Organizational model of the digital agribusiness ecosystem

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Abstract. The article proposes an organizational model of a platform ecosystem that forms a universal digital infrastructure in the agro-industrial complex and unites government institutions, markets and agribusiness in a single information system. Within the framework of the methodology of system economic theory, the content of the model is structured in terms of four components - organizational, infrastructural, communication, logistics and innovation, which form independent (object, environmental, process and project) subsystems. The main differences between the infrastructure industry ecosystem model and existing practices are highlighted. In organizational terms, they will be associated with a hybrid architecture of the ecosystem, where the role of the central actor and owner of the platform will be assumed by the state, which will ensure equidistance from the participants and eliminate the asymmetry of their position. The differences in the business model of the designed ecosystem are associated with the industry principle of clustering of actors (around industry value chains), the universality and complexity of the proposal, and the addition of the value proposition of ecosystem participants with complementary measures of government support.

1 Introduction

The modern technological revolution, which is based on digital technologies, knowledge and information, has led to the emergence of a new organizational form called the “digital ecosystem”, and the eco-systems themselves are considered as “the main organizational consequence of digital innovation”, generated by the “digital technological revolution” and best “adapted to new ways of creating and preserving value” [1]. Their rapid development is accompanied by the emergence of many business models, united by this “umbrella” concept, and active scientific discussion, during which no single idea has emerged regarding their essential characteristics. Ecosystems are interpreted as “collections of economic entities closely associated with a key company, technology or platform and interacting with it and among themselves on the basis of a hybrid transaction management mechanism” [2], as “based on modularity, and not on hierarchical management... a set of autonomous organizations producing mutually complementary components of value" [3], as "multilateral markets" that provide the possibility of transactions between different groups of users [4], as

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"a set of participants with varying degrees of multilateral, non- general complementarity, which are not fully hierarchically controlled" [5], etc.

The diversity of interpretations and implemented business models leads to the formation of independent areas of scientific research on ecosystems. A common approach is to highlight "three focuses of attention when defining ecosystems: the ecosystem around the company, the ecosystem around the innovation (technology) and the ecosystem around the platform" [2], or "business ecosystems, innovation and platform" [5] which "do not contradict each other, but rather reflect variations in business models that are now called ecosystems" [2]. Moreover, in different contexts, the same ecosystem can be considered as a business ecosystem (from the point of view of its core - the company that owns the innovation or platform), innovation (the role of innovation in the value proposition) and platform (the platform as part of the innovation).

The need to identify an independent concept of "digital ecosystems" also remains a controversial issue, since the vast majority of ecosystems either arise around digital innovations or actively use them when creating a value proposition [6, 7]. That is, they are "digital" "from the point of view of the infrastructure on which they are built," regardless of "how they are organized" [8]. Nevertheless, the definition has become widespread and is associated with "the presence of a digital infrastructure or digital platform," and the digital ecosystem itself is understood as "a set of business entities closely associated with a key company on the basis of a digital platform or digital infrastructure and interacting with it and among themselves on the basis of a hybrid transaction management mechanism [2]. A similar definition is given by the Bank of Russia, defining a digital ecosystem as "a set of services, including platform solutions, from one group of companies or companies and partners, allowing users to receive a wide range of products and services within a single seamless integrated process" [9], but in a similar In the interpretation, the key role of the interaction of participants in creating the value proposition of the ecosystem, which is leveled to the level of a service, fades into the background.

Even greater uncertainty characterizes the results of research in the field of ecosystem development in traditional industries, for example, in the agro-industrial complex, where the operational, financial and other features of agribusiness remain unattended. In the absence of a recognized theoretical basis, their development is characterized by a multiplicity of organizational forms, significant fragmentation of the market and consolidation of the monopoly position of large players developing their own ecosystems - banks (Rosselkhozbank), financial (Rosagroleasing) and resource supply organizations. A similar fragmentation of digital services is also typical for the industry department - the Ministry of Agriculture of Russia, whose departmental project "Digital Agriculture", which provides for the creation of a full-fledged system of interconnected digital platforms for the agro-industrial complex, was only partially implemented.

2 Research methodology

The basis of the research methodology is formed by the provisions of system economic theory and the systems approach as a whole, a modification of which a number of authors consider the "ecosystem approach" as an independent direction within which the theory of ecosystems in economics is formed [10].

A look at the digital economy as a set of interacting digital ecosystems that go beyond the boundaries of traditional firms and markets allows us to study them as integral economic systems that have properties (emergence) that are not inherent in its components (subjects and institutions) separately. This approach fully fits within the framework of the systems paradigm proposed by J. Kornai [11], which complements the basic economic paradigms (neoclassical, institutional and evolutionary) with the provisions of the theory of economic

systems. The main unit of analysis of the new direction of economic theory (system economics), formed on the basis of the system paradigm, is the economic system, studied "from the point of view of its position in the external space-time continuum (exogenous analysis), and in terms of its internal state (endogenous analysis)", which allows "to illuminate in a new way... the connection between the functions and structure of economic systems... the relationship between enterprises and society, etc." and creates prospects for "studying the structure and dynamics of a number of "supra-individual" economic objects - institutions, communities (including network ones), organizations, social layers, environments, etc." [12]. Including digital ecosystems that logically fit within the framework of this approach.

The subject area of the research is limited to the development of a platform ecosystem model that forms a universal digital infrastructure in the agro-industrial complex and unites government institutions, markets and agribusiness in a single information system. The model extrapolates existing trends towards convergence of public and private platforms associated with the growing value of an "integrated" offer that allows users to receive complementary government services within the framework of the commercial services they use, reducing their own transaction costs.

3 Results

System economics identifies four basic types of economic systems: objects, projects, processes and environments [12]. The criterion for their identification is the presence of spatial or temporal boundaries. Thus, object systems (for example, firms) are created for an indefinite period, but the territory of their presence is, as a rule, limited; process systems (for example, those ensuring the diffusion of innovations) do not have clear spatial boundaries, but their period of existence is determined by the life cycle of innovation. Project subsystems associated with the implementation of any projects (for example, investment ones) have clear space-time boundaries, while environmental systems (for example, information systems and infrastructure), on the contrary, do not have them. The listed systems manifest themselves and interact with each other both at the micro level (in the activities of an individual economic entity) and at the macro level, which determines their general nature.

The application of the considered approach to the study of digital platform ecosystems forms the necessary methodological basis for describing their internal structure. G.B. Kleiner proposed a component model that describes an ecosystem of four interconnected components (subsystems):

- organizational (object subsystem) – a cluster that unites interconnected actors and business processes;
- infrastructural (environmental subsystem) – a digital platform that provides the offer of interconnected value components;
- communication and logistics (process subsystem) – a network format of interaction between actors, supported by the IT integrator;
- innovative (project subsystem) – innovative initiatives and acceleration programs that affect the value of the proposal [13].

Before considering each component in more detail, let us outline the main provisions that distinguish the organizational and business model of the proposed industry ecosystem (let's call it an Infrastructure Industry Ecosystem, or IIE) from existing practices:

1) In organizational terms, the IIE will be distinguished by a hybrid architecture, where the role of the "central" actor and owner of the platform will be assumed by the state (Ministry of Agriculture of Russia), and the subjects and users of the value proposition (agribusiness, financial intermediaries, resource suppliers, buyers) will receive equal, non-discriminatory access to the emerging information system. On the one hand, the proposed idea does not

contradict existing views on the subject composition of ecosystem actors, which include "entrepreneurs, firms, government agencies and research institutions" [14], "authorities, consumers, suppliers, competitors, social media, civil society, scientific and educational institutions" [15], that is, many authors consider the state among the key stakeholders. On the other hand, the provision on the direct participation of the state in the ecosystem develops traditional ideas that "in these relations the state can play the role of catalysts, coordinators, certifying bodies and customers" [16]. And most importantly, this creates the prerequisites for overcoming the main organizational problem of ecosystems associated with the presence of a core, that is, a central company, the external environment of which is formed by individuals interested in the development of its value proposition and around which network interactions are built. The consequence of such an organization is "the asymmetry of the position of the subjects in favor of the central participant, which gives rise to a discussion about the need for intervention by the regulator" [2], that is, the state in regulating the relationships between participants in the ecosystem. The creation of a state platform equidistant from all actors will eliminate any form of discrimination, since the role of the state in the created infrastructure for network interaction will not go beyond the boundaries of regulatory functions, that is, unlike firms, for the state there is a risk of the prevalence of its own economic interests are significantly lower.

2) The IIE business model will differ from existing ecosystems:

- industry principle of clustering - the formation of supply around industry value chains (production, financial and information needs of agribusiness entities);
- universality and complexity of the offer - the functioning of many multilateral and conventional markets, that is, commodity (resources, wholesale and retail sales), financial (credit, leasing, insurance), information (services, consulting) marketplaces and services, in a unified information system;
- supplementing the value proposition of ecosystem participants with complementary measures of government support - a simplified (due to the information transparency of participants' transactions for the platform owner, that is, the state) procedure for remote receipt of budget subsidies, grants, soft loans, credit guarantees, etc.

Also within the framework of organizational modeling of the infrastructural industry ecosystem of agribusiness, the thesis that ecosystems use "market or network organizational forms", can be organized "in the form of hierarchies, markets or networks" and are considered as "an intermediate organizational form between markets" seems important. and hierarchies" [17], that is, "we are talking about a mechanism of interaction that differs both from the market relations of the company with suppliers and from vertical integration" [2].

The impossibility of describing digital ecosystems solely in terms of markets is associated "with the fact that, firstly, they may consist of several interconnected, multilateral and "ordinary" markets; secondly, they function (to a certain extent) outside of transactions that have signs of market interactions (price mechanism and even hybrids)" [2]. Differences from hierarchies are associated with the modular organizational structure of digital ecosystems, which does not imply full integration of actors. For the ecosystem leader, the emerging dependencies are associated with the need for the participation of other economic entities (complementors) in complementing his value proposition, the latter retaining economic independence and control over assets, but are forced to act in a coordinated manner, accepting general rules determined by the platform leader.

4 Discussion

To detail the organizational model of the infrastructural industry ecosystem of agribusiness, we will consider its internal structure in the context of selected components (subsystems).

The organizational component of the IIE is a set of actors (cluster association) participating in the creation of an industry value proposition and being its consumers (Fig. 1).

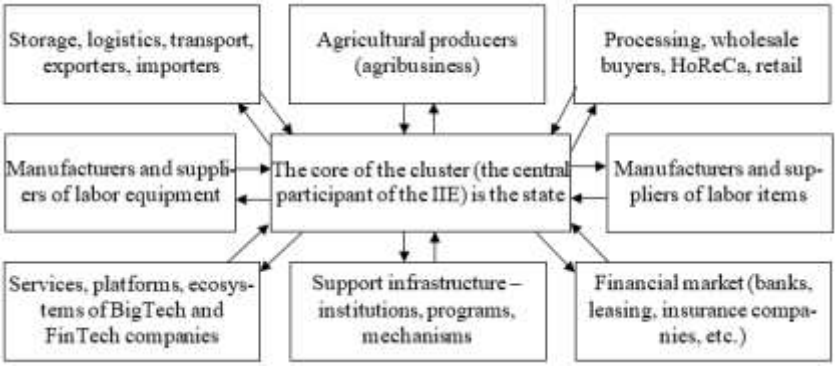

Fig. 1. Organizational component of the infrastructure industry ecosystem of agribusiness.

In essence, we are talking about a "stakeholder representation" of this subsystem, that is, identifying the key stakeholders most interested in the development of the ecosystem [15]. The features of the organizational component of the IIE will be:

- lack of discrimination - the core of the ecosystem (the owner of the platform is the Ministry of Agriculture of Russia) is equidistant from all participants and has no economic interests of its own. For the state, incentives will be associated with increased efficiency of measures to support the industry: consolidation of government services into a single information system, increased transparency of transactions, increased targeting of support, automation of control, reduction of transaction costs;
- industry principle of clustering - spatial localization within the boundaries of industry chains of formation and movement of value;
- going beyond the boundaries of the traditional understanding of the industry - in addition to the subjects of the agro-industrial complex, the ecosystem must provide the possibility of network communications with government institutions, financial and IT industries;
- the opportunity for agribusiness entities to simultaneously act as both the demand side and the supply side.

The infrastructure component of the IIE is a digital platform, the owner and operator of which will be the Russian Ministry of Agriculture. Platforms are "products, services or technologies" that provide connections between ecosystem participants and allow them to "develop their complementary products, technologies or services" [18]. Unlike traditional firms that "create value within a company or supply chain, platforms use an ecosystem of autonomous agents to co-create value [19] and in practice function as online stores (multi-sided markets connecting multiple suppliers and customers) [17]. The value proposition of the IIE platform will be built around the needs of agribusiness entities and, unlike existing practices, will unite four groups of products: goods, financing, information and government services (Fig. 2).

The communication and logistics component of the IIE is a variant of the applied implementation of the network structure of interaction between ecosystem members. The "network stability" of the ecosystem depends on the state of this component, determined by "the presence of stable network connections between stakeholders and the core of the ecosystem" [15]. Along with information security requirements, the main technological barrier to the creation of IIE is the need to implement Open API technology in the information systems of the Ministry of Agriculture, ensuring the possibility of their interaction with information systems not only of other government institutions, but also with information systems of complementors (economic subjects) involved in creating ecosystem value. The development of the necessary digital infrastructure (the unified state digital platform GovTech and the unified state cloud platform "GosOblako") creates the prerequisites for combining all information systems of the Russian Ministry of Agriculture in a single shell and creating a digital platform that provides the possibility of multilateral communications between ecosystem participants, that is ensures the technical feasibility of the IIE concept.

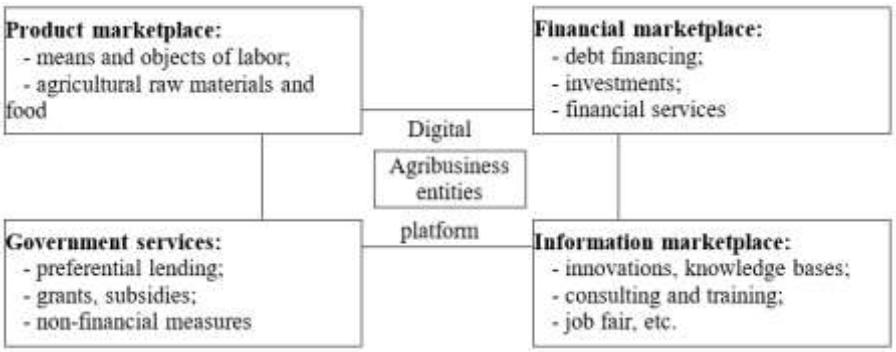

Fig. 2. Infrastructure component of the infrastructure industry ecosystem of agribusiness.

The innovative component of the IIE is a set of innovative initiatives and acceleration programs that influence value. Taking into account the organizational features of the IIE, this component will combine free and commercial information services. The first include free industry knowledge bases, industry educational and acceleration programs implemented by the Russian Ministry of Agriculture and ensuring the popularization and diffusion of innovations (including digital ones) into the industry. The second includes consulting, educational and acceleration programs implemented by industrial partners and scientific (educational) organizations related to the commercialization of innovations, that is, their use by agribusiness entities. It is also necessary to develop mechanisms for involving departmental universities and research institutes of the Russian Ministry of Agriculture in the search for start ups, projects and ideas, and developing business incubators on their basis to support innovative initiatives and scale up best practices.

5 Conclusion

The infrastructural industry ecosystem of agribusiness, incorporating into a single platform solution tools and mechanisms for interaction between industry business structures in value chains and the proactive implementation of government functions for managing and supporting the industry, will functionally and organizationally combine the capabilities of existing digital platforms and ecosystem solutions in the agro-industrial complex on a technological basis , information and legislative levels. But at the same time, its development should follow the “one of many” principle, that is, it will not replace existing ecosystem and platform solutions in the industry, but will function in parallel, competing with other market participants on the one hand and forming a publicly accessible infrastructure for their interaction. actions, on the other hand. The fundamental difference between the model being developed and existing practices, which determines its functional and elemental features, will be the active role of the state represented by the Ministry of Agriculture of Russia, which in the model of the industry ecosystem will be assigned the role of founder and system actor.

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