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Rationing as a Normative Principle of Ecosystem Interaction's Financing

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ABSTRACT

The relevance of the study is confirmed by the fact that it is financial relations in ecosystems that have become the **subject of research** that are influenced by certain rules (including state regulation) that limit the degrees of freedom of ecosystem participants and its organizers and ultimately determine the viability of the ecosystem approach, which determined **the purpose of the study** as establishing the potential of the financial instruments of the state in ensuring the necessary level of rationing for regulation in business ecosystems. It is shown that the distinctive feature between the corporate and ecosystem approach is the use of rationing as additional restrictions to financial decisions based on public and private sources of financial resources available in business ecosystems. **Research methods**, on the one hand, are based on a key methodology – the emerging ecosystem's theory in the part where it replaces the firm's theory, taking into account the provisions of the credit rationing theory as an application to corporate finance, on the other hand, the conceptual provisions of the theory of constraints in relation to finance are taken into account. **The results of the study** show that the allocation of public and private ecosystem rationing makes it possible to form the basis for strategic financial decisions. It is established that when creating an industrial business ecosystem, small and medium-sized businesses will become its main participants, which is justified by the need for external financing that the business ecosystem can provide. **It is concluded** that when implementing the idea of rationing, the search for the optimal strategy for participants can be simplified to considering only pair interaction (instead of optimizing the entire set of relationships). The presented paired partitions make it possible to clarify the constraints and individualize them. Comparative analysis has shown that, from the point of view of effective implementation of restrictions, the consortium with state participation has the greatest potential, and clusters have the least potential, from the point of view of capital rationing. As a result, the conclusion is made about the prospects for the development of business ecosystems with state financing (control), which would imply a purposeful solution to the tasks of the state in the modern economy.

Keywords: finance; digital finance; digital economy; united digital space; financial constraints; credit rationing; credit rationing; business ecosystem; ecosystem with state participation

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INTRODUCTION

Ecosystem interaction in any of its forms (supply chains, cluster consortium and others [1]) requires a new approach, different from corporate finance, to financial support for the functioning of these forms, because it is finance that will ultimately determine the viability of the ecosystem approach in the future.

In terms of financing, we note that the ideal scenario for business ecosystems falls somewhere between market radicalism and rationing (normalization), wherein financial decisions — and thus all interaction designs — are subject to regulations that typically restrict the degree of freedom available to ecosystem participants and organizers. This conclusion is based on the fact that ecosystem participants (according to the business ecosystem theory) interact with the market (with varying degrees of limitation of the range of decisions taken) by engaging in business-organized interaction (when the level of restrictions imposed depends on the type of eco-system).

The basic research question in this case: are such constraints a disruptive factor in the efficiency of ecosystems, or a benefit that ensures the stability of the functioning, primarily, of the participants?

Undoubtedly, this research issue is further reinforced by the widespread use of digital financing (in particular, digital credit, which is both theoretically and practically possible as a decentralized solution), which also has a large impact on ecosystem financing.

The initial challenge that needs to be addressed is the need for a clear separation between corporate and ecosystem governance. As a rule, the budgeting system of any company is a strict set of rules that ensure the achievement of the objectives set while minimizing resources [2]. The objectives of corporate capital rationing are to ensure in the end the financial viability of projects [3].

Rationing as a system of constraints (and an integral part of management) within the business ecosystem depends on its organizer or sponsor: so, with a private sponsor, the

purpose of rationing only partially remains the same — to prevent the involvement of financially unstable participants in the ecosystems, but at the same time to provide additional profit (or surplus profit) [4]. The task of the public organizer of the business ecosystem is different — to ensure the implementation of projects (often socially significant) and the necessary control of activities from the point of view of the state, including fiscal policy.

As a rule, most large corporations do not allow freedom of access to financial markets to separate units, thus forming restrictions (rationalizing) and, accordingly, providing the necessary degree of control.

At the same time, more advanced rationing associated with public budgeting ensures the success of public resources, preventing the deficit of financial resources in the target areas and limiting the irrational requests of participants in the budget process. Government rationing benefits where principles or rules are long-term and not subject to rapid change. However, it is no secret that bureaucratic mechanisms do not always fully determine the effective selection of financing directions, which initially leads to a reduction in the efficiency of the targeted use of public funds.

Additional difficulties are posed by the digital economy when a significant number of new instruments appear (such as digital financial assets) that do not always curb ineffective solutions, or whose inefficiency cannot be determined at the time of rationing rules (for the purposes of discarding the use of new tools). The emergence of a digital transformation in terms of the organization of payments (including the same FinTech solutions [5]) or the use of digital financial assets, including the organization of decentralized finance is complicated. In this case, the danger of opportunistic behavior of corporate participants further reinforces the need for the formation of state business ecosystems.

All of the above forms the need to clarify the task of government regulation — establishing the capacity of the financial instrument of the state in ensuring unavoidable rationing for regulatory purposes in business ecosystems.

RESEARCH METHODOLOGY

The key methodology of this study is the formation of the ecosystem theory in that part where it replaces the theories of firm [6] and public administration (including the concept of modern management [7]). The second component is the theory of credit rationing in part of the appendix to corporate finance (according to J. Tirole's approach [8], rather than J. Tobin's [9], and based on J. Stiglitz's famous article [10]). In other words, the basis is the methodology of organizing the design of interaction on a financial basis within the framework of business ecosystems with public participation, but without the formation of public ownership (which reduces long-term costs of the state while in control of the efficiency of the use of transferred financial resources). Some conceptual provisions of E. Goldratt's limitation theory [11] were used for finance.

In this study, we noted two fundamentally different types of entrepreneurial ecosystems:

1) private-initiated ecosystem as the business eco-system of the organizer or sponsor (a natural or legal entity that compensates for the cost of organizing the interaction of the ecosystem), the source of which becomes private capital;

2) public-participating ecosystem without the formation of public ownership, but with control of access to public resources, creating a "unique-specific resource" [12].

The second type of ecosystems can also be called control-service or financial-service in the sense that the ecosystem provides financing for interaction, but not on market terms, but on terms of limitation (rationalization) of financing in order to the required results.

From our point of view, for example, the emerging concept of a single digital space in

industry, can be implemented as the first type (with private initiative), and as the second, but closer to the second approach, which implies a more targeted use of resources as a result of the synergy of private solutions and a set of state constraints, which has largely determined the development of this study.

THE RESEARCH RESULTS

Financing rationing needs to be established initially. In most cases, the researchers talk about rationing the loan (in the initial formulation of the question of trust to the borrower in the light of information asymmetry, according to the basic work of J. Stiglitz) and much less often — about rationing the credit portfolio [13]. Even fewer publications relate to the rationing organization process, although according to T.A. Liseichikova and R.T. Balakina "rationing includes not only limiting, but also its organization" [13] as the process of setting limits. The above-mentioned features of the business ecosystem indicate that in order to solve the task, it is necessary to study all aspects, but, above all, from the side of demand and supply of money [14]. At the same time, rationing of the loan significantly improves its quality by eliminating the problem of bad choices and bad behavior of the borrower [15].

The issue of the digital balance of credit rationing is addressed in the study of O.V. Lunyakov, which argues that the "credit market has the potential to increase the aggregate amount of payments per monetary unit of borrowed funds" [16], which confirms our conclusion about the potential of over-profit of the lender in the business ecosystem. However, the article of A.A. Lobov makes a reasonable conclusion that with the increase of claims to borrowers, "the elasticity of the number of borrower (capital) at the interest rate decreases" [17]. It should also be noted that we believe that in terms of rationing of credit it is more effective to use the Bayes-Nash separation balance [18], which cannot be attributed to a "self-organizing procedure" [19].

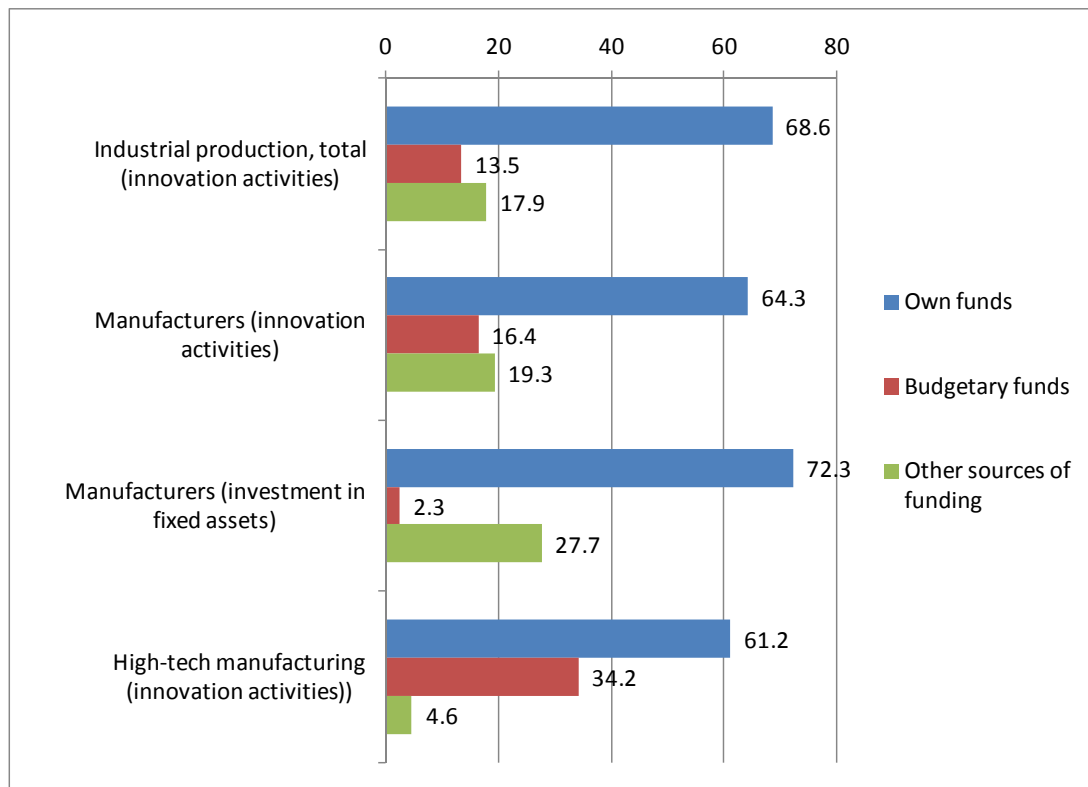


Fig. 1. The Structure of Sources of Financing in Industrial Production in 2022, %

Source: Compiled by the authors based on the data: Factors of growth in the effectiveness of innovations. Science. Technologies. Innovations, 02.20.2024. Institute of Statistical Research and Economics of Knowledge at the HSE. URL: <https://issek.hse.ru/mirror/pubs/share/898321071.pdf>; Industrial production in Russia. 2023. Statistical collection. Moscow: Rosstat; 2023. 259 p. (accessed on 29.06.2024).

Digitization also has a significant impact on rationing processes. We consider that with a certain level of digitization of financial resources (especially with the introduction of central bank digital currencies) the situation in this area can change substantially by moving to the stage of interaction and control. In this case, it is possible to discuss the hierarchy of single spaces (digital money and industrial digital), which will require further separate studies in the future.

The experience of the development of Russian industry historically shows that the most successful implementation of projects, fully or partially funded by the state, was achieved precisely in those situations when the state did not initiate projects on a competitive basis with further freedom of decision-making, and when it exercised control over the use of funds through the

introduction of financial restrictions. Thus, the statistics show the predominance of own funds in the structure of sources of financing for different directions and sector sectors in industrial production (Fig. 1), while the financing of innovative activities is a noticeable share of budget sources.

At the same time, noting the growth of the volumes of state support within the activities of the Industrial Development Fund in the Russian Federation (from 60.9 bln rubles in 2020 to 140.1 bln rubles in 2022¹), which provides preferential loans for the development of import substitute industries and updating the logistical base, it should be noted that the control of key indicators, which is carried out by this fund. Thus, in addition

¹ Industrial Development Fund. Results of IDF 2022. 10 p. URL: <https://bod.frprf.ru/public/documents/rezultaty-raboty-frp-za-2022-god> (accessed on 29.06.2024).

to the amount of private investments in the projects it supports the revenue indicators, the number of high-performance jobs created and the tax deductions of the recipient industrial companies are monitored.

At the same time, in individual studies devoted to the problems of rationing credit in the Russian economy, it is argued that “direct financing or preferential lending from the state budget are the worst forms of support... interest rate subsidy is in the second place among worst support measures” [20], which is not confirmed by real economic decisions.

It should be noted that in the creation of an industrial business ecosystem, at least of a sectoral scale, the main players will not be large, but small and medium-sized, except in the situation of contracting (if the business eco-system with the participation of the state will take over the functions of concluding large contracts, actually becoming an operator). The reason for the priority of small and medium-sized enterprises is the fact that large corporations are provided with funding and potential sources of such funding, while for small and mid-size enterprises this problem will be substantial. Thus, with a 45.8% increase in the volume of loans granted to small and medium-sized enterprises from 2019 to 2022, and with an 88.7% increase in their number^{2,3} the statistics characterizing financial stability indicate an objective but slight decrease in the own capital assurance of small enterprises due to the growth of the credit burden, but for medium business entities this trend is not confirmed — the ratio of financial autonomy increases every year (*Fig. 2*).

² Ministry of Economic Development of the Russian Federation. Report on the State of Small and Medium Entrepreneurship in the Russian Federation and Measures for its Development for 2019–2022. URL: https://www.economy.gov.ru/material/dokumenty/doklad_o_sostoyanii_msp_v_rossiyskoy_federacii_i_merakh_po_ego_razvitiyu_za_2019_2022_gg.html (accessed on 29.06.2024).

³ OPORTA of the Russia. Crediting to SMEs: new records. URL: <https://opora.ru/news/opinion/kreditovanie-msp-novye-rekordy/> (accessed on 29.06.2024).

At the same time, individual corporations strive to create their own ecosystems (shaping a mini digital space compared to a single one and striving to attract the largest number of market participants). These actions are aimed at convincing the State that these mini spaces retain the old principles of corporate governance and related design of interaction, as before, and do not constitute a competition to state decisions.

From our point of view, this does not allow to clarify the research question, using the following formulation: how within the framework of ecosystems created will be organized regulation by the state: through the organizer of the ecosystem (as we have already noted in early publications, until ecosystems fall under the regulation of the state due to the absence of the organizational-legal form of eco-systems and not always manifested direct connection with organizer), or the state should form a different industrial policy and enter into the single digital space as a full player, taking away the role of organizers of rationing financing, excluding the mediation of sponsors of ecosystems, and leaving the freedom of entrepreneurial initiative to the participants of such ecosystem? Such decisions will also be further justified by national characteristics, when, for example, the requirements to the regulation of credit and finance in general are reinforced by additional conditions in Islamic finance in the establishment of special conditions imposed on “business within the framework of religious Sharia control, as well as additional control over the activity of the entrepreneur by the bank or investor” [21].

On the basis of the above, we distinguish for further consideration two types of rationing: public and private.

State rationing within the business ecosystem involves not only the elimination of information asymmetry (when accessing the digital profile of participants), but also the use of the state-available solutions that provide additional effect:

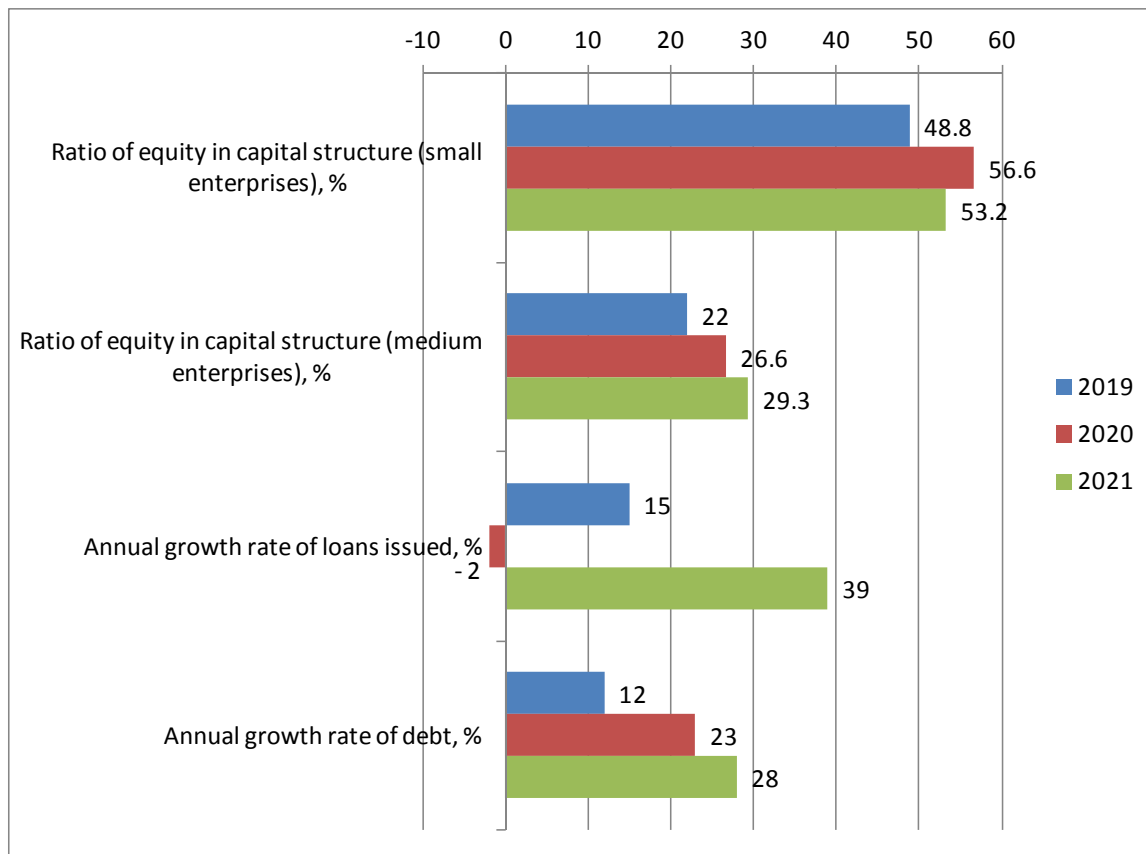


Fig. 2. Indicators of the Dynamics of Capital Provision for Small and Medium-Sized Businesses

Source: Compiled by the authors based on the data: Small and medium-sized enterprises in Russia. 2022: Statistical collection. Moscow, Rosstat, 2022. 101 p.; Expert RA, March 2023. SME lending in 2022–2023: at maximum speed. URL: <https://raexpert.ru/docbank/92d/0aa/d42/6b6d6a98664cf02dbc874a8.PDF> (accessed on 29.06.2024).

- direct financing;
- interest rate subsidy;
- guarantee.

At the same time, the state can use, in addition to direct participation, and a hybrid model, involving in the rationing process of either its own operator or the bank-agent. In the latter case, the opportunistic behavior of the agent bank is possible, which can, for example, impose an additional commission (including a covered commission) and significantly reduce the effect of rationing. Therefore, from our point of view, it is more efficient to use the operating bank, which should be integrated into the services of the business ecosystem.

The system of restrictions is also affected by a significant number of regions of presence, which is characteristic of the Russian Federation. This

raises the question of whether regional services can be empowered to rationalize or fund, or whether this option can be retained only at the federal level. In our view, the solution depends on the quality of a single digital space, in which the “invisibility” of regional specifics and the smooth transition from the regional level to the federal level should be created.

Private financing, depending on supply or demand surplus, controls the following rationing parameters in the business ecosystem:

- collateral requirements;
- information awareness;
- establishment of an ecosystem premium, including disguised payments for financing risk.

The choice of these solutions would be more justified with a set of empirical data,

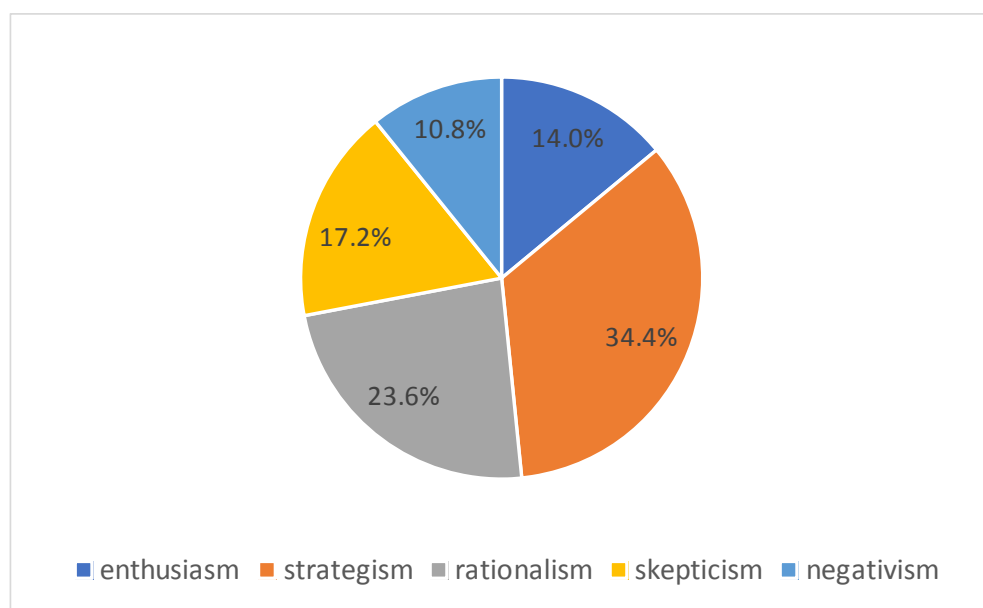


Fig. 3. Clustering of Opinions of Survey Participants by Groups

Source: Compiled by the authors.

but, according to the study of V.V. Akberdina and E.V. Vasilenko, “an analysis of ecosystems cannot be carried out in a short period of time, it requires long-term observation of the dynamic evolution of the structure of the ecosystem, the relationships of the participants, their goals” [22, p. 551]. Although there is another statement in the scientific literature that already “the ecosystem has become the unit of economic analysis at this stage” [23, p. 91]. Factual information on the ecosystem, especially on internal services (including funding), is unfortunately not available due to the lack of an organizational, legal or other form capable of statistical accounting, including within the framework of internal reporting. Such data is not always available to the participants of the business ecosystem, for whom information about the environment and services becomes available only after the creation of a digital profile and integration into the supply chain with the general declaration that there will be an exchange of profile data for information about contracts and other benefits, while such exchange is possible, but not guaranteed.

Therefore, it is more reasonable to study empirical experience on ecosystem sites

(which is not always objective) or conduct various surveys (what is used for this study) to establish trends. As a sample, we focused on medium-sized business organizations, in whose interests production activity in a particular area is indicated.

Note that, despite the absence of a de facto full-fledged single digital space, most participants assume that in one way or another they will participate in the ecosystems, but as a result of the processing of the results were established 5 groups (*Fig. 3*), which are further used as integral opinions, instead of taking into account the opinions of individual participants — conditionally named opinions “enthusiasm”, “strategism”, “rationalism”, “skepticism” and “negativism”. The financial failure to establish resilient groups (re-group participants) may have been due to insufficient specific and definite provision on the financial capabilities of ecosystems.

DISCUSSION OF THE RESULTS

Initially, we should note two assumptions used in the discussion of the results:

- business ecosystem level was not considered as a virtual structure or object for reasons of lack of objectivity due to lack

of ownership and tax evasion, as well as the performance of the intermediary function on behalf of the sponsor/ecosystem operator without commitment;

- at the same time, we exclude some of the ecosystem operating processes that are not related to real business processes, considering the costs incurred compensated by either the organizer's or the participants' contribution.

These assumptions allow us to focus on the contractual component of the business ecosystem functioning — i.e. the contracts that can be concluded within the framework of the services of the Business ecosystems are identified:

- as one-off non-repetition transactions, short in time of execution;
- medium- and long-term transactions that form supply chains;
- long-term repetitive transactions that require the formation of a consortium;
- cluster solutions that support an anchor organization within an ecosystem;
- cluster solutions for an external anchor organization, but whose interests are within the interests of the ecosystem (services);
- internal business processes focused on the integration of ecosystem participants at the request of the ecosystem customer on a contractual basis.

The following sources of funding are available for these contracts:

- ecosystem resources, including digital credit and accumulated participant contributions/contributions;
- resources of the ecosystem organizer/sponsor;
- resources of domestic bank (financial service);
- resources of an external agent bank (accredited or with a cooperation agreement);
- budgetary sources (if they are not included in the resources of the customer's ecosystem).

Additional features for funding sources:

- private domestic sources of ecosystem financing;

- budgetary sources of ecosystem financing;

- external financing (both private and public).

Accordingly, business ecosystem participants can be divided into three:

- participants with sufficient own funding for both current projects and new contracts that may be available in the ecosystem;
- participants who need funding but are ecosystem-oriented as a source of funding;
- participants in need of funding but oriented towards external funding.

Identifying the economic agents of the ecosystem allows the following strategies to be identified:

– on the demand side:

- search for financial resources with sincere intentions but with poor financial condition;

- search for resources with sincere intentions and good financial condition, but about which the creditor does not know;

- search for financial resources with planned moral hazard;

– on the supply side:

- transfer of financial resources without limitation;

- credit rationing to limit access to credit by vulnerable borrowers;

- reducing information asymmetry by accessing the digital profile of the borrower (internal financial service only) and setting limits according to typed profiles;

- introduction of additional rationing conditions to limit moral hazard.

The vast majority of contemporary publications affirm the desire of all potential participants to engage in interaction with the ecosystem. Future statistics will show this, but the survey we have already conducted has identified two groups (the groups “skepticism” and “negativism”) that initially do not consider participation in ecosystems (total private and public) desirable, and their share is about 28% (*Fig. 3*), which calls into question the hypothesis of supply deficit and substantial demand for financial resources.

From our point of view, the implementation of the strategy of the entire ecosystem should take into account the divisive balance of Bayes-Nash, i.e. both sides may know about the probability of a certain strategy, but not know the specific preference (choice). This balance means that individual constraints can be applied to each participant, but that will not lead to exit from the business ecosystem. It is obvious that finding the optimal strategy for all participants can be simplified to consider only pairing interaction (rather than optimizing the whole set).

When interacting in pairs, we can identify the participant's choice implementation process (forming the matrix of strategies) iteratively and consistently:

- first option: own or external financing;
- second option: external or ecosystem financing;
- third option: private or public funding (if available).

Sourcing allows another option to be considered — co-financing through collaboration: i.e. supply chain participants or consortium (much less often cluster or simple contract) may expect co-financing within the supply chain.

The presented pairs allow to clarify the directions of restrictions (like the mechanism of rationing on the part of the supply of financial resources) for specific solutions and to individualize them.

Financial Constraints in the Design of Ecosystem Interaction on the Supply Chain Model

It is presented that requires no proof that the participation of the borrower in the supply chain created by the business ecosystem service significantly increases the volume of information about it and reduces information asymmetry. Moreover, participation in many chains often no longer requires additional funding, as reverse mechanisms arise when financing of the buyer's credit scheme is formed. Therefore, from the point of view of

rationalization, it should in this case be more applicable to the offer, i.e. under other equal conditions, the financing of the participant in the sustainable supply chain brings additional benefits and guarantees to the financial service provider, which requires a higher priority in the loan portfolio of the offer to the participants in such a process.

A similar situation can be considered when investing in projects related to future supply chain security, which does not eliminate all risks, but in many ways guarantees payment capacity in the offer for a long period, making this choice rational. In this case, the pioneering should be focused on ensuring that the financing of such a supply chain remains in the business ecosystem and does not allow choices to be made in favor of non-institutions. In addition, the involvement of the State in the supply chain as a financier allows it to exercise considerable control. Therefore, supply chains are the simplest and most efficient tool of the business ecosystem and actually form its competitive advantage.

Financial Constraints in the Design of Ecosystem Interaction According to the Consortium Model

A consortium can consist of both effective and less effective participants, who need to be subject to the most stringent rationing measures, including funding restrictions up to a certain physical level of participation in the production or provision of products or services. The most common form for a consortium on the part of the State is the issuance of guarantees, but they do not provide full necessary control. In terms of private lending, the situation is the opposite. Consortium — a larger association existing as a form (as opposed to a supply chain that exists only in contracts) allows to attract larger amounts and become an attractive investment object. At the same time, a large information asymmetry is inherent in the investor, as a consortium can often doubt the

possibility of attracting the necessary amount of funds by one investor.

Financial Constraints in Designing Ecosystem Interaction on the Model “Cluster”

From the point of view of funding as a whole, the cluster has no special advantages. The participation of an organization in a cluster does not compensate for information asymmetry and does not supplement the information in the digital profile of the organization, while the cluster provides no increase in the pledge, as there is no need to distribute ownership between all the organizations that are members of the cluster. Often, only the so-called anchor enterprise or nucleus of the cluster enjoys all the benefits of a cluster, while other participants can either receive additional benefits or not receive them.

From the point of view of the State, a cluster becomes a consumer of infrastructure resources, and the State must introduce the most stringent measures to rationalize the financing of the cluster, avoiding preferential financing or other ways of allocating financial resources (considering that the Cluster cannot guarantee the intended use). Therefore, the level of rationing in the business ecosystem cluster should exceed the market level, increasing responsibility for the decisions.

Ensuring Balance between Capital Rationing and other Approaches in the State's Industrial Policy

In the paper of I.V. Filimonov [24], a comparison of “European” and “Asian” approaches to the regulation of ecosystems at the state level was presented, which allowed establishing that the European approach tends to advancing innovative development, and the Asian approach to integration into a single national system. This separation is largely because, according to our approach, in the first case, there is a surplus and in the second a shortage of supply for financial resources, which leads to the need for concentration of resources and appropriate management.

This comparison shows that industrial policy should eliminate unrestricted preferential financing and replace it with rationing (including preferential and targeted financing), allowing for a more accurate resource fee setting on the basis of the creation of a single digital space, only within which a full-fledged digital industrial policy will be implemented (at least at the level of industry segments). In this case, funding constraints should be tightened even more, as self-organization in achieving balance does not occur with this approach.

CONCLUSION

The proposed approach may not be the only one suitable for such a new category as ecosystem finance with its uncertain legal status.

Nevertheless, this article proposes a model of limitation (rationalization) of financing in the organization of interaction within the ecosystem for four potentially different solutions: supply chains, consortia, clusters, and stimulating digital industrial policies. At the same time, the possibility of public participation without the creation of state property with the preservation of the state control was demonstrated through the category “finances”, and not only through taxation and dividend payments. It has been concluded that the possible perspective of business ecosystems for the digital economy is precisely the formation of a single digital space as a new institutional environment that has the potential to solve the challenge of confronting private initiative in terms of localization of both tax payments and the activity itself. Indeed, this conclusion shows that the ecosystem model can and should be implemented within the framework of traditional public administration or new public administration, counteracting collective or private management in every way.

The comparative analysis showed that in terms of effective implementation of constraints, the most potential has a public participation consortium as a form of

achievement of achieved results and control of objectives. The most weak in terms of capital rationing is a cluster, except for a model that would have chosen financing as its cluster advantage (a financial cluster), but such models are unknown in practice, or they operate solely within free economic zones.

Therefore, attention should be paid to the development of “industrial business ecosystems” or ecosystem with state funding or state control as a means of implementation of modern effective industrial policy with the

replacement of large companies as organizers of business-ecosystems, which implies a targeted solution of the tasks of the state in the modern economy.

In many ways this solution can be achieved through transformation of industrial policy, for which the direction of transformation must adopt not the general ideology of digitization (proclamation), but concrete solutions related to new forms and possibilities of digitization and support (including financial) of industrial companies.

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