Innovation Ecosystem Models in Russian Electric Power Sector

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Abstract

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For the last decades we can observe an emergence of various forms of interfirm collaboration, which cannot be described neither in terms of hierarchy, nor in terms of transaction cost economy: networks of independent firms which retain control over their assets and activities but nevertheless coordinate with others in terms of collaborative value creation. This phenomenon is called an ecosystem and is being exhaustively studied by many authors (e.g. Gawer & Cusumano, 2002; Nambisan & Sawhney, 2011; Adner, 2012; Fjeldstad et al., 2012; Adner et al., 2013; Autio & Thomas, 2014; Jacobides et al., 2018). One of the most promising avenues for the research is a concept of ecosystem model, which helps to describe the logic of ecosystem in terms of different actors and coordination mechanisms, which the focal firm uses in order to facilitate collaboration among them.

While the abovementioned authors contributed significantly to the ecosystem theory, still the current body of knowledge does not fully address the following questions: (1) motivation of firms to collaborate; (2) choice of coordination mechanisms by a focal firm.

My PhD research aims to contribute to the existing study on innovation ecosystems and is based upon the study of firms within Russian electric power sector, which are currently facing the challenge of the industry transformation and its transition from traditional vertically integrated grid towards a more decentralized one with the greater influence of end-consumers. This transition is governed under the state program EnergyNet and includes around 150 company-members that are willing to adapt to the new conditions and perform innovation activities in collaboration with each other. Within this research we will make an attempt to answer the following research questions: (1) why firms engage in such collaboration; (2) how and why a focal firm chooses appropriate mechanisms for coordination.

Currently, our study is focused on the first research question and is devoted to the assessment of the influence of various institutional factors (specific to the industry) on the willingness of firms to collaborate (availability of resources; partnership possibility; state support). At the moment, a preliminary survey of 16 firms was conducted, which allowed to verify and clarify the questionnaire as well as to determine a set of factors which negatively influence the willingness of firms to collaborate: (1) While SMEs point out high and medium importance of collaboration with big companies and SMEs respectively, big companies seem to have moderate to low interest in collaborating with similar ones and SMEs; (2) State support in general seems to be less important in comparison to availability of various resources and possibility to collaborate? both for big companies and SMEs; (3) There is an imbalance between the importance of various institutional factors and their availability. In the following 6 months we are planning to continue the survey until we collect at least 50 completed questionnaires.
The second stage of the research is focused on the second research question. It relies on the work by Jacobides et al. (2018) and will address the question of how various types of complementarities present in the ecosystem will influence the choice of coordination mechanisms by a focal firm. It will be launched in the following 2-3 month and would be based upon the interviews with firms' representatives (middle-managers, CEO, chief innovation managers) as well as on secondary data (open data and documents). Initial assumptions are the following: (1) in case when ecosystem implies unique complementarities in production, a focal firm will put more emphasis on co-specialization and lock-in of the ecosystem; (2) while in case of supermodular complementarities there would be more attention paid to the divergence and attraction of new members; (3) regarding the complementarities in consumption, presence of unique ones would not require a close cooperation with consumers; (4) while in case of supermodular complementarities, consumers would be a central figure due to the possibility to gain additional yields from generated network effects. We plan to process the data using the QCA method which would allow to outline complex causal relationships between observed factors.

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Recent fundamental changes in the Russian electric power sector and corresponding shifts in innovation practices stimulate the development of new approaches towards the nurturing of collaboration of organizations during the innovation process. These approaches are best described in terms of the ecosystem concept, which has been firmly established within the existing managerial research and introduces a radically different explanation of the underlying dynamics of interfirm collaborations during the development of innovations. In particular, we rely upon the notion of innovation ecosystem model, which proved itself to be useful for the analysis of the collaboration process. Moreover, an attempt is made to widen the scope of the collaboration analysis and include a motivational aspect, which in turn depends upon the existing socio-technical environment of the studied sector. Conducted survey of the ecosystem participants revealed factors, which are assessed to be crucial for the organizations to actively participate in the ecosystem. Availability of resources (tangible, financial and personnel) seems to be of highest importance. Possibility to collaborate is considered to be moderate in terms of motivation of ecosystem participants to be involved in the ecosystem. State support is considered to be the least important factor. Obtained results may be used as a foundation for the fine-tuning of the existing coordination mechanisms used by central actors of the ecosystem.

**Keywords**: ecosystem; innovation ecosystem, innovation ecosystem model, interfirm collaboration, innovations, Russian power sector.

1 | Introduction

Current state of electric power sector in Russia is the result of two antagonistic drivers: (1) decoupling of the value chain (currently, power generation, transmission and sales are separated businesses – unlike before, when they were performed by a single entity); (2) heritage of a soviet period, when the development of the sector was completely controlled and governed by regulators with almost no freedom of choice for the companies of the sector, and a result – high concentration of the sector; (3) recent technological advances in power electronics and IT technologies. After the division of the previously united power system each country was left with a certain amount of assets, which were not efficient on their own as they were created for the purpose of serving to a big electric system of the whole Union. As a result, we are able to observe a surplus of assets, which companies are not able to properly maintain, manage and update.

At the same time, recent advances in power sector technologies fundamentally change strategies of companies – they have to deploy innovations in their practices – otherwise they could face substantial difficulties in the future development.

Government, being a key stakeholder in the power sector and being responsible for the establishment of a suitable conditions for innovation activities, has made a number of attempts to do so. The most bright examples would be technological platforms (when big companies establish a platform for collaboration with small companies, academia and various groups of interest) and programs of innovative development (when big companies are obliged
to create a strategic plans for innovative development and report upon its execution in order to get a financial support from the government). However, these initiatives demonstrate very humble results – most companies assess them as being ceremonial and formal (Volkova & Burda, 2017; Gershman, 2013).

At the same time, there is a considerable group of companies within the sector who are willing to create innovations and collaborate with each other and external partners as well. The only problem is that there is not enough understanding on how to do this and if there is a chance to get necessary support from the state – both legislative and financial. This is why in 2016 a new initiative was launched called “EnergyNet”. It is aimed to create of a favorable condition for those organizations within power sector who want to innovate – without any pressure from the government. Up to now this initiative already demonstrated substantial results – a lot of research was undertaken, and innovative projects were launched.

However, due to the fact that organizations pursue their activities on their own, there is lack of proper understanding on how to operate within these conditions – what is required from them in terms of strategies and roles. Government is responsible only for providing co-financing for the projects that have a significant potential and for the overall regulation of the sector. At the same time, big companies who are perceived as catalysts of innovations, (it is rather common for big companies to attract smaller ones) do not fully realize the underlying motivation for other firms to collaborate.

In this research I make an attempt to study the current state of this collaborative innovative activity and investigate the underlying motivation of economic agents. The study is based upon the innovation ecosystem theory as it provides adequate tools for investigate this loosely coupled constellation of economic agents and the process of their collaboration, which cannot be fully described through market or hierarchy.

Current research is devoted to the investigation of various institutional factors (availability of resources, collaboration possibility, state support) from two important perspectives: their perceived importance from the perspective of economic agents and their assessment of the current state of each particular factor. We are making an assumption that these factors influence the motivation of economic agents to participate within the ecosystem, which in turn influences the ecosystem model.

2 | Theoretical Background

2.1 | Ecosystem: Form of Interfirm Collaboration

For the last decades we can observe an emergence of various forms of interfirm collaboration, which cannot be described neither in terms of hierarchy, nor in terms of transaction cost economy: networks of independent firms which retain control over their assets and activities but nevertheless coordinate with others in terms of collaborative value creation.

Modern management literature provides a wide array of various forms of description for collaboration among many economic agents. The most prominent ones are networks, value-chains, platforms, alliances and open innovations. These forms provide a very distinct explanation of forms and methods of collaboration among economic agents and are widely used within managerial research. However, recent emergence of a completely different form of interfirm collaboration necessitated the development of a new theory, which were able to describe the phenomenon when: (1) members of collaboration process vary in time (Lutjens et al., 2019); (2) the links between economic agents are not direct (Adner, 2017); (3) when links “supplier-consumer” are not unidirectional (Adner, 2017); (4) the number of partners is rather large (Ketonen-Oksi & Valkokari, 2019); and (5) activities of actors are integrated to a certain extent so that they are interdependent (Jacobides et al., 2018).
This phenomenon is called “ecosystem” and is exhaustively studied by many researchers (Gomes et al., 2018). It should be indicated at once that existing debate regarding the term “ecosystem” itself (Oh, et al., 2016) will be left outside the scope of the research.

The origin of the phenomenon can be traced back to the canonical work by Moore (1993), where the author pioneered the idea that the competition for the consumer is performed not by a single firm but rather by constellations of firms – even from various industries. This notion about the collectivism for the purpose of profiting received a considerable attention in the following studies and separated into three rather independent research streams: knowledge ecosystems (Van der Borgh et al., 2012; Clarysse et al., 2014); innovation ecosystems (Adner, 2006; Adner & Kapoor, 2010); and entrepreneurial ecosystems (Isenberg, 2010).

Within this study we will refer to innovation ecosystem in order to highlight the reason for interfirm collaboration – creation of a particular innovation. However, the underlying logic of interaction within all these three streams is rather similar.

Given the fact that current body of knowledge about ecosystems is fragmented (there is plenty of research streams, either of which is trying to stress a particular aspect of the phenomena) there is a variety of definitions for the construct. However, we would like to refer to one particular definition, which seems to adequately distinct ecosystem from other forms of interfirm collaboration. “The ecosystem is defined by the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize” (Adner, 2017: 42). Definition by Ron Adner highlights four important aspects of an ecosystem as a form of interfirm collaboration (Adner, 2017: 42-43): (1) alignment structure (includes mutual agreement among partners on the distribution of roles and activities); (2) multilateral (critical interaction across various relationships); (3) set of partners (creation of value proposition depends on these actors regardless their direct connection to a focal firm); (4) focal value proposition (a particular value proposition sets a boundaries of an ecosystem and defines the set of partners, which allows to restrain the border of analysis). Abovementioned focal firm is an entity who takes the orchestration role within the ecosystem, aligns its partners and coordinates their activities so that a value proposition was created.

![Figure 1. Ecosystem (conceptually)](image)

Basing on the provided description of the phenomenon, we can argue that ecosystem is distant from the other forms of interfirm collaboration in sense that its participants are not connected either by a hierarchy of by formal contracts of any kind (Jacobides et al., 2018). Moreover, ecosystem by its structure may incorporate various constellations of economic agents (e.g. platforms, as it is shown in the figure above) and by that reason called a meta-structure of collaboration based upon self-regulation. However, there is still a certain structure present with its own
rules and coordination mechanisms which entitle a great freedom for participants but nevertheless include certain amount of devotion.

2.2 | Ecosystem Model

The whole purpose of ecosystem existence is a creation and delivery of a so-called “ecosystem value proposition” (EVP) (Lindic & da Silva, 2011; Ulaga & Reinartz, 2011; Walrave et al., 2018), which is aimed at the satisfaction of consumer requirements. Given the fact that these requirements may shift over time, EVP is also changing. This, in turn, may lead to the changes in the ecosystem membership structure, their activities and/or their roles. Focal firm, being an orchestrator of the collaboration process, is able to influence the ecosystem and reshape some of its components. Combination of these components is called “ecosystem model” (EM). Latter can be described in terms of how the value (EVP in this case) is created and delivered to consumer as well as how added value is appropriated by ecosystem members (Walrave et al., 2018) (Figure 2).

Figure 2. Relation of ecosystem value proposition, ecosystem model and a focal firm

Ecosystem model could be described via a business-model analogue, which defines the value logic of a single firm (Adner, 2017; Osterwaldeer & Pigneur, 2010; Zott et al., 2011). EM consists of the following major elements: (1) actors and their activities; (2) links among actors; and (3) coordination mechanisms employed by a focal firm.

Basing on the analysis of the current body of knowledge on the subject, we may argue that actors of the ecosystem may be divided into two major groups (as indicated at the figure above): (1) focal firm (who represents the cornerstone member of the system and is responsible for the coordination of activities performed by diverse economic agents); and (2) complementors (who provide necessary complementary offerings and allow for the creation of a complex and complete value proposition) (Jacobides, 2018). As it was shown in work by Adner (2017) a producer of an innovative automotive run-flat tire requires other partners (wheel producers, automakers, car dealers and repair shops) to reshape their business processes so that end user was able to use this innovative offering.

Links among actors within the ecosystem may be both direct (when a focal firm collaborates with complementors so that there was a congruence in their offerings, e.g. an OEM manufacturer who works in close ties with a software producer to make latter worked smoothly with a particular hardware) and in-direct (when a focal firm does not collaborate directly with complementors and fitness of the offerings is achieved via an established set of technological standards, e.g. a smartphone manufacturer uses a widely used connector so that other manufacturers were able to provide consumers with comparable accessories – charging cables, wired headphones etc.).

Despite being formed as a voluntary and self-sustained form of collaboration, ecosystem still requires certain mechanisms to coordinate activities performed by various members. Current body of knowledge put emphasis on the

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1 Original equipment manufacturer
2 Examples from IT sector are provided for the purpose of clarity. It does not mean that ecosystems exist exclusively in this sector – former are widely spread phenomena, which can be observed in various industries
following: creation of a unified vision of the ecosystem (Autio & Thomas, 2014; Overholm, 2015; Williamson & De Meyer, 2012); establishing appropriate modularity (Nambisan & Sawhney, 2011) and a set of technological standards (Gawer & Cusumano, 2002); provision of support for the complementors (Adner & Kapoor, 2010); balancing various goals and attitudes of participants (Makinen & Dedehayir, 2013); development of proper alignment in roles and activities (Adner et al., 2013; Koenig, 2012; Williamson & De Meyer, 2012); management of common resources (Fjeldstad et al., 2012; Koenig, 2012).

Abovementioned studies as well a few more papers devoted to the topic (Adner, 2012; Jacobides et al., 2018) provide us with a very detailed analysis of the coordination mechanisms used by focal firms and explaining the underpins of the ecosystems. However, current body of knowledge does not fully address the following important question: how does a focal firm chooses, which coordination mechanisms are appropriate in a given ecosystem and which factors must be considered? In this paper we will make an attempt to address this question via the investigation of the external environment of the innovation ecosystem and identification of factors, which are important in terms of collaboration.

2.3 | Institutional Factors, Actors’ Motivation and Innovation Ecosystem Model

As it was clearly shown in the work by Walrave et al. (2018) any given ecosystem does not exist in a vacuum – there is always a multi-level external environment present, which includes a number of interrelated levels: (1) existing niche; (2) existing socio-technical regime; (3) existing socio-technical environment. Niche constitutes not only of the members of a given ecosystem, but of various external actors as well – universities, scientists, NGOs, associations and policy-makers, who may not participate in the ecosystem, but are interested in the development of the particular domain of the ecosystem interest (Walrave et al., 2018: 106). Authors of the cited work rely upon the strategic niche management (SNM) literature and argue that in case of path-breaking innovations existing niches may possess a rather hostile environment for the development of a given technology. At the same time, existing socio-technical regime poses another challenge for the development of the ecosystem – incumbents are prone to defend their positions. Socio-technical regime is yet another factor, whose influence is important in terms of the ecosystem existence as it acts as a mediator of the ecosystem success. As so, authors (Walrave et al., 2018: 106-107) argue that ecosystem members should reciprocally interact with the environment and gradually update their EVP depending on the reaction.

In this research we rely on the abovementioned arguments and claim that socio-technical environment must be considered as an important factor that influences the ecosystem model and consequently its value proposition. As it was indicated in (Schot & Geels, 2007) an external environment may be considered as a “[…generic make-up (the genotype” of a technology expressing itself in products and processes…”) while regimes are the source of stability of a particular technology due to the constituting rules, which are shared and reproduced (Schot & Geels, 2007: 608). Moreover, external environment (regime in particular) guide the technical design and shapes market development (consumer preferences in particular). As so, institutional environment appears to be an important mediator of the ecosystem model and should be considered appropriately.

At the same time, ecosystem manifesting as a set of interrelated economic agents is deeply dependent on their collaboration (which is the essence of its existence). As it was mentioned before, one of the most important tasks of the focal firm is to facilitate such collaboration via various mechanisms. However, its ability to influence economic agents is limited as it does not have a hierarchical or contractual leverage. Moreover, their behavior is shaped by the existing external conditions and their perceived assessment of these conditions. Regardless the structure of the ecosystem model and arguments of the focal firm economic agents will be reluctant to participate unless they find
tangible benefits from such collaboration – e.g. access to available resources, possibility to partner with a big firm. This situation may be described in terms of their motivation. Motivation of economic agents is an important mediator of the ecosystem model as it is directly influencing its structure and specifies the effort that a focal firm will have to make in order to attract important members and retain their interest.

Taking all this into account, an innovation ecosystem model should be analyzed in combination with the analysis of the existing socio-technical environment and of the motivation of economic agents, which relies upon their assessment of such environment.

3 | Innovation Ecosystem Models in Russian Electric Power Sector

3.1 | Current State of Innovations in Russian Electric Power Sector

As it was stated in the introductory section of the paper, current state of innovation within the Russian electric power sector is a result of two divergent factors: heritage of the Soviet Union united power system and recent technological advancements. Former results in reluctance of incumbents to innovate due to their path resistance on previously vertically integrated value chain and inability to generate additional revenues for innovations. Latter results in the emergence of various newcomers – firms who provide nonconventional offerings for consumers up to the point when they obtain the ability to withdraw from the relationships with the traditional power companies. Probably the most obvious example would be the distributed generation and smart local grids when a certain number of consumers no longer require purchasing electricity from sellers, which in turn results in absence of demand for the grid and big generation. All this at its extreme may result in the overall obsolescence of traditional players of the sector.

Keeping this possibility in mind, government launched various initiatives, which were aimed to stimulate innovative development within the sector. However, companies have executed them in a formal way and results of these initiatives were extremely humble. The major reason of such poor outcome was the fact that firms were forced to innovate, which resulted in their resistance in every possible form (Gershman, 2013).

Keeping this situation in mind, the government decided to substantially reconsider its policy and switch from directives to involvement. As so, in 2016 a new initiative was launched under the name “EnergyNet” – a self-regulating community, which consisted only from those organizations who had a wish to participate and collaborate. Role of the government resolved to financial and legislative support of the initiatives from participating parties: co-financing of the projects and elimination of administrative barriers for the execution of these projects. Moreover, if there is no input required from the government – neither financial nor legislative, firms are not required to report on their collaboration and are free to execute the project in any way they want – until they do not brake existing rules and regulations.

Providing a great amount of freedom to organizations of the sector, this initiative resulted in a considerable number of various projects being launched over a four-year period. However, being non-directive, this initiative does not provide any practical rules and strategies for companies to manage their collaboration. As a result, there is a lack of understanding on how to coordinate various activities among divergent set of actors. As so, this research is aimed to tackle this issue by investigating the motivational aspect of the collaboration process. By identifying the most important triggers of motivation we can obtain the ability to develop an appropriate strategies and practices to maximize the output of collaboration process.
3.2 | Ecosystem Model of Russian Electric Power Sector

EnergyNet consists of participants from various sectors ranging from traditional power sector to IT and academia. Consisting of such heterogeneous members, it allows to tackle innovations from several points of view. The overall structure of the ecosystem can be described in the following way (Figure 3).

![EnergyNet structure](image)

There are several types of participants: (1) business – companies both from power sector and other industries, who are interested in the execution of innovative projects; (2) science and education – various universities and research centers, who owns research competencies and is able to provide necessary insights; (3) industrial partners – big traditional companies, who act as catalysts of the innovation process and provide necessary resources and industrial expertise; (4) development institutes – quasi-government entities, who provide financial support for participants; (5) regulators, who provides administrative and legislator support for the projects.

As we can see, the overall logic of EnergyNet is a promotion of lateral collaboration – both between the government and industry, as well as among other partners. Members of the ecosystem collectively develop and execute projects, eliminate regulatory barriers and use existing pool of various resources. Such approach already demonstrated outstanding results – since 2016 more than 50 various innovative projects were launched.

Organization of activities is performed via a so-called working group, which consists of the representatives of participating parties. Members of the ecosystem make arrangements on how to execute collaborative projects, whether to submit for state support and if there is a need for certain adjustments in legislation. The underpinning of the overall process is the motivation of economic agents to collaborate, which is why this side of the ecosystem will receive the most attention in this research.

3.3 | Research Design

In this research we focus on the assessment of the motivational side of the ecosystem model and are trying to understand, which factors are crucial for economic agents. The research is based upon a mixed theory-practice technique for the decomposition of the abovementioned concept of socio-technical environment. In order to assess its importance and influence of the motivation of economic agents to collaborate we developed a congruent list of its descriptors, basing both on existing institutional theory and executed interviews with the industry representatives.

We were able to describe the environment through the following sets of indicators (Figure 4).
Above-mentioned indicators are able to provide a holistic description of the existing socio-technical environment as they include three major driving forces of the sector: (1) availability of resources; (2) partnership possibility; and (3) state support.

As it was stated earlier in the paper, resources available for sharing by participants are crucial for the ecosystem as they provide a rationale for the participation. Within the electric power sector, the most important types of resources are the following: personnel – both highly skilled and operational. Given the fact that nowadays we can observe a problem of ageing workforce in the sector (Schulte, 2018) and lack of interest to it from alumni, provision of access to human resources is an appealing argument for ecosystem members to participate and bring their experience, resources and technologies.

Financial resources are unquestionably important, as projects within electric power sector are usually capital-intensive and require shared investments and risks. Usually these resources are provided by a focal firm – old, well-established incumbent who is financially stable but requires non-monetary inputs from new-entrants in a form of technologies, new skills, specialized expertise etc. Ecosystem participants require such resources for their development and will be willing to share their inputs in return of financial support from a focal firm.

The same goes for the equipment, materials and infrastructure, which are essential elements of the innovation process. Being highly specialized, equipment within the electric power sector has a very high quasi-rent. As so, its development is usually conducted collectively. Materials are considered to be rather scarce, which increases the power of suppliers and poses a challenge for new entrants. Availability of resources is considered as an attractive factor and turns to be important in terms of motivation to collaborate within the ecosystem.

Being an essence of the ecosystem, collaboration possibility describes the availability of various partners for collaboration. Ability to collaborate with consumers (including big companies and SMEs) opens up a possibility to collectively develop the value proposition so that was able to satisfy the requirements of the user. Establishment of relations with suppliers is important in terms of their relative bargaining power and ability to influence the EVP by providing (or on contrary – non providing) certain valuable inputs. Collaboration with production partners guarantees the stability of the delivery of innovative offering in case it is adopted by the market. Possibility to run collaborative R&D is probably the most important motivational factor as former allows for sharing risks associated with such activity as well as for combining heterogeneous experience of participants involved.

State support was included into the analysis due to the fact that regulatory environment is considered to be of high importance – especially in such highly regulated industry as electric power sector. First of all, indicators included
those related to taxation of activities. As it is widely accepted, tax incentives act as an important motivator for economic agents to conduct their activity within the given location. Administration of investment projects is yet another factor, which influences the motivation of economic agents to collaborate within the ecosystem. It is of high importance to have a “one-window” approach towards the administration of various innovative projects within the complicated regulatory environment. Such administration is especially crucial in cases when the execution of a project requires shifts in the legislation and/or regulatory mechanisms. Only the government, being the ultimate coordinator of the sector, has power to update the “rules of the game”.

Consulting and educational support is more important for small companies and especially newcomers in the sector as they are less familiar with the overall framework and existing supporting mechanisms. Such mechanisms dramatically shorten the learning curve for new entrants and allow them to concentrate their effort on a productive activity. Financial state support is yet another important factor for the establishment and development of the business within the ecosystem. When there is a chance to receive co-financing for the project and/or business economic agents would be more inclined to do so.

As so, this research includes the complex analysis of various external factors that influence the motivation of economic agents to participate in the ecosystem and collaborate within. Resting upon the notion of the importance of socio-technical environment for the existence of various forms of innovations, we propose the following hypothesis:

Examined institutional factors influence the motivation of economic agents to participate in the innovation ecosystem, which in turn influences the ecosystem model

Visual representation of this hypothesis is proved in the figure 5.

Within this research, we mainly focus on the left side of the figure and devote major attention to the assessment of various factors of the socio-technical environment. Being a part of the broader environment and being affected by it, ecosystem model cannot be studied in a vacuum. In order to fully understand the underpinnings of the phenomena, one should understand the external context. In particular, we will focus our attention on the following two aspects of the socio-technical environment:

- Assessment of the importance of observed factors from the ecosystem participants’ point of view (perceived importance). This will allow to understand what do economic agents participating in the ecosystem actually think about the external factors as it will explain their actual patterns of behavior;
- Assessment of the availability of the observed factors from the ecosystem participants’ point of view (perceived availability). This will allow to understand how economic agents feel about the environment, which in turn will allow us to understand the underlying logic of their actions.
Such two-sided assessment will also allow to conduct a very simple yet important action – to compare the perceived importance and availability of various factors. In case if we will observe an imbalance in the assessments, we then can hypothesize on the possible shifts in the environment required.

### 3.4 | Data

The research is based upon the questionnaire of economic agents who participate in EnergyNet (150 members in total). There are representatives of various industries and sectors: electricity generation (including renewables), electric power grids, heavy production companies, IT companies, universities, research centers, telecommunications. Our goal is to reach around 2/3 of the total population of the ecosystem (100 respondents) so that we were able to generalize our results.

We used questionnaire technique so that respondents were able to provide us with their perceived assessment of the external environment. The questionnaire was anonymous and was conducted both online and offline. As it was mentioned before, respondents were asked to provide their perceived assessment of the external factors from two standpoints: (1) importance of the given factor; and (2) perceived availability of the factor. Both assessments were based upon a traditional 7-point Likert scale, where 1 indicated low importance and availability, while 7 indicated high importance and availability of a given factor.

Questionnaire is being launched for a few weeks and at the moment we were able to collect 16 responses (description of the current sample is provided in the table 1). Obtained preliminary results allowed us to verify the clarity of the questionnaire. As so, no changes in the structure and form of the questionnaire have been made.

<table>
<thead>
<tr>
<th>n</th>
<th>Size of the company (# personnel)</th>
<th>Type of ownership</th>
<th>State ownership (regional) (%)</th>
<th>Age of the company (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>[1-15] – 6.3%</td>
<td>JSC – 40%</td>
<td>0% – 62.5%</td>
<td>&lt;5 – 25%</td>
</tr>
<tr>
<td></td>
<td>[16-100] – 37.5%</td>
<td>LLC – 46.7%</td>
<td>[5-10] – 6%</td>
<td>[5-10] – 6%</td>
</tr>
<tr>
<td></td>
<td>[101-250] – 18.8%</td>
<td>Affiliated company – 6.7%</td>
<td></td>
<td>[10+&gt; − 69%</td>
</tr>
<tr>
<td></td>
<td>[251-500] – 12.5%</td>
<td>PJSC – 6.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[501-1000] – 6.3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[1001-5000] – 12.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[5001 and more] – 6.3%</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

As we can see, most of the respondents represent small and medium sized companies, while big ones represent around a third of the overall sample. However, taking into account the disproportion in the actual number of SMEs versus big companies, presented sample, despite being rather small, can be treated as balanced. At the same time, vast majority of the companies in question has no affiliation to the state. As for the age of the companies, most of them are older than 10 years, which can be the result of the peculiarities of electric power industry.

### 3.5 | Results

Conducted survey allowed us to understand how ecosystem participants assess the importance and availability of various external factors. By that we obtained the opportunity to understand the underlying logic of their behavior and outline possible avenues for influencing their motivation. Table 2 provides a detailed description of the assessment of the perceived importance of various external factors.
Table 2. Perceived importance of external factors

<table>
<thead>
<tr>
<th>#</th>
<th>Factor</th>
<th>Average</th>
<th>MIN</th>
<th>MAX</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Availability of resources</td>
<td>5,17</td>
<td>0,95</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Personnel</td>
<td>5,38</td>
<td>3,00</td>
<td>7,00</td>
<td>1,15</td>
</tr>
<tr>
<td>1.3</td>
<td>Financial</td>
<td>5,44</td>
<td>2,00</td>
<td>7,00</td>
<td>1,71</td>
</tr>
<tr>
<td></td>
<td>Equipment, materials &amp; infrastructure</td>
<td>4,69</td>
<td>2,00</td>
<td>7,00</td>
<td>1,78</td>
</tr>
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<td>0,80</td>
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<tr>
<td>2.1</td>
<td>With big companies</td>
<td>5,69</td>
<td>3,00</td>
<td>7,00</td>
<td>1,45</td>
</tr>
<tr>
<td>2.2</td>
<td>With SMEs</td>
<td>3,69</td>
<td>1,00</td>
<td>6,00</td>
<td>1,40</td>
</tr>
<tr>
<td>2.3</td>
<td>With consumers</td>
<td>6,31</td>
<td>4,00</td>
<td>7,00</td>
<td>0,95</td>
</tr>
<tr>
<td>2.4</td>
<td>With suppliers</td>
<td>4,81</td>
<td>2,00</td>
<td>7,00</td>
<td>1,72</td>
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<tr>
<td>2.5</td>
<td>Collaborative R&amp;D</td>
<td>4,50</td>
<td>0,00</td>
<td>7,00</td>
<td>1,83</td>
</tr>
<tr>
<td></td>
<td>State support</td>
<td>3,59</td>
<td></td>
<td>1,73</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Tax legislation</td>
<td>3,88</td>
<td>0,00</td>
<td>7,00</td>
<td>2,70</td>
</tr>
<tr>
<td>3.2</td>
<td>Administration of projects</td>
<td>3,88</td>
<td>0,00</td>
<td>7,00</td>
<td>1,93</td>
</tr>
<tr>
<td>3.3</td>
<td>Consulting &amp; edu. support</td>
<td>2,88</td>
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<td>5,00</td>
<td>1,59</td>
</tr>
<tr>
<td>3.4</td>
<td>Grants &amp; subsidies</td>
<td>3,75</td>
<td>0,00</td>
<td>7,00</td>
<td>2,98</td>
</tr>
</tbody>
</table>

Note: (1) factors are listed in the same order as they were presented within the questionnaire; (2) factors are numbered in accordance with the figure 4

We are able to rank the groups of factors of external environment by the degree of their perceived importance (average within the sample): (1) availability of resources – 5,17; (2) collaboration – 5,00; (3) state support – 3,59. As so, we can conclude that the major reason for the economic agents to participate within the ecosystem is the possibility of get access to the resources available. However, if we take a closer look at the individual factors, the ranking of importance is the following: (1) Collaboration with consumers – 6,31; (2) Collaboration with big companies – 5,69; (3) Availability of financial resources – 5,44; (4) Availability of personnel – 5,38; (5) Collaboration with suppliers – 4,81. What is interesting, state support was indicated as the least important factor. Basing on the standard deviation, we are able to state that obtained results are rather stable (except scores for tax legislation and grants & subsidies).

Perceived assessment of availability of external factors is provided in the table 3.

Table 3. Perceived availability of various institutional factors

<table>
<thead>
<tr>
<th>#</th>
<th>Factor</th>
<th>Average</th>
<th>MIN</th>
<th>MAX</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Availability of resources</td>
<td>4,23</td>
<td></td>
<td></td>
<td>1,35</td>
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<td>Personnel</td>
<td>4,41</td>
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<td>7,00</td>
<td>1,29</td>
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<tr>
<td>1.3</td>
<td>Financial</td>
<td>3,54</td>
<td>0,67</td>
<td>7,00</td>
<td>1,60</td>
</tr>
<tr>
<td></td>
<td>Equipment, materials &amp; infrastructure</td>
<td>4,75</td>
<td>1,00</td>
<td>7,00</td>
<td>1,71</td>
</tr>
<tr>
<td></td>
<td>Collaboration</td>
<td>5,10</td>
<td></td>
<td></td>
<td>1,26</td>
</tr>
<tr>
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<td>With big companies</td>
<td>5,50</td>
<td>1,00</td>
<td>7,00</td>
<td>1,67</td>
</tr>
<tr>
<td>2.2</td>
<td>With SMEs</td>
<td>4,69</td>
<td>0,00</td>
<td>7,00</td>
<td>2,15</td>
</tr>
<tr>
<td>2.3</td>
<td>With consumers</td>
<td>5,27</td>
<td>1,33</td>
<td>7,00</td>
<td>1,51</td>
</tr>
<tr>
<td>2.4</td>
<td>With suppliers</td>
<td>5,63</td>
<td>3,50</td>
<td>7,00</td>
<td>1,32</td>
</tr>
<tr>
<td>2.5</td>
<td>Collaborative R&amp;D</td>
<td>4,41</td>
<td>0,00</td>
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<td>2,21</td>
</tr>
<tr>
<td></td>
<td>State support</td>
<td>3,42</td>
<td></td>
<td></td>
<td>1,83</td>
</tr>
<tr>
<td>3.1</td>
<td>Tax legislation</td>
<td>3,75</td>
<td>0,00</td>
<td>7,00</td>
<td>1,65</td>
</tr>
<tr>
<td>3.2</td>
<td>Administration of projects</td>
<td>3,63</td>
<td>0,00</td>
<td>7,00</td>
<td>2,03</td>
</tr>
<tr>
<td>3.3</td>
<td>Consulting &amp; edu. support</td>
<td>2,69</td>
<td>0,00</td>
<td>6,00</td>
<td>2,21</td>
</tr>
<tr>
<td>3.4</td>
<td>Grants &amp; subsidies</td>
<td>3,63</td>
<td>0,00</td>
<td>7,00</td>
<td>2,33</td>
</tr>
</tbody>
</table>

Note: (1) factors are listed in the same order as they were presented within the questionnaire; (2) factors are numbered in accordance with the figure 4

Basing upon the obtained results we were able to rank the external factors by the level of their perceived availability (average within the sample): (1) collaboration – 5,10; (2) availability of resources – 4,23; (3) state support – 3,42. A the same time, ranking of individual factors slightly differ from the aggregated assessment of the three groups: (1) Collaboration with suppliers – 5,63; (2) Collaboration with big companies – 5,50; (3) Collaboration with consumers – 5,27; (4) Availability of equipment, materials and infrastructure – 4,75; (5) Availability of personnel and collaborative R&D – 4,41. Obtained results are rather stable, with the exclusion of factors 2.2, 2.5, 3.3 and 3.4 – their standard deviations are rather high.
But what is even more interesting, a comparison between the assessment of importance of the factors and their availability reveals an existing imbalance (Figure 6).

Group level analysis revealed that availability of resources, despite being considered as the most important, ranked second during the questionnaire. And the satiation with the collaboration is the exact opposite – while being considered less important, this group of factors receives the highest score out of all. State support is being ranked third – both in terms of importance and availability.

Analysis of individual factors has shown even greater disbalance: most of the factors being considered important by respondents are indicated as not available. The level of disbalance for the five most important indicators is the following: 2; 0; 8; 2; -4. Results of the imbalance calculation are provided in table 4.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Importance score</th>
<th>Availability score</th>
<th>Imbalance score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>12</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
<td>11</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>1.2</td>
<td>10</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>1.1</td>
<td>9</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2.4</td>
<td>8</td>
<td>12</td>
<td>-4</td>
</tr>
<tr>
<td>1.3</td>
<td>7</td>
<td>9</td>
<td>-2</td>
</tr>
<tr>
<td>2.5</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>3.1</td>
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<td>5</td>
<td>0</td>
</tr>
<tr>
<td>3.2</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3.4</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2.2</td>
<td>2</td>
<td>8</td>
<td>-6</td>
</tr>
<tr>
<td>3.3</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: factors are provided in the order of descending importance

Imbalance score was calculated as follows:

1. Importance ranking. Factor being ranked number one by respondents receives the highest score – 12 (by the overall number of factors);
2. Availability ranking. Factor being ranked number one by respondents receives the highest score – 12 (by the overall number of factors);
3. Degree of imbalance equals the difference between the importance and availability scores.

Positive score of imbalance means that given factor received a higher importance score compared to availability score. This means that respondents consider this factor to be important yet not available. Negative score of imbalance means the opposite – that respondents do not consider a given factor to be important, yet available. Zero score means that a factor is as important as it is available.
Half of the examined factors received an imbalance score other that 0, which means that they are considered to be not as available as they are important. We can argue that discovered imbalance will negatively influence the motivation of economic agents to collaborate within the ecosystem as their priorities differ from those established. This situation may result in sum-optimal outputs of the ecosystem and its stunted development. Given the fact that the overall pace of innovative development and changes in external environment, it is of paramount importance to increase the balance of these factors. Moreover, as we can see from the results, not only increase-focused initiatives are required, which simplifies the task substantially.

4 | Conclusions

This paper presents a result of a pilot study of motivational aspect of innovation ecosystem model within the Russian electric power sector. Being recently deregulated in terms of producing innovations, actors of the sector lack a proper understanding on how to coordinate their activity on a nondirective basis. Conducted questionnaire of the ecosystem members allowed to reveal the most important factors in terms of collaboration. We made an attempt to deepen the understanding of the underlying logic of the innovation ecosystem model. Results of the pilot study, despite being based upon a rather limited sample of organizations, provide valuable insights into the internal logic of the actions of the ecosystem participants.

5 | Limitations and Directions for Future Research

Being a pilot study, obtained results are based upon rather limited sample, which by its definition may be prone to abnormality. In order to be able to generalize these results a completion of the questionnaire is required. However, obtained results seem to be promising in terms of outlining the factors that are most influential in terms of the motivation of economic agents to collaborate within the observed innovation ecosystem. One of the most interesting avenues for future research would be the assessment of the output of the ecosystem in question in order to reveal if there is an evident relationship between the motivation of its participants and results that they are able to deliver as a result of collaboration. At the same time, another important area for investigation is related to the choice of coordination mechanisms by a focal firm and which factors are important on this behalf.

Acknowledgements

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References


