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Business Ecosystem Finance: Modern Agenda and Challenges

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ABSTRACT

The relevance of the research is confirmed by the fact that, with the widespread distribution of ecosystems as high-tech heirs of clusters and platforms, the issues of financing business ecosystems are rarely studied in the scientific literature and do not receive the necessary theoretical generalization. **The purpose of the research** is to systematize the available forms of financing in industrial business ecosystems within a united digital space. **The objectives of this research** are defined as clarifying the need to include financing functions in the toolkit of emerging industrial business ecosystems and revealing the possibilities of using selected financing methods. **The methods of research**, on the one hand, are based on the emerging theory of ecosystems, which develops both as a firm's theory and as ecosystem management, and on the other hand, on a new concept that can be formulated as a fusion of finance, industrialization and digitalization**. The results of the research** show that there are several approaches to the organization of ecosystem finance. Ecosystems are reported to be equally susceptible to decentralized and centralized (traditional) financing, providing opportunities to create their own decentralized financial environment as well as collaborating with current cryptocurrency-based services. Several forms of financial organization in ecosystems have been identified: a) compensating costs by forming budgets for the creation and ongoing activities; b) attracting ecosystem participants' own funds to various forms of lending (including on the basis of financial technologies). **It is concluded** that the development of financing instruments depends on three factors: 1) government policies to regulate the financial aspects of business ecosystems; 2) the efficiency of using the resources of ecosystem participants; 3) ecosystem interactions with supply chains. It is determined that a completely new theory of business ecosystem finance will be completed only after the exit from the experimental mode of financing business ecosystems.

Keywords: finance; digital finance; financing; industrialization; digitalization; ecosystem; business ecosystem; business model; supply chains; digital economy

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INTRODUCTION

The increase in the share of digital solutions in business communications significantly stimulates the creation of fundamentally new forms of interaction of economic agents. This innovative renewal of interaction is aided by the fact that practical solutions, particularly in the field of financing, exceed theoretical generalizations. The new forms of business interaction should include ecosystems, or, according to the work of the author of the ecosystem concept J. Moore [1, 2], business ecosystems. According to experts,[1] from 2018 to 2020, the Russian ecosystem market in terms of subscriptions to services grew more than 12 times. By 2024 (compared to 2020) it is expected to increase by almost 4 times, and by 2030 about 55 mln Russians will be subscribers of ecosystems with a monthly fee of at least 200 rubles.[2]

The success of such industrial business ecosystems as *Huawei, Haier, Samsung Electronics* and others, which grow by bln USD annually, should be mentioned first of all. *Samsung Electronics* recorded revenue of 234 bln USD in 2022,[3] growing by 10% over the year, and *Haier* continues to strengthen its position in the markets, reaching revenues of 243.5 bln yuan and increasing net profit by 12.5% — to 14.7 bln yuan.[4] US sanctions led to a record 69% fall in *Huawei's* net profit to 5.2 bln USD in 2022, but revenue remained virtually unchanged to 92.38 bln USD (or 642.34 bln yuan).[5]

Service ecosystems (Sber, Yandex, VK, MTS) are currently predominant in Russia, which together have ensured an average annual revenue growth of 165% over the last 5 years[6] — from 0.4 to 19.7 bln USD (*Fig. 1*), which requires appropriate funding, while only the Sber ecosystem is provided with its own funding.

Applications for the creation of production business ecosystems are also declared by most of the largest Russian companies with state participation, for example, such as Rostec and Rosatom (with turnovers of more than 1.5 trn rubles each), although elements of such forms create almost all Russian companies, not only implementing such financial solutions as *"Buy now, pay later", "Integration of financial services with ecosystem", "Full cycle: "purchase-payment", "Digital dual asset management"* and others, but also considering the possibility of using digital financial assets.

The successes of the practice implementation lead to a substantial increase in publications devoted to the classification of business ecosystems and their economic, entrepreneurial, and social essence (to which a lot of foreign reviews are devoted, for example, D. Teece [3], E. Altman [4], R. Kapoor [5], M. Jacobides [6], X. Parisot [7], M. Spaniol and N. Rowland [8] and others, and Russian publications, first of all, A.V. Babkin [9], E. A. Tretiakova [10], E.V. Popov [11], T. O. Tolstykh [12] and others).

In many publications on business ecosystems, most researchers (except for publications devoted to crypto assets) do not analyze the question of financing new structural solutions, both planned and current. In one of J. Moore's most recent publications, dedicated to the man in the ecosystem [13], the word "finance" does not appear, as if ecosystems have the ability to attract finance without any problems. J. Moore restricts his paper to the cost of the business ecosystem to support the creativity

[1] ICT Moscow. J'son & Partners Consulting. Russian ecosystems. Players, services, subscriptions, user experience fom2018–2024. URL: https://ict.moscow/research/ekosistemy-rossii-igroki-servisy-podpiski-polzovatelskii-opyt-2018–2024/?amp&amp&amp (accessed on 17.04.2023).

[2] Petrova J. By 2030, ecosystems in Russia will have 55 million subscribers. Frank Media, 01.02.2022. URL: https://frankrg.com/58581 (accessed on 17.04.2023).

[3] Consolidated Financial Statements of Samsung Electronics Co., Ltd. and its Subsidiaries Index to Financial Statements. URL: https://images.samsung.com/is/content/samsung/assets/global/ir/docs/2022_con_quarter04_all_1.pdf (accessed on 17.04.2023).

[4] Haier Smart Home Co., Ltd. 2022 Annual Report. URL: https://smart-home.haier.com/en/gpxx/?id=yjbg&spm=investor.31547_pc.irheader_20200506_2.2 (accessed on 17.04.2023).

[5] Huawei Investment & Holding Co., Ltd. 2022 Annual Report. URL: https://www-file.huawei.com/minisite/media/annual_report/annual_report_2022_en.pdf (accessed on 17.04.2023).

[6] The role of ecosystems and marketplaces in the development of small and medium-sized enterprises in Russia. June 2022. URL: https://delret.ru/research/rol-ekosistem-marketplejsov (accessed on 17.04.2023).

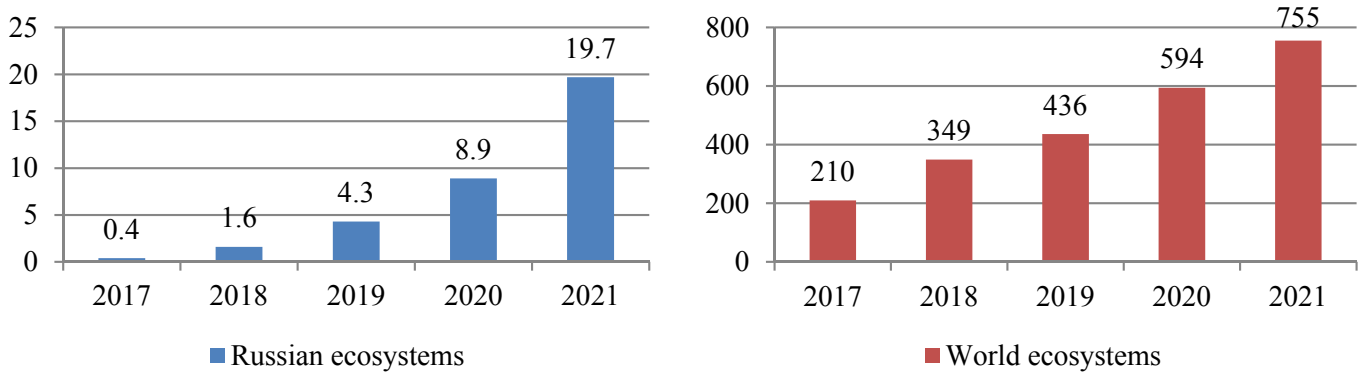

Fig. 1. **Comparison of Ecosystem Revenue Growth, Billion Dollars**

Source: The role of ecosystems and marketplaces in the development of small and medium-sized businesses in Russia. June 2022. URL: https://delret.ru/research/rol-ekosistem-marketplejsov (accessed on 17.04.2023).

of the individual, providing "zero distance with the consumer" [13, p. 65].

At the same time, the supporters of the crypto approach, i.e. the use of cryptocurrency-based financing, are actively creating their own ecosystems, frequently allocating to them with the precision of the underlying cryptocurrency — the ecosystem of bitcoin, the ecosystem of Ethereum[7] etc., including the emergence of a new category — decentralized finance (DeFi) [14].

The second group of authors is determined that the implementation of ecosystems in industry does not require special solutions to attract financial resources and that the existing financial system of the state or corporations, for example, in an open innovation ecosystem [15, 16], allows such projects to be implemented successfully. This approach raises some doubts, as if it were fair, there would be no new challenges associated with the digitalization of finance.

Furthermore, financial technologies, which initially relied on the facts of accelerated settlements and ease of use [17], are beginning to prevail in a number of business ecosystems, not only as a settlement instrument, but also as a financing tool.

At the same time, in practice, key beneficiaries of the results of digitalization have also not completed their choice regarding the role of finance in the ecosystem. Many banks, for example, try to get involved in the digital economy by focusing on the real sector rather than the financial sector, which is supported by the perspective of central banks actively examining the capabilities of digital financial instruments. At the same time, the consulting company *BSC* insists in its reviews that financial institutions pay attention to digital ecosystems [18], which will either enable banks to recover from the crisis phenomena of the last two decades, or have the possibility of being consumed by them if they refuse to cooperate with business ecosystems.

All of this allows us to emphasize the importance of the chosen subject, to formulate the purpose of our research — the systematization of available forms of funding for ecosystems — and to initiate a discussion that will allow us to define the contours of the changes that are affecting the financing of projects, specifically industrial business ecosystem functions in the format of the digital economy (*Fig. 2*).

Not all directions of digitalization (not the complete model of the digital economy) are considered the object of the study, but only the part that is aimed at creating a single digital space in industry as a business ecosystem,

[7] Top 5 cryptocurrency ecosystems by capitalization in May 2022. Crypto.ru, 13.05.2022. URL: https://crypto.ru/top5-kriptovalyutnyh-ekosistem-po-kapitalizatsii/ (accessed on 17.04.2023).

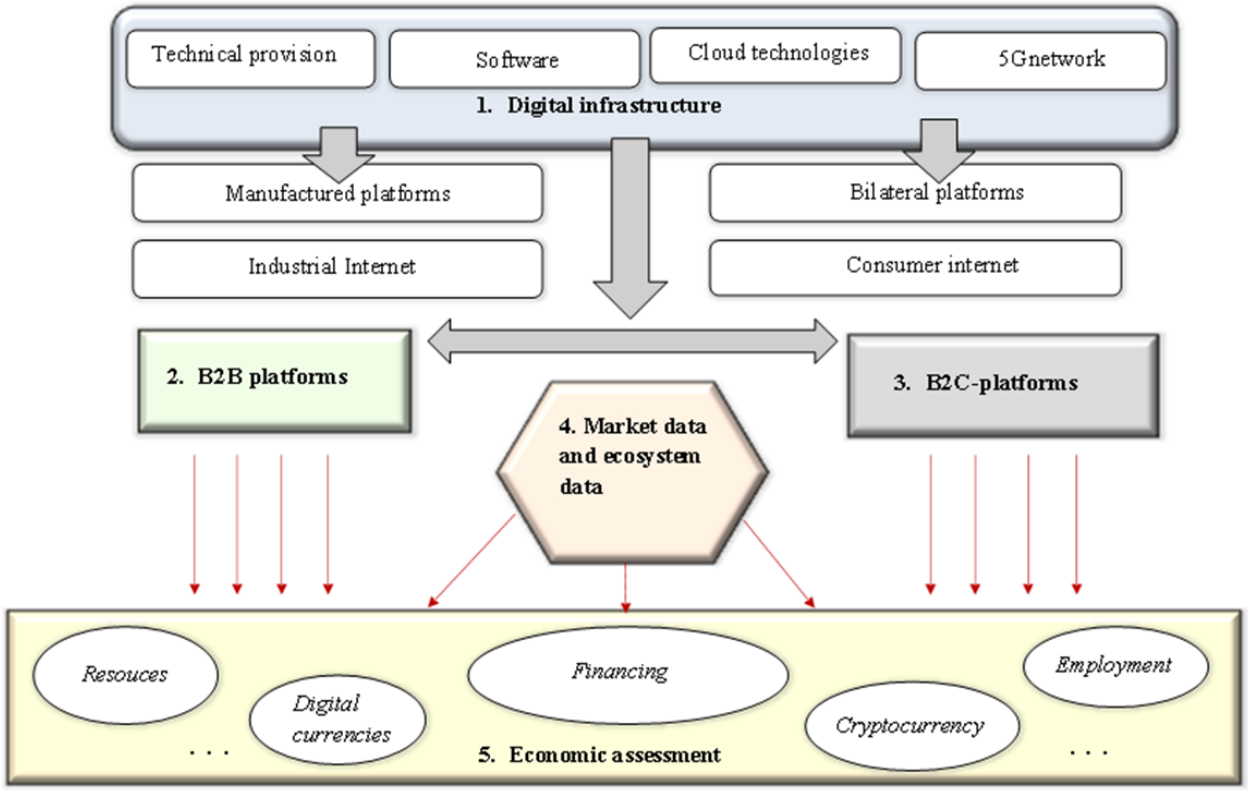

Fig. 2. **The Structure of the Digital Economy**

Source: Adapted by the authors based on [19].

which allows to clarify the research question and to specify the objectives of this study: 1) indicate the need for financial services to be included in the toolset of growing industrial business ecosystems; 2) discover possible financing methods in digital ecosystems. The theoretical basis of the first problem is contained in the paper of R. Levine and S. Zervos [20], in which it is justified that it is finance that is an important driving force that contributes to the modernization of the industrial structure.

When considering the problem presented in this study, we use two classic approaches to understanding finance: a) the distribution of resources over time, according to the classical vision (E. Fama and M. Miller [21]), and b) how to manage cash flows through various organizations (first of all, business ecosystems in the modern vision, not yet having organizational and legal status), according to the classic approach (J. Hampton [22]).

METHODOLOGY

We are based on the assumption that funding is an indispensable resource without which any form of business, including ecosystems, is impossible. Not to mention the nature of finance (their role and origin), the two approaches to finance functions (reproductive and distributive), note that finance as a resource does not lose its significance in the digital economy, and finance remains an important component of the success of any project.

The methods of research are the systemic approach and its modification — the ecosystem approach. The basis of the ecosystem approach to the study is the creation of the theory of ecosystems, for example [3–6], including publications that extend the boundaries of modern firm theory to ecosystems [23].

Over a 15-year period, the research was based on scientific publications that both

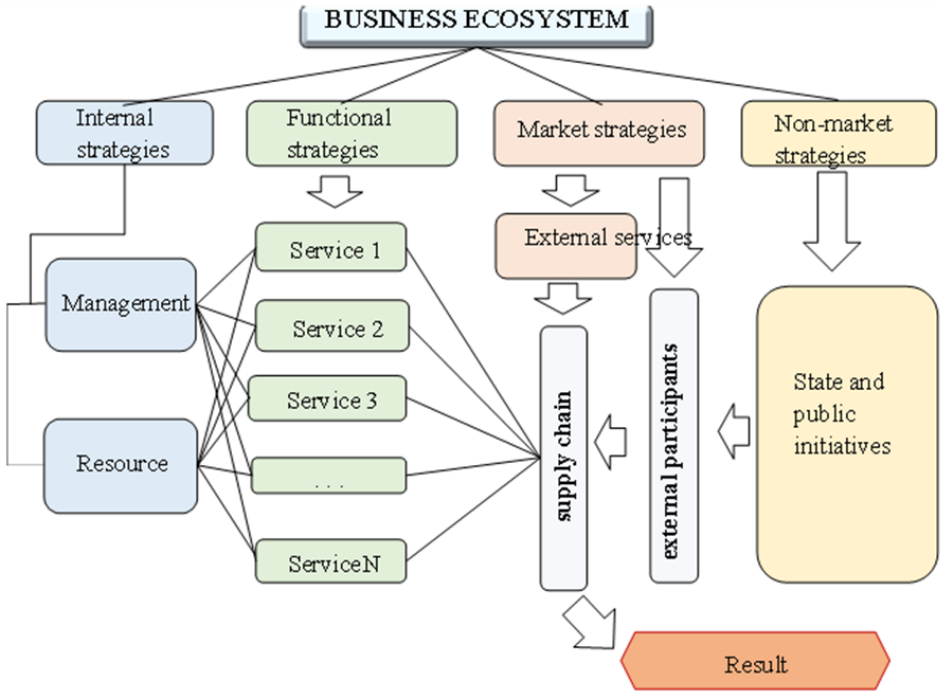

Fig. 3. **Generalized Management Model of the Business Ecosystem**

Source: Clarified by the authors based on [24].

generalized ideas about ecosystems and digital platforms and revealed specific features of different ecosystem types. We use the following model to ensure the consistency of business ecosystems (*Fig. 3*). It should be noted that this presentation does not contain any financing solutions.

The most promising approach to considering the financing of selected types of ecosystems (manufactured or industrial), in our view, is the concept of "*FID* — fusion of industrialization and digitalization" [25], which authors point to the required resources, assuming that financial support is one of them. This approach is consistent with our decisions, when we say that modern technology has a complex structure (with transformative and managing components) [26], while the authors of the quoted article talk about the two cores of the business ecosystem — production and management. It should be noted that, in terms of financing, such a concept should be supplemented, and it would be right to call it *FFID* (Fusion of Finance, Industrialization and Digitalization).

RESULTS AND DISCUSSION

Basic of the study is the conclusion that at present the appearance of a single financial mechanism of business ecosystems has not developed. Various sources of finance resources for ecosystems are combined designs, using the potential of both traditional finance and virtual (or digital). In fact, we can assume that ecosystem finance is currently in a pilot mode, completion of which will identify key development directions, but we can already note that banks working with ecosystems [18] are achieving better financial performance than the traditional banking sector.

As a result of this study, we managed to systematize several approaches to solving the issue of providing financial resources for the activities of ecosystems (*Fig. 4*).

Ecosystem cost compensation, including budget allocation for its functioning ("Internal strategies", *Fig. 4*)

A number of studies [27, 28] show that the original appearance of a projected ecosystem

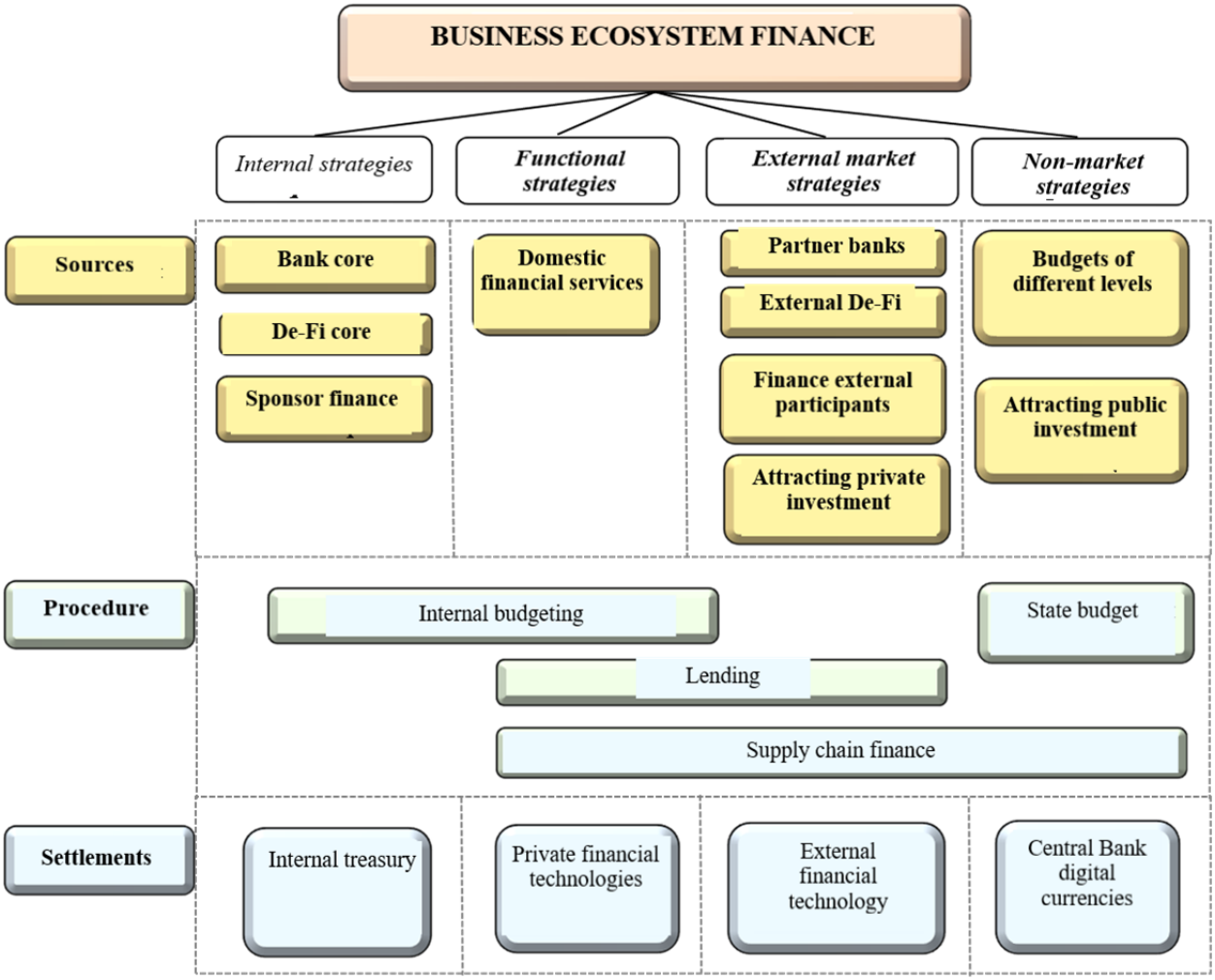

Fig. 4. **Organizational Structure of Business Ecosystem's Financial Sector Based on a Generalized Model**

Source: Developed by the authors.

is usually fixed at the time of creation and dynamically revised as it develops. This uncertainty leads to the conclusion that, in the initial design of ecosystem relationships, it is impossible to set the purpose of returns. In most of M. Jacobides's publications and ecosystem synthesis [6], it is assumed that ecosystem financing is costly, on the assumption that it creates a more efficient form of governance rather than a more effective form of profit. Accordingly, like any other management, ecosystem management must have a budget for its creation and maintenance. The effectiveness of such a budget is based on the fact that the ecosystem: a) either reduces exchange costs, thereby improving the outcome of financial transactions; b) increases sales, thus realizing the scale effect. Most platform and subsequent ecosystem solutions are based on these preconditions, as are J. Moore, who argues that ecosystems create a new space for human development, or M. Jacobides, who more confidently speaks of creating a new resource management system.

The cost approach is implemented by allocating a budget without demanding efficiency, but with predetermined results. Note that business ecosystems do not have organizational and legal forms, and, for example, in article M. Jovanovic et al. [29] the concept of "ecosystem sponsor" is introduced for an ecosystem investor who is entrusted with relations related to the organizational-legal form. On the basis of its own financial resources, the sponsor also manages the involvement of potential participants [30, 31].

The budget allocated by the sponsor (as initial capital investments) ensures a broader market presence [32, 33] in line with the interests of the stakeholders in the sector [34].

In any case, the cost model is applicable, and in the initial stages of constructing business ecosystems, it is even required, but it should be emphasized that the cost model itself can contribute to the collapse of the ecosystem formed (especially if the business model is incorrect).

In general, the cost ecosystem financing model is intuitive because the emergence of new digital opportunities is closer to its approach to infrastructure solutions. It should be noted that the participation of the state in the creation of, for example, industrial ecosystems is also likely to be cost-effective. Unfortunately, the existing theoretical basis does not for the estimation of the size of such budgets, and empirical data are still insufficient. At the same time, the creation of many ecosystems is linked to the implementation of the concept of technological leadership, where the amount of resources allocated is determined by opportunity rather than economically reasonable costs.

Use of credit money in the functioning of the ecosystem ("Functional strategies", *Fig. 4*) and partner banks ("Market strategies", *Fig. 4*)

Cost financing is not feasible when implementing directly operational activities, so in this case, a different approach is required: the use of borrowed funds, the source of which can be the ecosystem itself, based on the banking (or cryptocurrency) core.

Currently, the unavailability for business ecosystems of the classic instrument of attracting financing through an *IPO* (as equity) significantly increases the significance of credit money for ecosystems. There is no doubt that an *IPO* can be carried out by a parent company, but in this case, the financing model will be reduced to the first approach — cost financing.

With such financing, integration of virtual and traditional finance is acceptable — for example, the use of procedures for lending in cryptocurrencies and subsequent conversion into fiat currencies with the appropriate reverse process. Note that this approach also requires the use of swaps, which must be included in the financial services of ecosystems due to the high current volatility of cryptocurrencies. The possibility of such a solution arises from the comparability of the money supply, for example, the ruble and the capitalization of cryptocurrencies (*Fig. 5*).

The ecosystem mechanism (*Fig. 3*) may provide for a procedure (as a functioning service) to attract credit similar to a banking or DeFi organization (compliant with national legislation). At the same time, by its economic nature, the financial service of the ecosystem is more of an intermediary than a full-fledged business.

One of the possible ways of creating a financial service in the business ecosystem is the acquisition of banks and the formation of an internal service from them (*Fig. 4*). An alternative to this approach is the creation by the bank of a new unit that performs settlements within the framework of the ecosystem management of the partner company, such as, for example, *Goldman Sachs*[8] for *Apple*. At the same time, credit money arises as a result of settlements, but additional cash resource generation is not completed.

The most common mechanism of using credit resources to finance ecosystems is reversible factoring, which allows us to talk about replacing the "pushing" approach to the flow of finance with "pulling".

The "buy now — pay later" mechanism, based on artificial intelligence and business analytics, is also beginning to gain personal place and importance, allowing for reverse factoring intermediaries within supply chains. In this case, the reverse factoring is not completed by the end consumer, but by an internal intermediary, who, for example, buys

[8] Podkletnov A. Goldman Sachs has billions of dollars in losses due to the Apple card. Is that true? Habr, 15.02.2023. URL: https://habr.com/ru/articles/716950/ (accessed on 17.04.2023).

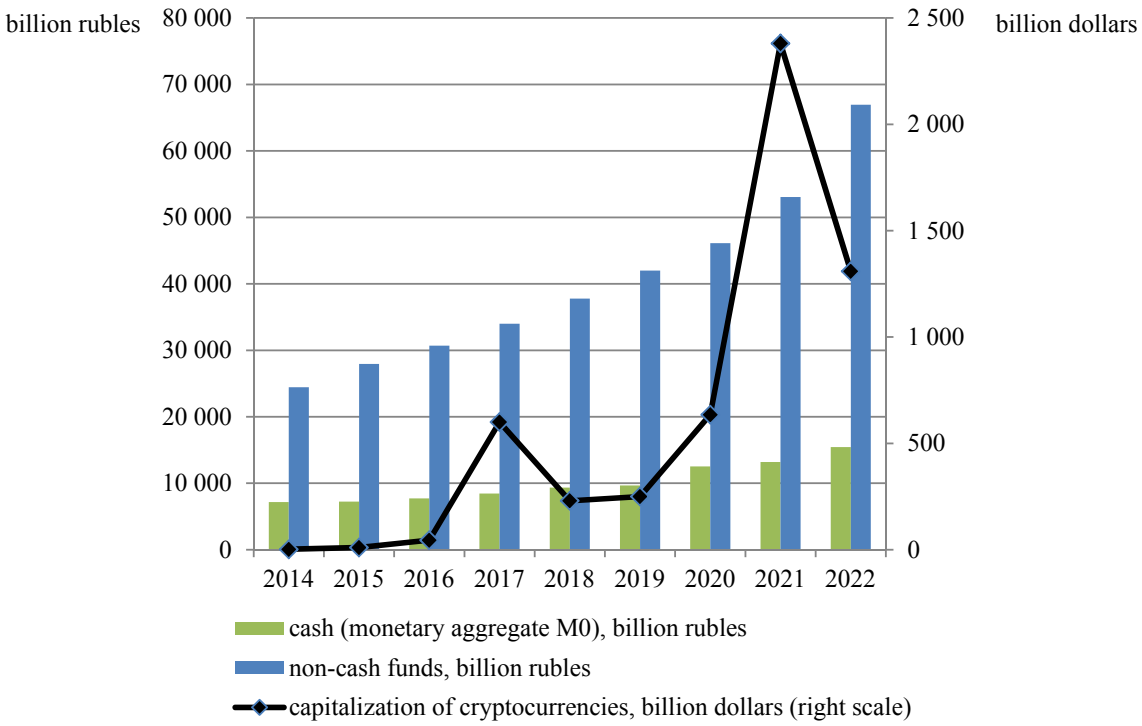

Fig. 5. **Dynamics of Money Supply Indicators in the Russian Federation and the World Market Capitalization of Cryptocurrencies**

Source: Compiled by the authors based on data from: Bank of Russia. Money supply (national definition). URL: https://cbr.ru/statistics/ms/; Digital Economy Compass 2022. URL: https://www.statista.com/study/128160/digital-economy-compass-2022/#professional (accessed on 17.04.2023).

a batch of goods whose sales are guaranteed by business analytics forecasts, providing the final consumer with payment terms.

Furthermore, the attractiveness of full-cycle financing (so-called "purchase-payment") is increasing, which can be completed either with advance payment or entirely on the basis of credit money. This model is often used for collaborative economic solutions in which the return on credit investments in a collaborative business model is delivered through more efficient exploitation of an asset than a conventional purchase, providing a priority for protecting ownership of an ecosystem asset.

Use of the money of ecosystem participants ("Market strategies", *Fig. 4*)

A characteristic feature of almost all existing financial ecosystems is the attraction of participant funds to ensure their own cash flow. In the case of a bilateral contract, such a participant continues to control the entire supply chain; however, ecosystems can be identified by the fact that complete control over the entire supply chain is not possible, and several participants are present in the same chain with their own funds. The success of such solutions requires the establishment of a clearing service within the ecosystem (*Fig. 3*).

Creation of financial technologies as own settlement instruments (including on the basis of digital financial assets) ("Functional Strategies", *Fig. 4*)

This approach requires a participant with their own financial resources to convert them into digital financial assets or financial technology units and use a supply chain tool that is inherent in the ecosystem. In addition to providing an additional commission (income) to the ecosystem, it enables consistency of settlements across the financial model and

necessary swapping independent of central banking and other regulatory. Note that the external consumer of the products and services of the ecosystem may not feel this approach to financing by making the usual purchase or sale of goods and services.

The disadvantage of this approach is the loss of part of the funds in the inputs and withdrawals of financial resources into the ecosystem, the need for continuous valuation of money in generally accepted currencies, and significant difficulties for public companies to conduct audits of their activities.

This strategy can be practically implemented by developing one's own calculating services as well as using well-known settlement services. The ecosystem can itself issue digital financial assets in one form or another, complying with the relevant legislation, generate its own cash, and use it directly as the currency of the ecosystems (e.g., Ethereum).

In the last case, the ecosystem will need an additional number of exchanges and other settlement centers to increase the liquidity of the digital financial asset used. If an ecosystem functions only as part of its interaction, i.e. the supply chain is completely absorbed by the ecosystems, then fintech solutions can be quite self-sufficient, and in this case, the main problem will be either limiting the volume of the issue of the calculation instruments (and the increase in the value of such an instrument) or the demand issue (and its devaluation).

Investment in the ecosystem: private ("Market strategy", *Fig. 4*) and public ("Non-market strategies", *Fig. 4*)

Such a process can be initiated by an inflow of external investment into the ecosystem (often sectoral in nature), in which external structures invest in the ecosystem in anticipation of higher returns than the current market return, or in anticipation of more effective achievement of required public policy objectives. For example, banks can open deposits in an ecosystem, the state can invest a certain budget or a return on funding into the ecosystems, and how individual participants can invest (for example, to participate in the ecosystem you need to own a certain amount of coins issued by that ecosystem, as in the case of Dominica's digital citizenship[9]).

Supply chain financing

The question of competition and interaction of ecosystems and supply chains is relevant. Understanding the need to attract cash resources has the answer to the question of how different supply chain financing is in general and ecosystem financing in particular.

A comparison reveals that three different situations can be formed:

a) ecosystems and supply chains coexist (as shown in *Fig. 3* and *Fig. 4*);

b) supply chains complement the ecosystem (e.g. as a technology carrier, management, environment, etc.);

c) ecosystem complements the supply chains.

These situations do reflect the actual situation, but do not reveal the funding mechanism, as different funding needs arise depending on the method of interaction.

If, in case (a), it is possible to talk about resource sharing, then (b) the source of funding is generally the resources of the ecosystem, and (c) the ecosystem becomes a source of additional (transaction) costs.

The practice uses models of financing of early repayment of debt, pledge of movable property and reverse factoring financing, financing for receivable debt (direct factoring), funding for stocks (holding obligations), advance payment, and collateral of pre-paid goods for financing.

Thus, summarizing the results of the study, we note that the modern portfolio of financial instruments in ecosystems is combined, heterogeneous and developing, while there

[9] Announcement on Issuing First National Token DMC by Tron, Huobi, DMC Labs with Dominica Government Endorsement. Huobi, November 29, 2022. URL: https://www.huobi.com/support/en-us/detail/54924020805230 (accessed on 16.05.2023).

is no unity of sources of financing (at least, traditional and virtual).

CONCLUSION

The study, based on the fact that ecosystems are increasingly widespread, has shown that ecosystems can use both centralized, state-regulated and decentralized finance (in a way that is not contrary to government regulation). This combined opportunity enables a substantial increase in the volume of attracted financial resources and a reduction in their cost.

It is important to note that the need for initial funding based on cost compensation rather than project returns is a historical feature of ecosystems (contracted from platforms). As mentioned before, the word "sponsor" of the ecosystem is used for this purpose. This condition can act as an important barrier to the formation of ecosystems.

The financing characteristics of existing business ecosystems are largely dependent on their interaction with supply chains, including the three opportunities identified in the study (equal and mutually reinforcing impact, supply chain priority, ecosystem priority). Such interaction develops as a result of the distinctive features of the industry segment and the ecosystem managers' strategy.

Investment processes in ecosystems that are extremely attractive to large financial institutions and that respond promptly to changing financial relationships should also be analyzed. Central bank digital currencies will create more opportunities for direct investment, requiring financial institutions to decide between more active penetration into developing ecosystems or less active penetration.

The financial characteristics of ecosystems identified in this paper indicate that the funding tool is in the process of developing and requires long-term monitoring of financial experiments.

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