in joint R&D projects, and a decrease in the number of participating organisations. Yet, the potential of

inter-firm innovation cooperation allows us to make assumptions about the feasibility of forming the ICIES. At the beginning of this work, the author formulated the postulates of the ICIES and proposed a conceptual model of its functioning. These postulates can be interpreted as 'the rules of the ICIES' and they can become the basis for forming the methodology for creating and ensuring the functioning of the ICIES. The latter generally determines the directions of further work.

At the same time, of course, the article is not without controversial points and limitations. Certainly, the issue that needs to be discussed in the scientific and practical environment is the need to develop not only the methodology for the formation of ICIES, but also the methodology for the formation and organisation of the effective functioning of CIES. At the same time, it is advisable to develop these concepts in parallel, coordinating and measuring the direction of conclusions, theoretical constructions, and practical solutions.

The limitation is the deliberate exclusion of organisations in the banking, scientific, and other sectors, as well as mechanisms for involving academic science and the higher education system in ICIES. This decision was made not only due to the article's limited scope but also because it focuses on studying the unification of competing participants within ICIES. Additionally, these structures and aspects have already been examined by the author in other works. Of course, insufficient attention has been paid to the study of the risks involved in creating and participating in ICIES, as well as to the problem of financing. The latter also determines the directions of the author's further research.

However, the aim of the article has been achieved. The author notes the advantage of the article in its broad formulation of the problem regarding the development of CIES and ICIES. In light of this, the author invites the scientific community and business leaders to engage in discussions and develop a methodology or concept for ICIES. This is significant given the urgent need to adapt or create an accelerating mechanism for the innovative development of the Russian economy.

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