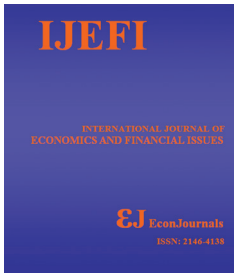

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Scientific Notation of Technology Park Structure on the Basis of Stakeholders' Environment Models

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ABSTRACT

The paper is focused on the development of scientific and theoretical concepts of technology park structures (TPS) as main subjects of modern innovative regional economy. The author suggests using the concept of environmental in conjunction with the stakeholders' theory, which allows to create possibilities for determination of the position and significance of a variety participants of TPS for management purposes. This ensures the balance of priorities in the activities of TPS to meet the needs of different stakeholders. Based on the methodology the main stakeholders groups and their objectives in relation to the TPS are identified; the importance of the Mitchell's model is allocated; the structure of resource relations between the stakeholders of TPS in accordance with the Rowley's network model is shown. The author proposes a strategic model of stakeholders' management, which allows developing a unified approach to manage stakeholder groups, as well as a matrix model with the application of certain aspects of the Savage's model. Using obtained results in practical activities of TPS enables to create significant benefits for the expansion of the stakeholders network and their involvement in joint activities and special management system based on the principle of "soft power."

Keywords: Technology Park Structure, Science and Technology Park, Stakeholders, Internal Environment, Innovative Environment, Innovative Company, Anchor Resident
JEL Classifications: O3, O14, R1

1. INTRODUCTION

The current stage of development of the Russian economy is characterized by ambiguity. Using improved methods of the socio-economic management designed mostly on basis of the formal synthesis of the various economic and theoretical schools provides essential changes in the economy in recent years. The current significant reduction of economic growth determines the position of the country at some point of bifurcation which requires a qualitative leap primarily for further development due to changes in the organization and management of economic actors. Nowadays a fundamentally new approach to the problems of methodology of management in the innovative sphere is required. It should be a source of overcoming the national economy crisis caused by the deformation of its individual parties. Tools and methods of modern regional economy in some causes impact only on surface forms of socio-economic relations while maintaining the effect of the problem on deep social and economic processes at the micro level. This problem is called "subjectlessness management" (Lepsky, 2010).

The features of the present stage of economic development in the innovative sphere are significant institutional changes the result of which is the formation of fundamentally new for Russia's economy institutions (development institutions, innovative infrastructure, venture capital ecosystem and so on). In 2007-2014 about 680 billion rubles were given from the federal budget for the formation of an innovative infrastructure, about 70 billion rubles were spent for the development of its regional components. At the moment the federal authorities are concerned with the target use of the incurred expenses as well as their effectiveness.

The studies show that low effectiveness of the innovative infrastructure in the majority of cases is not associated with the lack of resources, physical infrastructure, developed approaches to management but with the lack of well-functioning communication between the participants of the innovative process at all levels, the insufficient design of the main characteristics of content of innovative infrastructure objects for a specific territory (Löfsten and Lindelöf, 2002, Bania et al., 1992, Westhead and Storey, 1995). The problems of technology park structures (TPS) which include scientific, technology parks, innovative business incubators are particularly marked. Many of them were created spontaneously by the administrative guidelines and now, in fact, do not fulfill their mission or are not cost-effective as the subjects of the economy.

2. THEORETICAL OVERVIEW

The development of TPS management methodology identified a new vector of scientific and theoretical understanding of their nature and the internal structure which is not simply a set of participants but special reality which promises to create effective development of innovative activity in their territories and demonstrates the essential proximity of the considered methodology to environmental concept. Westhead and Batstone (1998) wrote about the presence of a special TPS' environment catalyzing the incubation process of innovative companies. Poon (1998) pointed to the need of effective interaction of TPS with the environment, the formation of relationships with universities and research institutes, inter-firm network. Pfirrmann (1995) claims that all of this will lead to an increase of the efficiency of R and D, the development of technological spillover.

The scientific basis for the development of ideas about innovative environments is reflected in the works of the Russian and foreign scientists, among them the works by Lepsky (2010) who developed interdisciplinary foundation of "environmental paradigm" according to the basic precepts of postnonclassical rationality and justified subject-oriented approach to the innovative development environments creation stand out. On the basis of the systematization of the views of various authors (Lepsky, 2010, Camagni, 1991, Boschma, 2005) it was stated that the innovative environment is a set (in case of its higher development it is a system) of the subjects, their relationships and conditions of innovation. It is characterized with its unique principles, norms, values and other attributes that distinguish it from the environment as a community.

Transforming the above research thesis on the problem of TPSs it is noted that they have these essential characteristics. Thus, TPSs as integrated elements of innovative infrastructure have a mission to create conditions for innovative activity and its development support in a particular area. The central element of TPS is a management company which forms the resident structure, engages for cooperation with the outsourcing service companies to facilitate the creation of high-quality and most popular services for innovative companies and provides interaction with the expert and the investment communities.

According to the modern research the impact of innovative activities having a creative basis often depends on the environment influence on innovators. Exactly an opportunity to be in the community of "similar" in some cases attracts innovative companies to the TPS. Thus, the analysis of the International Association of Science Parks data conducted by the author has shown that only 26% of TPS in the world provide the residents with space for rent at lower than market rate and in 32% of these structures the rents for residents is higher than the average one outside (Maltseva and Chevychelov, 2012). This proves the thesis about the presence not only and not so much the formal conditions for innovation in well-functioning TPS but also a special community (environment) which creates prerequisites for the development of its own innovation.

The territorial proximity of the TPS subjects correlates with the thesis of Camagni (1991) about a limited geographical area of innovative environment which functioning, in this case, does not fully find its confirmation because of the well-functioning virtual TPSs organizing of innovative activities of entities through innovative environment in the Internet space. Thus, it is advisable to consider proximity concept of Boschma (2005) in relation to the subject and the object of research. He highlights the cognitive, geographical, organizational, social and institutional proximity of subjects. The scientist proved that the geographical proximity itself does not accelerate the transfer of knowledge and innovation but only indirectly affects this process demonstrating the priority of cognitive, organizational, social proximities to success in innovative sphere. The subjects of innovation activity in the TPSs are characterized with rationally organized cognitive proximity representing individuals (companies) that are at a certain (close) level of development, belong to the same field of activity, have similar goals and are in need of information on the possibilities of the project implementation, success stories and so on. Belonging to the number of residents of TPS or affiliated persons or organizations (expert and investment communities) provides an organizational proximity between the subjects which not only allows their quick and consistent connection but also enhances their monitoring, control and hierarchy which are some of the functions of the management company. Social proximity of TPSs could emerge (or be purposefully formed) due to organizational and geographical proximity as a result of the establishment of formal and very close (or) informal relationships between actors of innovation. The generation of the innovative cycle chains involving several residents, formation of their own particular corporate culture in TPS contribute to social proximity.

Exactly, the initial strategic objective of the formation of TPS as an innovative environment can provide the further effective management of innovation processes based on it. In the context of post-nonclassical rationality management is not hard determination of systems but 'soft form of governance' that is creation of conditions for their further development. For the purposes of fundamentally new management paradigm design for innovative infrastructure objects this approach involving various mechanisms of social impacts such as management, organization, moderation, mediation, support, promotion is the most expedient (Lepsky, 2010).

Indeed, experience shows that some fairly large-scale regional projects of the TPSs formation failed due to priority of

conceptual and methodological and technological level. Lack of basic values of TPS as a center of innovative development contributes to the so-called strain which transforms its main idea (a comprehensive support to start-up companies) in fundamentally different activities (organization of TPS as rent-oriented business center, attracting budget co-financing of major regional investment projects). Formation of TPS is expedient only within territories with a high level of innovative susceptibility and specific mentality of society, which, in interaction with innovative environment TPS, can provide not only harmonious development of the structure as a whole but also its individual entities. These subjects of the economy as the participants of TPS themselves make significant influence on the development of innovative environment on its basis, so their innovative ideological level, in fact, defines a vector of further development of TPS.

Using the concept of stakeholders firstly proposed by Freeman (1984) allows to formalize the approach to the management of internal and external environments of TPS by segmenting its participants' relations. For the purposes of the research the basis of the stakeholders' approach application is the idea that the success of TPS measures the degree of satisfaction (effectiveness) of not only its members but also of all the interested parties (stakeholders). As noted by a number of authors (Post et al., 2002) relations with stakeholders are the "most important asset that should govern management and organizational ultimate source of wealth."

The stakeholders' theory application is one of the most effective tools for the research and development of TPSs' management methodology because of their polystructural essence, the large number of participants both in the structure and outside it as well as an active impact on the socio-economic processes in the region. Integration of environmental and stakeholders' approaches can provide greater result for TPSs' methodological foundations development and their subsequent practical using. Moore (1996) introduced the concept of business ecosystems involving the company together with its stakeholders. For management systems there are two large groups of governance tasks: Management of the interactions network "one-to-many" and the administration of multilateral networking interactions in the business. The first group of tasks relates to the relationship management of the economy agent with its stakeholders some of which have a complex structure but are considered as "relatively indivisible." In the second case, the main challenge lies in the fact that the vital force (competitiveness) of the ecosystem depends on the state and behavior of all its elements, and all of them are stakeholders in view of common strategic goals achieving. In fact, one can say that there are three levels of goals: The goals of the company, the goals at the dyads level and the goals at the network level (Sheresheva and Palt, 2014).

Thus, in the process of TPSs' efficient management system design one should take into account the network nature of the interactions of all participants as well as the purposeful vector of development as balancing of needs and resources of internal and external stakeholders.

Using stakeholders' methodology as a basis for the simulation of TPS' environment demanded its theoretical understanding. So, one of the most significant stages is the identification of main stakeholders and their classification. As shown above, the TPS is a special subject of the region's economy. There are different approaches to the definition of its essential characteristics which also can be divided into narrow and broad (Post et al., 2002, Clarkson, 1995, Freeman, 1984). With regard to the stakeholders' theory the differences between them lie in the point of inclusion of various participants. It is proposed to use some average approach to understand TPS as the subject of the regional economy and to provide both external and internal stakeholders' environment. This will allow to identify the tasks of participants in relation with TPS and external environment as well as to highlight the interests of stakeholders from the environment with respect to TPS as a whole and to individual participants.

Thus, level approach can be traced in understanding the essence of TPS: At the micro level the interests and relationships of TPS individual participants among themselves and with the subjects of the environment are determined and at the meso level TPS in general become the subject of the relationship. This approach is the basis for the stakeholders' classification and for constructing models for the interested parties' significance assessing.

The modern researches contain numerous approaches to the stakeholders' classification which are essential for their clear identification and formulation of their average interests in relation to the investigating company (Freeman, 1984, Savage et al., 1991, Newbould and Luffman, 1989, Petrov, 2004). The methodological foundations of the stakeholders' theory that serve as the basis for the formation of the organization management system are the most important. One of the first widely well-known concepts of stakeholder management was proposed by Mitchell (1997). The essence of Mitchell's model is to identify the stakeholders with the most significant attributes for the company ("power," "legitimacy," "urgency") and, therefore, depending on the class of importance a special approach to the management of relations with each group of stakeholders is required (Mitchell et al., 1997).

Improved knowledge of the importance of stakeholders for the TPSs' purposes is a model of resource relationships (Rowley, 1997). The model is based on the identification and evaluation of resource sharing between the stakeholders and the company which may be asymmetrical in favor of the target element, equivalent or asymmetrical to the detriment of the target element. For the purposes of efficient functioning the company should support the first and second types of resource sharing with stakeholders, in the third case it is in the "flawed" position, i.e. it gives more resources than receives. The development of the Rowley's model was representation of a network of relationships with stakeholders as part of the resource sharing which introduced the main features of the network density and centrality of element. Their application in conjunction with the Mitchell's model provides creation of strategic stakeholders' management model that is matrix in accordance with which relationships with stakeholders' groups could be managed. Data of figure reveal the stakeholders' groups with which relations should be established with a priority

("to yield") or with regard to their interest in the interaction ("compromise"). It also provides the possibility of excluding from consideration in the network model of the stakeholders' groups which appear in the lower left corner of the matrix because of their level of network performance and availability of attributes of Mitchell's model.

Other approach that can be used to develop TPSs' strategic stakeholders' management is the Savage model (Savage et al., 1991). The basis of the management matrix is stakeholders' classification based on the determination of their potential (probability) to bring damage to the organization and its capacity (readiness) to cooperate. Besides considered methodological approaches for determining strategic priorities in relation with main stakeholders' groups matrix "force-dynamic" and "power-interest." SWOT and VRIO-analysis and others can be used.

Thus, a theoretical overview creates the necessary basis for the formation of the methodological foundations of the development of the TPSs' stakeholders' environment.

3. RESEARCH METHOD

The methodological basis of the study was the theoretical analysis, content analysis, compilation, systematization, classification, expert assessment and several others. The conceptual and methodological aspects of the theory of innovative environments, the theories of stakeholders and business ecosystems were used. For the purposes of the study theoretical and methodological aspects of the theory of stakeholders were systematized and later transformed to the problem of the TPSs' management. The foundations proposed in the literature were used through conceptual basis of environmental paradigm that eventually gave rise to a special new approach to the problem which is substantially similar to the methodology of functioning and management of business ecosystems.

The algorithm of a theoretical construct of TPSs' environment models using stakeholders' approach includes the following steps:

1. Identification of main stakeholders' groups using different types of classifications.
2. Setting goals (interests) of stakeholders' groups in relation to TPS.
3. Evaluation of the stakeholders' importance on the basis of Mitchell's model.
4. Formation of network representation of resource stakeholders' relations based on the balance and Rowley's network model.
5. Development of recommendations for using models in TPS practice in the framework of monitoring the main stakeholders' groups' dynamics and development the foundations of the strategic management of each stakeholders' groups.

The design of the models in accordance to the given algorithm is the theoretical basis for the further implementation. During the study empirical testing of the following theoretical considerations was not carried out due to the lack of technical capabilities that, in this case, determines the way forward but does not diminish their scientific and methodological significance. The practical implementation of the models is available in concrete place and time, for specific groups of stakeholders, so the resulting classification and network representations of stakeholders' groups are applicable only for the considered case that reduces the possibility of their translation into other circumstances.

4. RESULTS OF THE RESEARCH AND THE DISCUSSION

On the basis of grouping mentioned in the theoretical review the classification of TPSs' stakeholders was proposed taking into account the above sound level approach.

1. External stakeholders
   - Management company
   - anchor residents
   - innovative companies - residents
   - Service companies.
2. Internal stakeholders
   - Universities
   - Research organizations
   - Expert community
   - Investment community
   - Regional authorities
   - Development institutes
   - Goods and services suppliers
   - Buyers and customers (consumers)
   - Credit institutions
   - Innovative companies – potential residents
   - Mass media
   - Professional communities.

An important group of TPSs' stakeholders are the owners which can be regional authorities, universities or private persons who are, in most cases, the founders of the management company. Depending on the TPSs' owner the vector of its development and, accordingly, the interests of owners as a stakeholders' groups are defined while level of responsibility, the degree of influence and their interaction with TPS increase. The regional authorities as the initiator of project and owner of TPS, in most cases, are guided with the objective of creating of favorable conditions for innovative development of the territory, increasing of employment and self-employment, the growth of tax revenues from resident companies. Universities as TPS founders aim the most complete and effective commercialization of their created research and development. Private parks mostly operate as business providing a pool of services to starting innovative entrepreneurs, and therefore their main goal is to maximize profits and to preserve financial stability. The list of stakeholders does not include ones of nano level that are the staff and the top management of the management company, service and resident companies which, in this case, make a very significant impact on their functioning and should be presented as stakeholders within their level' submission.

As shown above, TPS is viewed as a complex object. For a level approach application the additional specification is necessary. It aims at stakeholders identifying each of its members. In the study structuring of the most important stakeholder groups of TPS

participants (management company (Figure 1) and innovative companies-residents (Figure 2) was conducted. It allows to regard the problem of formation of effective relationships between entities of external and internal environment of TPS more profoundly.

For the formation of the block diagrams the basic interests of the main stakeholder groups were highlighted. Ranking their importance for the management company and innovative companies-residents was carried out with the help of expert approach based on empirical studies of modern TPS' functioning. In accordance of comparison of TPS' stakeholders' groups and its main participants there are some differences between the level of importance and stakeholders that shows no contradiction between the models. It is characterized with different level of depth study of relationships between individual actors in the regional social and economic system.

The design of models of TPS as a stakeholder company was conducted on the basis of known models proposed in the works of Mitchell et al. (1997) and Rowley (1997). During the study the average expert assessment of attributes for main TPS' stakeholders' groups was carried out. In accordance with level approach they include some stakeholders that interact with the most active TPS' participants: The management company and residents. The result is the model identifying the importance of TPS' stakeholders (Figure 3).

The most significant stakeholders' group for TPS' management system is definitive one represented by the management company, owners and top management. Indeed, these stakeholders' groups make the most important impact on the TPS development vector, are associated with it with very close formal and informal relationships and are highly dependent on the results of its operations. Attention is drawn to the dominant group which includes anchor residents, the investment community, regional authorities, credit institutions, buyers and customers (consumers). With a strong attribute of power in conjunction with legitimate interest they can make a significant impact on TPS in general and on individual participants which requires the development of mutually beneficial relationship with them. A dangerous group includes both individual competitors of residents and management company and TPS as a whole. At the present stage in the Russian Federation mainly the prevalence of supply over demand in the market of TPSs' services due to the emergence of this form of innovative activity development is observed. In stable conditions management of a dangerous group can easily convert it into the partner allowing to concentrate joint efforts on the production of a particular innovative product or provide a wide pool of services to residents and, ultimately, its positive impact on the final result. So, a balance of interests can be provided instead of available directly opposite objectives.

For the TPS' resource model it is appropriate to consider the balance of relations between it and the main stakeholders. However, the presence of level structure is a prerequisite of analysis of the resource sharing between its main participants. The final resource model can be obtained using the transitive characteristic and includes all possible resource relations arising with individual participants and the structure as a whole. It is noted that the resource relations develop between the TPS'

Figure 1: Stakeholders' map of technology park structures' management company

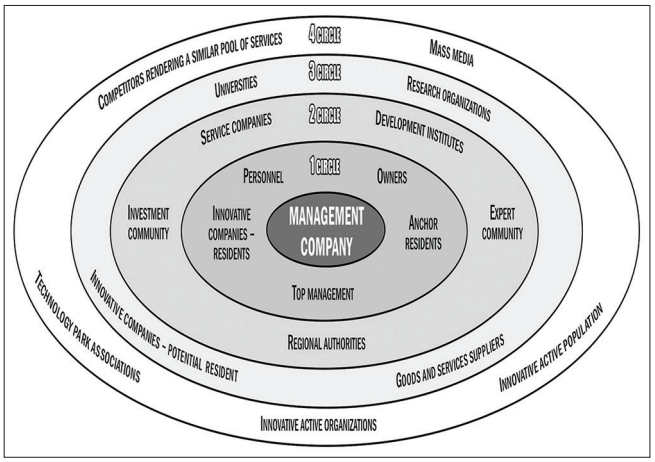


Figure 2: Stakeholders' map of technology park structures' innovative companies-residents

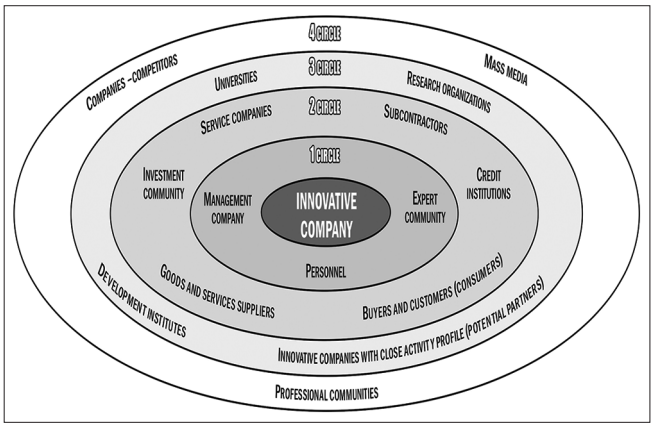
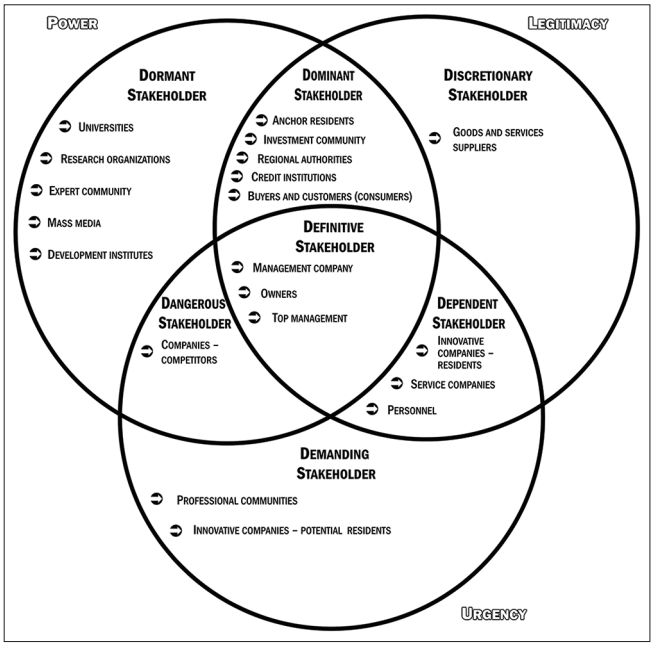


Figure 3: Universal Mitchell's model for technology park structures



participants, too. For the purposes of harmonization of the TPS' internal environment in accordance with the concept of innovative environments it is necessary to achieve the equivalent of resource sharing between the participants, or eventually one of them will seek to adjust or eliminate such relationships. For the balance of the TPS' resource with the external environment the target vector of development of relations with stakeholders will ensure a positive resource balance.

For the purposes of the study of TPS as stakeholders' organization levels of density and centrality of its resource sharing with its main stakeholders were assessed using the average expert estimates. As a result a strategic stakeholder management model was drafted (Figure 4). It includes not only the matrix of stakeholders' groups depending on the position in Mitchell's model and network characteristics of resource sharing but also the most appropriate format of relations between TPS and concrete stakeholder.

The network model of TPS' resource sharing which shows the direction of flow of resources with the help of arrows is below (Figure 5).

It is noted that this study does not include quantitative assessment of applicants and received resources due to the need of more clear specification of the research object and implementation of numerous measurements of the interaction with stakeholders. The figure also highlights features of the TPS' network resource model resulting in some cases in one-sided interaction between different stakeholders and TPS' participants. This explains the fact that the central element of the model is the management company which, in some cases, receives resources from stakeholders and transforming them passes to residents. They, in turn, pass other types of resources in favor of this group of stakeholders.

The author has investigated the main features of the Savage's model with respect to TPS' stakeholders (Savage et al., 1991). As a result the following matrix model was obtained (Figure 6). Its graphical representation was based on the methodological approach of Grabar and Salmakov (2014).

The design of the system of TPS' relations with stakeholders is possible relying on the directions proposed in the model. In some cases, it is noted that such classification is conditional and a mutually reinforcing effect of the individual stakeholders' interaction is possible. So, in general, the investment community and credit institutions due to their diversification do not represent a particular threat to TPS but in conditions of financial and economic crisis and sharp reduction in the proposed financial and investment resources are they can both cause substantial damage to suspend the residents' innovative projects implementation due to lack of financial resources. These models and the following from them basis of management on the basis of stakeholders' theory are provisional and should be adapted for the purposes of the particular TPS. This should be considered as a stage of the life cycle of the structure as a whole and its individual members, ownership, the predominant profile of residents. In this case there are significant deviations from the proposed models which can become the basis of a particular practice research.

The importance of the TPS' study through the paradigm of innovative environments is noted because of its operation at both regional and micro levels. Ensuring maximum involvement of regional actors in the innovative economy as the most important strategic objective to create such structures in the Russian Federation requires soft forms of governance associated with agitation, gradual involvement in the activities of cooperation and compromise. Exactly, these tools provide achievement of TPS' goals and its high efficiency.

5. CONCLUSION

Using the stakeholders' theory for management of specialized structures that contributes to the development of innovation is quite justified in the frameworks of this article. Existing problems in their functioning on the meso and micro levels can be solved

Figure 4: Strategic stakeholder management model of technology park structures

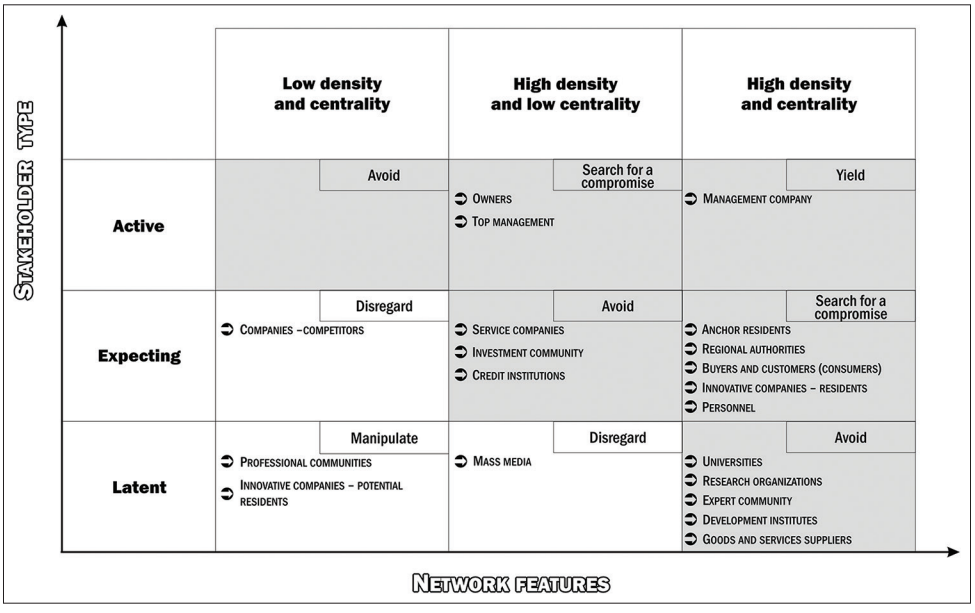


Figure 5: The network model of TSP resource sharing

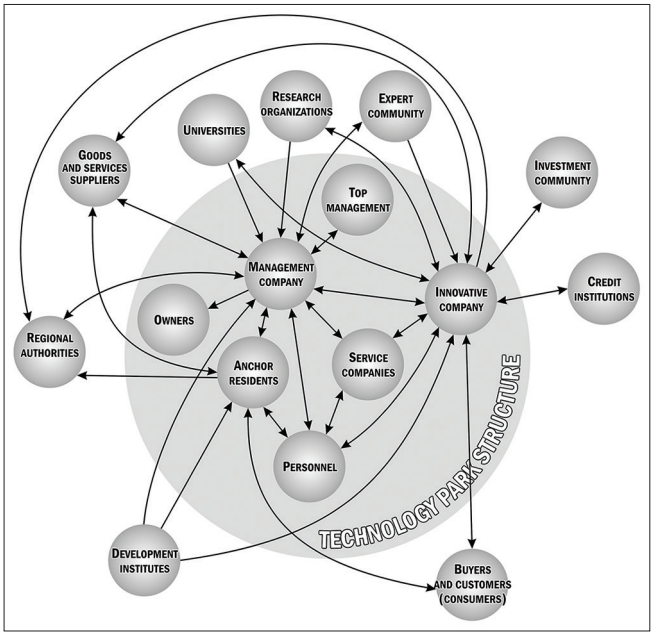
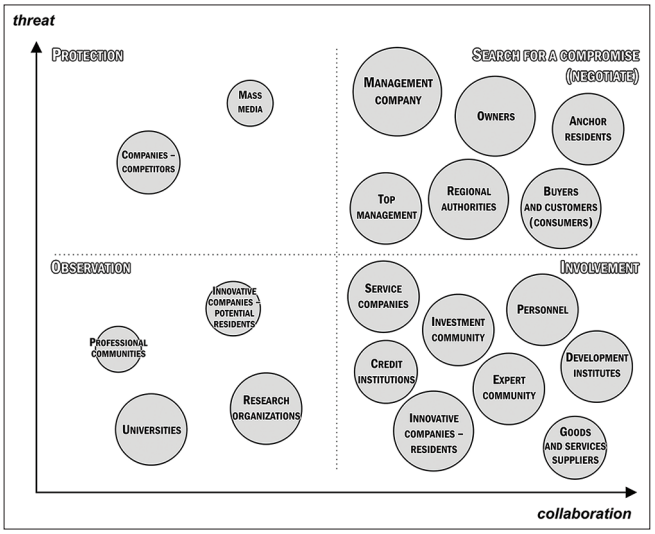


Figure 6: Savage's model of technology park structures' stakeholders



with the use of advanced management tools. Stakeholders' theory does not simply describe the existing situation and predict the cause-effect relationships. It also recommends the installation of the structure and practice that taken together define stakeholders' management (Donaldson and Preston, 1995).

As shown in other works of the author (Maltseva, 2015) TPS' management should be transferred to the non-material basis due to the probabilistic nature of the risky innovative activity and high role of intellectual assets in its development. It emphasizes the closeness of the developed methodology to the concept of organizational wealth which is the most important basis of the theory of stakeholders (Post et al., 2002). In fact, the well-established relations with stakeholders are the so-called relations capital. They not only create a competitive advantage for companies operating in the innovative sphere but they themselves can provide the necessary strategic vector of development based on the involvement of other organizations with both material and intangible assets the lack of which hampers its harmonious development inside TPS. According to Post et al. (2002) organizational wealth is a summary measure of the organization's ability to generate benefits for all of its stakeholders over a long time. The system of interactions in which the formation and use of organizational wealth occurs is sharing of resources. The organizational wealth generation is aimed not only on achieving their own goals but also on the benefit of stakeholders. There is connection with the proposed concept of network and environmental paradigms. From the viewpoint of network resource sharing organizational wealth can be accumulated not only due to the direct flow of resources from stakeholders but also indirectly, i.e. within specially formed network of stakeholders of the organization. They are able to multiply the incoming resources to organization from various channels by coordinate efforts.

The paradigm of innovative environments shows significant advantages to expand the network of stakeholders and to involve them in joint activities with the help of the principle of "soft power." Precisely taking the value and balancing their own interests with the interests of the target segment stakeholders become generators of wealth together with the considered organization. For the implementation of the mission of TPS the level of involvement of stakeholders in the TPS' activities, the development of new innovative companies based on the success stories of residents, increase of the innovation active economic actors will demonstrate its effectiveness at the meso level and promote growth of its organizational wealth.

In the framework of this article predominantly one-sided consideration of interactions with stakeholders incoming from TPS is marked. In actual practice each TPS stakeholder may also be considered as a target segment actively forming relationships with stakeholders, i.e., for the purposes of effective management the most suitable instrument can be dynamic simulation. Stakeholders' theory largely allows to formalize the management system of the relationship with the outside of the company which, however, may not always lead to positive results. For example, some group of stakeholders can include economic actors with very different interests in relation to the investigation of the company and, in this case, the use of standard approaches to interaction with them is not justified. But the theory allows to identify their interests and develops solutions to meet their balance with the interests of the company as quickly as possible.

The unified approach to dealing with external and internal environment of TPS surely requires clarification of detail in the case of its practice application due to general methodological orientation of this work.

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