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Digital Innovation Ecosystems and Their Role in Financing Innovations in Russia

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ABSTRACT

Objective. This article explores the role of digital innovation ecosystems as a key driver in the development of Russia's contemporary innovation financing system. **Methods.** The study is based on a review of relevant literature and comparative analysis. **Results.** The authors present a comprehensive analysis of both international and domestic experiences in the creation and operation of innovation clusters modeled on the "Silicon Valley" framework. The study also examines modern digital platforms that facilitate effective interaction between investors and innovative projects. Employing a systems-based approach, the paper identifies the characteristics and limitations of current innovation financing instruments and substantiates the need for alternative mechanisms to attract private capital to the innovation sector. The authors propose practical recommendations for fostering the development of Russia's digital innovation ecosystems. **Scientific novelty.** The research introduces an integrated approach to studying the role of digital innovation ecosystems in financing innovation in Russia. It incorporates insights from international "innovation valley" models and leverages the potential of modern digital platforms for investment attraction. **Practical significance**. The findings of this study can inform the design of national policy initiatives aimed at promoting innovation-led development and digital transformation of the economy.
Keywords: digital innovation ecosystems; innovation financing; innovation clusters; venture investments; digital platforms; SAFE; startups; innovation activities; private capital; technological development

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INTRODUCTION

The economy of any country requires innovative development, as it is precisely through such development that new products, production methods, and ways of organizing production, management, and marketing processes can be created [1]. In countries with the most advanced knowledge-based economies, its share of GDP can reach 30–40%, whereas in Russia it is about 14% [2]. Research shows that Russian businesses are extremely poorly involved in the implementation of new technologies and practices, and according to data from the Generation S fund, fewer than 12% of Russian companies are innovation-active.[1]

The development of a knowledge-based economy requires investments from either businesses or the state, which are associated with high risks. In practice, Russian businesses show little interest in investing in research and development. According to data from the National Research University Higher School of Economics, in the overall structure of funds used for innovation, the state accounts for about 60%, 14% comes from the organizations' own funds,[2] and the rest from third-party investments (funds, private organizations, companies). This situation leads to a lack of incentives for developing innovative projects and does not promote competition, resulting in lagging behind in certain production sectors.

The decision to use government funds is quite logical, especially given the extremely high risks at the early stages. For example, a breakthrough project for Russian science and industry was once implemented — the creation of nuclear weapons. At that time, Russia lacked sufficient competencies, and in the shortest possible time, research and production enterprises were established, including the famous Kurchatov Institute.

Although government capital often provides the initial impetus for such projects (as was the case with almost all major innovation clusters), its further use is associated with organizational, legal, and other barriers. The directions for its application are approved at the highest level and cannot change quickly, unlike private capital. Notably, since 2020, no new unicorn companies[3] have emerged in Russia. This is precisely why Russia faces the challenge of establishing a system of interaction between private businesses, research organizations, and the state, aimed at creating and commercializing innovative developments.

At the same time, questions arise: what should such a system look like? What are its sources of funding? And so on. A.G. Aganbegyan suggests adopting the experience of creating "Silicon Valleys" around the world [3]. Russia has its own experience with similar projects, but in the scientist's opinion, the scale of their funding is incomparable to that of foreign counterparts. Moreover, as noted above, government capital cannot be quickly increased to meet the needs of growing startups or technological solutions.

Other Russian researchers likewise do not offer a concrete mechanism for financing innovation. For example, L.M. Gokhberg confirms the impossibility of relying indefinitely on government capital, but does not specify exactly what should be used instead, merely noting that the very nature of innovation is reaching a new level.[4] Thanks to the growth of digitalization, the innovation process is becoming decentralized, so the development of new technologies can be carried out by scientists who do not necessarily have to be located in the same city or the same research organization.

Thus, we face the challenge of proposing a financial mechanism for a digital system that unites innovation developers, research organizations, and private businesses.

RESULTS. THE EXPERIENCE OF "SILICON VALLEYS"

In a sense, "Silicon Valleys" — zones for the concentration and placement of innovative com-

[1] URL: https://generation-startup.ru/upload/iblock/9cf/9ym25asu3p3jq9yp159w26ke91xzhwps/

[2] URL: https://portal.inno.msk.ru/uploads/agency-sites/analytics/research/9d954d6f8775e5361279fd1dbd1382999c5d.pdf/

[3] A start-up company that has achieved a market valuation of over $ 1 billion.

[4] URL: https://www.youtube.com/watch?v=nDBufBrO788

panies — have become the gold standard for developing a country's innovation ecosystem. The term itself originated from the name of the famous Stanford Technology Park in California. Such centers serve as hubs for venture capital investments in innovative projects and companies.

Russia has experience in organizing similar projects. The first was the Skolkovo Innovation Center. Other examples include Kazan's Innopolis and the technology park under construction at Moscow State University. However, although the construction of such centers in Russia has been underway since 2010, they have not become as financially or economically successful as their foreign counterparts. For instance, A.G. Aganbegyan cites the Shanghai Free Trade Zone, where the total turnover of all companies amounts to about $ 200 billion, and the center in Bangalore, where unicorn companies match those in New Delhi in terms of capitalization.

Although such projects initially developed with state capital, at a certain stage the main source of investment became private business — something that has not happened in Russia.

Overall, nearly all Russian researchers identify the creation of startup studios or specialized venture funds as the primary means of attracting investment flows into new technologies [4–6]. However, questions remain open: what tools should be used to increase private business interest in investing? Should new "Silicon Valleys" be created to form an innovation ecosystem based on new financial principles?

A.G. Aganbegyan notes that Russian "Silicon Valleys" should be established on the basis of the country's largest institutes and universities, since any innovation begins with intellectual work. However, as mentioned above, the innovation process is undergoing a transformation driven by digitalization. Therefore, while the creation of new specialized innovation zones is possible, it is not a necessary condition, as it requires significant initial investments in setting up technology parks and office buildings. This could be avoided by creating digital innovation ecosystems, which would allow participants to collaborate regardless of factors such as geographic location.

DIGITAL INNOVATION ECOSYSTEMS

With the widespread development of digitalization around the world, digital platforms have emerged that connect innovative startups with investors. The most well-known of these at present is Crunchbase, which contains information on more than 3 million innovative companies at various stages of development and 287,000 investors worldwide [7]. Initially, this project was an internal resource of the information company TechCrunch, but by 2014 it began to grow rapidly and turned into a primary platform for finding connections between investors and startups.

In Russia, the first similar database was the startup registry of the Skolkovo Foundation. Originally created to list the residents of its innovation cluster, it later began to register innovative companies throughout Russia. According to data on the organization's website, 4,507 companies and 4,720 technology projects[5] are now registered in this ecosystem.

Another example is SberUnity, a platform of the Sber corporation, which was established as a fully digital solution aimed at working with startups at no earlier than Round A stage. It does not provide for the R&D stage of groups of scientists, and only legal entities are allowed to register. Currently, 94 major Russian corporations are registered as investors on the platform, along with 5,261 startups and technology companies, mainly in the IT and FinTech[6] sectors.

The Innopraktika Foundation has also developed its own platform, supporting the above-mentioned technology cluster at Moscow State University (MSU) — the National Technology Transfer Association (NTTA). It has created a digital ecosystem focused on supporting innovative initiatives throughout Russia. Unlike SberUnity, the NTTA is oriented toward registering technology ideas

[5] URL: https://sk.ru/

[6] URL: https://sberunity.ru

at any stage — it was the first to introduce this feature. At present, 427 technology authors are registered on the platform, including institutes, universities, and research organizations.[7]

Moreover, it should be noted that with the support of the Chamber of Commerce and Industry of the Russian Federation, the "Innosfera" project is also being developed.

Thus, digital platforms are actively penetrating all sectors of the economy and are moving toward the full digital transformation of virtually all aspects of economic activity. For the innovation process, they can provide the most comprehensive information about the market, help consolidate and standardize the terms of agreements between investors and authors, ensure compliance with all rules, and more. Given all the advantages of digital platforms, modern scholars briefly note that they make it possible to create a product in a decentralized way while extracting value from it in a centralized manner [8]. Without them, the implementation of the "open innovation" concept, which is still weakly developed in Russia, is practically impossible. According to a study by Generation S, among the largest innovation-active companies in Russia, about 60% of acceleration programs were carried out independently, which suggests that companies either use their own innovations or accelerate solutions already formed on the market (but not new ideas).

The independent search for new solutions, starting from the idea and patent stage, is virtually impossible even for very large companies, as it requires a large and costly innovation department. Therefore, such tasks are often delegated to digital platforms like the aforementioned Crunchbase, and sometimes additional scouting organizations are brought in. A completely different situation exists among foreign companies. The Capgemini Institute conducted a study surveying around 1,000 large companies worldwide: 75% clearly emphasized that without the use of open innovations, it is practically impossible to ensure the timely implementation of the latest technologies.[8]

In summary, it should be noted that at present, Russian digital innovation platforms cannot compare to their foreign counterparts in terms of funding volume and the number of participants. This is due to the fact that Russian ecosystems rely on the same financing models dominated by public capital, with state corporations as the main participants. To change this situation, other schemes need to be used within the framework of digital platforms.

INNOVATION FINANCING INSTRUMENTS

In the academic literature, financing instruments are generally divided into repayable and non-repayable. The first group includes various types of investments with investor participation in the company's or project's capital, as well as subsidies and grants without such participation.

The second group is most often used by government bodies and agencies implementing state innovation policy. Overall, authors of innovative developments and startups mainly need non-repayable investments, which include equity participation in the company as a founder or direct profit-sharing through project agreements and other mechanisms. Credit financing is also used — it has been examined by many authors [9–11].

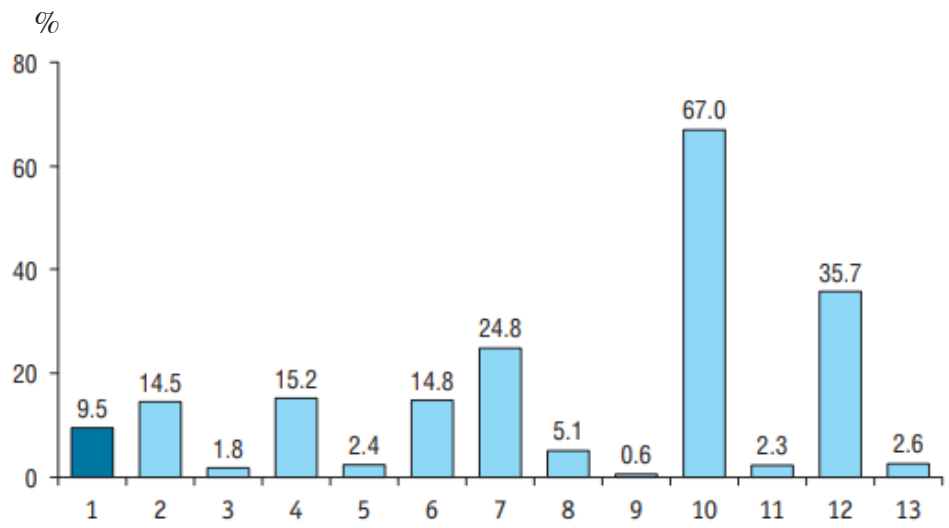
There is already some experience in Russia with introducing specialized loans for innovative companies. In particular, in 2020, the SME Corporation for the first time issued a loan secured by intellectual property for early-stage startups.[9] Since then, major Russian banks have launched similar programs.

However, this type of financing has not gained widespread traction in the innovation environment: data from the 2024 statistical digest Indi-

[7] URL: https://digital-natt.ru/

[8] URL: https://prod.ucwe.capgemini.com/wp-content/uploads/2023/05/CRI_Open-innovation_Report_Final-Draft_12062023_Web-File.pdf

[9] URL: https://www.vedomosti.ru/finance/articles/2020/09/03/838788-pervii-kredit



1 – **total**
2 – **industrial production – total**
3 – mining of mineral resources
4 – manufacturing
5 – high tech
6 – medium high tech
7 – Medium-low tech
8 – low tech
9 – supply of electricity, gas, steam; air conditioning
10 – water supply, sewerage, waste collection and disposal, pollution remediation activities
11 – **types of economic activity in the service sector – total**
12 – **agriculture – total**
13 – **construction - total**

Fig. **The share of loans and borrowings in financing innovation activities**

Source: URL: https://issek.hse.ru/mirror/pubs/share/907284710.pdf

cators of Innovation Activity (see *figure*) indicate its low prevalence.

As shown in the *figure*, the industries where credit financing of innovation holds significant weight are "water supply and waste disposal" as well as "agriculture." In all other sectors, it is negligible, and even in the high-tech manufacturing sector, its share does not exceed 2.4%. From this, it can be concluded that such financing projects have not become widespread in Russia. The most likely reason for this is the high risk associated with investing in high-tech projects, especially at early stages. Non-credit financing is therefore more appropriate than credit financing.

In practice, this means creating a new start-up company and attracting funding either in the form of equity stakes or share purchases. However, it should be noted that many high-tech projects (particularly in industry) cannot be realized through the creation of new companies because launching any large-scale production is only possible for relatively large corporations that control a significant market share. Young startups, even if they focus on a small part of the production process, find it nearly impossible to compete.

Launching such projects requires at least pilot production line trials, which only large

existing market corporations can afford. These corporations are often not interested in the growth of small innovative companies, preferring instead to acquire technologies at an early stage by directly purchasing patents or hiring the developers as employees. Therefore, direct equity investments in industrial innovation companies are rarely feasible.

At the same time, the patenting process itself is a complex task, requiring the author to incur costs for legal support and spend time registering the patent. Hiring the authors directly is often preferable in terms of conditions, but intellectual property rights for products created within a company usually belong to the company rather than the authors. For this reason, alternative approaches are needed. For example, in 2013, one of the largest venture capital funds —Y Combinator —introduced a financing instrument called SAFE (Simple Agreement for Future Equity[10]). This instrument allows companies to raise funds at the stage when only an idea and a team of creators exist. Under this agreement, the investment converts into actual equity in the company if it succeeds in the future.

This instrument gained popularity in the United States, and Y Combinator applies it to all emerging startups. However, as more data accumulated on SAFE usage, the specifics of its application and its impact on both investors' and recipients' interests have become clearer. Initially, SAFE was designed for the IT sector, where startups as small innovative companies are typical. However, this approach carries risks — for instance, if a startup fails or if the team moves on to a different project, the investor may lose their investment, among other challenges [12]. Nevertheless, the concept remains in demand, and academic research on SAFE's use in other countries exists [13, 14]. It is also applied within digital blockchain platforms in the form of smart contracts [15].

[10] URL: https://www.ycombinator.com/documents

All of the above suggests that the concept is overall a good option for attracting investment at early stages of project development and can be adapted for different purposes to enhance security and protect investors' interests.

CONCLUSION

To develop a mature innovation ecosystem within the economy, a free investment market and competition between ideas and developments are essential. Experience from the 2000s shows that an innovation ecosystem does not emerge spontaneously; it requires initiatives either from the state or from large private businesses. In various countries, this led to the creation of "Silicon Valley" projects — clusters where innovative companies are concentrated and given preferential conditions for growth. Unlike their foreign counterparts, Russian projects continue to rely on limited state capital and cannot match international examples in terms of growth and funding.

However, with the widespread development of digitalization today, innovation ecosystems are also transitioning to digital formats. This shift enables decentralized and flexible financing directly to developer teams during the creation of new technologies, as well as the attraction of private capital.

In conclusion, Russian digital innovation ecosystems need to:

- have a digital platform uniting Russian companies (or integrate with similar platforms);
- use direct investments for groups of technology developers, with profit-sharing arrangements with investors based on instruments like SAFE;
- gradually accumulate experience in applying this new financing tool and develop the platform's operational rules.

Thus, digital innovation ecosystems, supported by high-tech industries, can become centers for creating added value and thereby enhance the competitiveness of the Russian economy in the global market.

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