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Adapted Management Techniques for Innovative Networks

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Abstract

The paper defines the typical features of the notion with the help of theoretical propositions concerning business network. These features should be taken into account while building horizontally integrated systems. The paper notes innovative networks as the next phase of Russia's economic development after innovative clusters. Besides, the paper ascertains the organizational aspects for the formation of innovative networks based on the classification of economic entities and their strategic roles by the principle of mutual complementation. The authors use classical analysis techniques and planning methods adapted for the group of economic entities.

Keywords: innovative networks, management innovations, management methods and technologies, innovation strategies

1. Introduction

1.1 Topicality

In today's Europe, one can see that knowledge-intensive industries develop, information technologies spread and penetrate into in all spheres of social life and the global competition intensifies. In this situation, one of the main goals is to create an economy of knowledge which makes it possible, in authors' opinion, to achieve a sustainable development of society (Kulapina & Markova, 2006). The inputs become depleted during production in industrial economy, while information and knowledge as the main source of knowledge economy are not depleted but spread among all economic actors. Such phenomena as containment, isolation and limited area are significantly reduced in the economy of knowledge. So, the economy of post-industrial society is the *network economy* which is focused on the creation and dissemination of knowledge for innovative development (Markova, 2012). Hence, first it is necessary to analyze the scientific base of network economy and name its main features.

1.2 The Scientific Basis of Network Economy

Table 1 shows seven theories which form a scientific basis for network as an economic category. Each of them evolutionarily put its features into the definition.

Table 1. The theoretical basis for network economy

#	Name of theory	The essence	Representatives
1	Social exchange theory	The exchange of social and material resources is a fundamental form of human interaction (Tretyak & Rumyantseva, 2003)	George Homans—American sociologist and the representative of neobehaviorism
2	Resource dependence theory	Every economic entity has a certain kind of resource and thus is dependent on resource exchange with another entity (Pfeffer & Salancik, 1978)	Jeffrey Pfeffer and Gerald Salancik
3	Economic sociology	Contemporary economy is a set of social networks formed by sustainable horizontal, formal and informal, ties between individuals and enterprises (Granovetter, 1985)	Hayden White and Mark Granovetter

4	Institutional theory	Economic entities adopted institutionalized social norms and values which influenced the formation of networks between enterprises (Boisot, 1986)	M. Boisot
5	French agreement economy	Individuals fulfill the requirements of norms not because it is an absolute determinant of their behaviour but to reduce the indefiniteness in interaction and, as a result, to achieve their rational goals (Menard, 1996)	L. Boltanski, L. Tevenot and C. Menard
6	Transaction cost economics	Transaction costs appear when economic relations are established. In occasional once-only transactions on the market and in hierarchic structures, the whole set of such costs exceed similar costs in those networks where relations are already well-established (Coase, 1998)	O.E. Williamson and R. Coase
7	Cluster theory	The system of interconnected enterprises the significance of which as a whole exceed the plain sum of constituents (synergy) (Porter, 1998)	M. Porter

If we generalize the theoretical propositions of network as a scientific phenomenon, we can notice that the first two theories deal with the exchange of material and non-material resources, the next three ones are connected with social norms and relations, and the sixth and seventh theories deal with the efficiency of these relations. These three main aspects can be traced further comparing different characteristics of the notion of business network (Table 2).

Table 2. The main definitions for the notion of business network

Authors	Characteristic
Beije and Groenewegen	A group of *independent members* each of whom is partly but *purposefully* involved into the activity of the whole group (Beije & Groenewegen, 1992)
P. Kotler and R. Achrol	Network organization is a coalition of *interdependent specialized* economic entities with their own *goals* (independent enterprises or autonomous organizations) which act without *hierarchic control*, but all of them are involved into the system with common goals through numerous *horizontal ties*, *interdependence and exchange*. The *involvement* is the main distinction of the network conception in comparison with the traditional theory of organization (Kotler & Achrol, 2000)
Joel Podolny and Karen Page	Any group of participants (not less than 2 men) which has *repetitive long-term exchange ties* between each other and, at the same time, *does not have any body of power* authorized to solve problems occurring in the course of exchange (Podolny & Page, 1998)
H. Hakansson	A set of subjects which *do not depend institutionally* on each other but act and/or control resources with a certain *interconnection* (Hakansson, 1992)
J. Sydow and A. Windeler	Networks are the *long-term agreements* between different but interconnected commercial organizations. So, they are an *intermediate form between market and hierarchic* forms of business organizations (Sydow & Windeler, 1993)
C. Jones, W. Hesterly and S. Bogatti	Network is a *sustainable and structured* set of *semi-independent enterprises* (and/or nonprofit organizations) involved into mutual relations and united by a common goal. Relations in a network are aimed to streamline exchange relations between participants and promote their *adaptation to changing conditions*. Both formal and informal contracts form the basis for a network (Jones, Hesterly, & Bogatti, 1997)
R. Eccles and N. Nohria	Network organization is seen as an *organic and constantly broadening structure* which connects staff, enterprises and their consumers, suppliers and partners (Nohria & Eccles, 1992)

F. Webster	Network organizations are the corporative structures that appear thanks to many relations, ties with partners and strategic alliances. The main feature of network is *a unity, an open and flexible coalition guided from a common centre* with such important functions as the development and direction of alliances, coordination, financial management and technological progress (Webster, 1992)
M. Castells	Network is a complex of interconnected business entities and a specific form of enterprise with a system of means created by crossed segments of autonomous systems. It is a morphology of contemporary society (Castells, 2000)
K. Imai	Network is a set or system of units between which there are more or less constant ties within the framework of certain relations (Imai & Itami, 1984)

1.3 Innovative Network as an Object of Research

The object of this research is an innovative network. By the level of its development, this network takes an intermediate place between cluster and innovative system (Table 3). The Table shows that innovative cluster is only an initial stage of network distribution actively performed in Russian economy today.

Table 3. The development forms for the conception of network distribution of economic entities

Conception	Definition	The formation stage of scientific innovative network
Regional cluster	The concentration of interdependent enterprises belonging to one or several close sectoral specialization within the limits of small geographical area	Incipient, at the level of applicative knowledge diffusion and licensed technologies distribution
Regional innovative network	More organized cooperation between enterprises encouraged by contractual relations and aimed at the development of innovative activity of enterprises	At the level of joint research with the exchange of intermediate results
Regional innovative system	Cooperation between innovatively active enterprises and various organizations of knowledge generation sphere for knowledge sharing	At the level of joint creation and use of research infrastructure objects, data bases, fundamental and applicative knowledge and "the division of research labour"

The main goal of this study is to present the organizational update for innovative network with the help of classical management methods adapted for the object of our research.

2. Methods

2.1 The Classification of Economic Entities by Their Innovative Capacity

In order to integrate economic entities into the innovative network, they were classified by two criteria: innovative receptivity (i.e. how intensive they use market opportunities and overcome threats) and innovative ability (i.e. how they use their strengths and improve their weaknesses). For this, a well-known method of SWOT-analysis was adapted. It uses expert evaluation to distribute the types of enterprises in a matrix by their innovative receptivity and innovative abilities (Table 4).

Table 4. The evaluation of innovative abilities and receptivity of economic entities

		OPPORTUNITIES		THREATS	
		Not used (1-5)	Used well (6-10)	Not overcame (1-5)	Overcame well (6-10)
The degree of strengths	High (6-10)	Protectionist enterprises	The full use of market opportunities promotes enterprise's competitiveness	As a rule, large enterprises with considerable tangible assets	Venture enterprises secure against innovation risks
	Low (1-5)	Small enterprises with minor resources and scientific backlog	Small and medium business active and taking the initiative in the market	Enterprise with behavior guided by the market	Small enterprises adapted to changes
The degree of weaknesses	High (6-10)	Enterprises created not long ago with no market experience and government support	Privatized former garages and workshops of public enterprises	Short-lived companies	"Virtual" enterprises
	Low (1-5)	Enterprises figuring on government support and subsidies	Enterprises that use their opportunities in a certain market niche	Vertically-integrated enterprises (dealerships)	Horizontally-integrated enterprises

From the viewpoint of effective innovation management, it is the evaluation of innovative abilities and receptivity that helps to ascertain the outlook for an economic entity.

2.2 The Roles of Economic Entities in Innovative Development

According to the differentiated evaluation of enterprises' behavior in unstable environment, a role structure of economic entities in innovative network was developed by the complementary principle (Table 5)

Table 5. The role structure of economic entities for innovative network

		OPPORTUNITIES		THREATS	
		Not used (1-5)	Used well (6-10)	Not overcame (1-5)	Overcame well (6-10)
The degree of strengths	High (6-10)	The "locomotives" of state innovation policy, the consumers of budgetary funds	They play the role of "integrators" for innovators and their administrative support	They play the role of "customers" of changes for the efficient use of resources	The role of adoption and commercialization of innovations
	Low (1-5)	The need for infrastructure support	The "generation" of innovations timely in market conditions for consumer demand	The role of driven	The role of "deviation consultant" in innovative processes

The degree of weaknesses	High (6-10)	The need for administrative support	The role of customizer for innovations	Market outsiders with no strategic plans	The role of a catalyst for innovations
	Low (1-5)	The need for financial support	The role of mediator for innovation diffusion	Enterprises with technological dependence	The role of network communicator

Table 5 shows the main behavioral roles in innovation process for some goals and functions that better correspond to the potential of an economic entity. For a full characteristic of innovation roles of economic entities, the authors identified the main capacities they must have (Table 6). Besides, the authors made a conclusion that these very capacities of economic entities with certain innovation roles should be developed and periodically evaluated.

Table 6. The main capacities of economic entities in innovative network

#	The roles of economic entities	Innovation capacities
1	The "locomotives" of state innovation policy	High scientific and production backlog
		The use of socially ethical marketing
		Training loyal and devoted staff
2	The "customers" of changes	Sufficient experience of production and economic activities
		Decent renown in the city and determinant social role
		The protection of working people rights and the formation of a solidary team
3	The "generators" of innovations	Flexible and mobile in competitive struggle, client-oriented
		The support of creative and innovative gifts of the staff
4	The "catalysts" of innovations	Information and knowledge are the main resource. Contemporary information technologies and the intellectual capacity of freelancers are actively used.
5	The "integrators" of innovators	Considerable organizational resources
		The support of local authorities
6	The adoption and commercialization of innovations	Sufficient financial resources to cover innovation risks
		The active use of methods to form and boost the demand
7	"Communicators"	Developed business contacts with similar enterprises
		Constantly adopted practice of each other
8	"Deviation consultants"	Accumulated data base which can be used in typical situations
9	The "adaptation" of innovations	The ability to copy innovations with a glance to market development
10	The diffusion of innovations	The ability to distribute innovations into other sectors of economy

3. Findings

At the second stage, the authors found strategies suitable for economic entities according to their identified roles and capacities in innovative development (Table 7). Knowing the most suitable innovation strategies, one can manage the behaviour of economic entities in their cooperative activity.

Table 7. Behaviour strategies for economic entities in innovative network

		OPPORTUNITIES		THREATS	
		Not used (1-5)	Used well (6-10)	Not overcame (1-5)	Overcame well (6-10)
The degree of strengths	High (6-10)	Wait-and-see strategy	Innovative breakthrough strategy	Defence strategy	Direct attack strategy
	Low (1-5)	Copying strategy	The strategy of merging and acquisitions	Joining strategy	Flank attack strategy
The degree of weaknesses	High (6-10)	Imitation strategy	Flexible reaction strategy	Assimilation strategy	The strategy of localized strike
	Low (1-5)	Adjustment strategy	Outstripping strategy	Trench strategy	Partisan attack strategy

At the same time, all possible alternatives of detected long-term behaviour in the market were grouped by two lines:

- Adaptive, defensive and passive strategies.
- Creative, offensive and active strategies.

These two groups of innovative behavioral strategies have their features by four development indications. This is shown in Table 8.

Table 8. The main features of economic entities by the groups of innovation strategies

Innovative development strategies	Indications of the use and development of potential			
	market	production	personnel	financial
Adaptive, defensive and passive	Following the demand	Production improvement and ramp-up; saving on scale	Training loyal and devoted staff	Saving economic indexes; economizing
Creative, offensive and active	Outstripping the demand	Flexible market-oriented service; service diversification	The full use and development of intellectual capacity	Risk investment; business expansion

These tables show that the second group of innovation strategies corresponds better to market initiative and riskiness and, consequently, develops and makes the most of the potential of an economic entity, i.e. its market, production, personnel and financial capacities.

4. Discussion

4.1 The Evaluation of Factors Influencing the Development of Innovative Network Potential

The third stage of the study was the evaluation of factors for the development of innovative capacity which depends on market conditions, scientific and production environment, personnel and financial capacity.

It was necessary to consider certain factors which influence the choice of strategy and the use of potential for the innovative development of enterprise. According to Michael Porter's method of 5 competition forces, the authors identified these forces and assessed their influence on the components of innovative capacity (Table 9).

Table 9. The evaluation of factors influencing the components of innovative capacity (expert 10-point scale evaluation)

#	Capacity Factors	Market	Production	Personnel	Financial	**Total**
1.	**Situation in sector**	**8.8**	**6.2**	**7.2**	**7**	**146 (100%)**
1.1	The reduction of innovation cycle and product life cycle	10	7	8	6	31 (21.23%)
1.2	Specialization by business processes	6	7	8	5	26 (17.81%)
1.3	Relations based on service	10	4	7	7	28 (19.18%)
1.4	Business virtualization and informatization	9	8	8	7	32 (21.92%)
1.5	The increase of transaction costs	9	5	5	10	29 (19.86%)
2	**The influence of potential competitors**	**7.7**	**4.7**	**5.0**	**5.7**	**69 (100%)**
2.1	The export-import ratio of intellectual production	9	4	5	7	25 (36.23%)
2.2	Possibility to diffuse innovations into other sectors	8	6	4	4	22 (31.88%)
2.3	The low level of intellectual property protection	6	4	6	6	22 (31.88%)
3	**The influence of intellectual and information product suppliers**	**7.0**	**7.7**	**7.0**	**5.7**	**82 (100%)**
3.1	The ratio of fundamental and applied research	3	7	6	5	21 (25.61%)
3.2	The level of education and science	8	8	9	6	31 (37.80%)
3.3	Balanced infrastructure for each phase of innovation cycle	10	8	6	6	30 (36.59%)
4	**The influence of customers**	**8.8**	**8.0**	**7.3**	**6.5**	**122 (100%)**
4.1	Life standards and quality in a socio-economic territorial unity	7	8	9	7	31 (25.41%)
4.2	System-making enterprises which stimulate innovations	9	8	6	5	28 (22.95%)
4.3	Local innovation policy with a glance to business and society	10	8	8	6	32 (26.23%)
4.4	The level of venture business	9	8	6	8	31 (25.41%)
5	**The influence of substitute goods**	**6.0**	**7.3**	**7.0**	**6.7**	**81 (100%)**
5.1	The level of borrowed innovations	5	6	8	7	26 (32.10%)

5.2	The degree of import substitution in the area	8	9	7	5	29 (35.80%)
5.3	The ratio of modernized and innovative goods	5	7	6	8	26 (32.10%)

The last column of the table contains calculated weight, i.e. the importance of each force for the development of innovative network. Then the influence of meso-environment factors on the development of innovative network was evaluated by experts (Table 10). Business networks promote the development of "coopetition" and "concoperation" (Kleiner, 2004), i.e. the implementation of strategy for the collaboration and integration of competitors.

Table 10. The evaluation of five forces for COOPETITION in innovation environment

#	Forces and their factors	The importance of factors for innovative development, %	Expert evaluation	Average value
1	**Situation in sector**	**100**	**6.80**	**6.82**
1.1	The reduction of innovation cycle and product life cycle	21.23	5	1.06
1.2	Specialization by business services	17.81	6	1.07
1.3	Relations based on service	19.18	7	1.34
1.4	Business virtualization and informatization	21.92	8	1.75
1.5	The increase of transaction costs	19.86	8	1.59
2	**The influence of potential competitors**	**100**	**6.33**	**6.36**
2.1	The export-import ratio of intellectual equipment	36.23	7	2.54
2.2	Possibility to diffuse innovations into other sectors	31.88	4	1.28
2.3	The low level of intellectual property protection	31.88	8	2.55
3	**The influence of intellectual and information product suppliers**	**100**	**5.00**	**4.89**
3.1	The ratio of fundamental and applied research	25.61	6	1.54
3.2	The level of education and science	37.8	5	1.89
3.3	Balanced infrastructure for each phase of innovation cycle	36.59	4	1.46
4	**The influence of customers who buy innovative goods (services)**	**100**	**6.00**	**5.96**
4.1	Life standards and quality in a socio-economic territorial unity	25.41	4	1.02
4.2	System-making enterprises which stimulate innovations	22.95	8	1.84
4.3	Local innovation policy with a glance to business and society	26.23	7	1.84
4.4	The level of venture business	25.41	5	1.27
5	**The influence of substitute goods**	**100**	**5.67**	**5.61**
5.1	The level of innovative goods (services)	32.1	8	2.57
5.2	The degree of import substitution in the area	35.8	4	1.43
5.3	The ratio of modernized and innovative goods	32.1	5	1.61

4.2 The Most Considerable Factors Influencing the Development of Innovative Network

As Table 10 shows, both the situation in sector and potential competitors has the strongest influence on innovative development. So, market conditions promote the innovative development, and the threat of new competitors make enterprises search for modern and efficient forms for the integration of business entities such as innovative networks.

Besides, it should be noted a low evaluation for the influence of suppliers and customers. This indicates the low innovative activity of the main market entities. Various researches, educational and innovative institutions supply solutions for innovative development. They promote the efficient improvement and use of innovations by customers. Society, government and business entities should be those customers, but they often do not have motivation for innovative development. Moreover, the interests of these three parties should be reconciled. That is why, the author consider necessary to create a management system for innovative development on the basis of innovative network.

4.3 Goal Indicators for the Long-Term Development of Innovative Capacity

In order to increase the innovative activity of economic entities, it was necessary to find appropriate indicators to evaluate and stimulate the participants of innovative network. Thus *the fourth stage* consisted in the formation of balanced system of indicators for the activity of economic entities which are the participants of innovative network (Table 11).

Table 11. The balanced system of indicators for the activity of innovative network subjects

	Indicators	Essence
1	Market capacity	
1.1	The coefficient of cooperation between the subjects of innovation	The ratio of innovation suppliers to the total amount of innovations applied
1.2	The coefficient of commercial innovative activity	The percentage of proceeds from sold innovative technologies in domestic and foreign market
1.3	The coefficient of research in the market	The percentage of costs for patent research in the expenditures for market analysis
1.4	The coefficient of company value increment (innovative image)	The change of relative growth of market capitalization as compared with the relative growth of sector market
1.5	The coefficient of market demand for innovations	The percentage of costs for technological innovations at the expense of non-state funds
2.	The scientific capacity of production	
2.1	The coefficient of progressiveness for engineering support	The ratio of high-performance (efficient and wasteless) equipment and technologies to their total amount by types
2.2	The coefficient of knowledge content in production. Knowledge-intensive product has and index more than 10%	Costs for research and development / general operational expenditures
2.3	The coefficient of knowledge content in new product	The depreciation of intangible assets in the manufacturing cost of a new product
2.4	The coefficient of effectiveness for innovative production	The percentage of innovative product in the total volume
2.5	The coefficient of competitiveness for innovative production	The percentage of exported innovative products in the total volume
3	Personnel capacity	
3.1	The coefficient of personnel's innovative activity	Quantity of innovation ideas for one worker

3.2	The coefficient of receptivity to innovations	The ratio of implemented innovative ideas to the total number of propositions
3.3	The coefficient of involvement in innovations	The percentage of employees involved in innovative projects
3.4	The coefficient of intellectual capacity	The percentage of developers in the total number of design personnel
3.5	The coefficient of efficiency for the use of intellectual capacity	The percentage of acquired patents in the total number of applications
4	Financial capacity	
4.1	The coefficient of investment in innovations	The percentage of investments in innovative activity in the total volume of investment
4.2	The coefficient of potential for new goods and services	The percentage of proceeds from sold new products in total income
4.3	The coefficient of innovation profitability	The ratio of income to costs for innovations
4.4	The coefficient of product profitability increment after the adoption of innovations	The difference between profitability coefficients before and after the adoption of innovations
4.5	The coefficient of profitability for the investment in innovations	The coefficient of profitability increment *the volume of proceeds/investments in innovations

The balanced system of indicators was developed with the help of coefficient method which allows giving a relative evaluation and making conclusions about innovative development by corresponding quantitative and qualitative indexes. In this case, researchers may be interested in the comparative analysis of these indexes for economic entities for management solutions concerning the improvement of innovative development. The authors suggest laying responsibility for this on certain institutions of innovation infrastructure.

5. Conclusion

So, the usage of known management techniques adapted for the specific conditions of business network will make it possible to place and identify relative strategic roles for economic entities in order to include them into innovative network and to choose the most efficient strategies of innovative development. The method of five forces (by M. Porter) adapted for innovative network will allow identifying the most important development factors on the basis of collaboration and concerted economic interests. The proposed system of indicators for the usage of innovative capacity will promote the balanced economic growth of various economic entities. Organizational and economic mechanisms for the implementation of this method can be the prospect for research in this field.

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