INNOVATIVE FACTORS OF NETWORK COMPANIES ECONOMIC INTEGRATION

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Abstract. *The article proves the importance of innovative development for the successful economic integration of network companies. The innovative development of network companies is determined by increasing the level of competitiveness through the use of their capabilities for rapid updating of products, coordination of efforts to develop new products and technologies, active dissemination of innovations and their implementation. Factors of innovative development have a specific effect on each network. The most effective ones are the joint acquisition of the latest technologies for the production and sale of innovative products (including in international markets), joint efforts in the field of staff training and improving the efficiency of resource and organizational interaction. The combined effect of these factors leads to an increase in knowledge-intensity of products and sales of innovative products (services). The combination of competitive advantages related to network integration benefits and innovation opportunities creates new sources of efficient network operation and development. To activate the factors of innovative development, it has been proposed to form effective models of network interaction in the field of joint acquisition of new technologies, materials, related services; to increase the level of technological support, which affects the intellectualization of network companies; to optimize human resources management, which will determine the ability of staff to promote the creation and implementation of the latest innovative developments.*

Keywords: *innovations, economic integration, network companies, intellectual capital, science intensity of products, training, development and stimulation of personnel.*

JEL Classification: J01, J30, J50.

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Introduction. The level of innovative development of network companies operating in the domestic and international markets testifies to their ability to create high-performance and high-tech products that ensure their competitive position in domestic and foreign markets. Compliance of technological, market, consumer characteristics of products (services) with quality and price parameters plays an important role. If the demand for such products (services) shows growth trends, it indicates the effective impact of innovative development on network integration. In contrast, when the network under the conditions of production of the latest products does not take into account the quality and price requirements, sales opportunities are limited due to high prices or poor quality. In this case, it can be stated that the network has not yielded results, and the impact of innovation factors has not been effective. Ensuring the innovative development of network structures in domestic and international markets largely depends on their flexibility to market requirements and coordinated links between their participants.

Literature review. Problems of formation and evaluation of the innovative component of network companies activities were studied by: M. Perederii (approach to estimating the share of innovatively active production systems in the overall

structure of the organization, the indicators of innovative development) [11, p. 191]; O. Nikulina (use of the indicator of the share of innovative products in the total output of network companies within the analysis of innovation management) [9]; O. Hadzevych, I. Matviichuk (methods of assessment of innovative development) [1, p. 102-103]; Zen A.S., Fracasso E.M. (impact of resources and opportunities on innovations of network companies) [17]; Guan J., Ma N. (impact of innovation opportunities on the market and economic characteristics of the network) [2]; McPhillips M. (impact of open innovation on the state of innovation and economic development) [8]; Zimmer B., Cardinal J.S., Yannou B., Piette F. (building network connections in a cluster) [18]; P. Marešová, P., Jašíková, V., Bureš (efficiency of implementation of cluster initiatives of innovation development) [7], Utami Handayani, N., Cacravatia, A., Diawati, L., & Nur Bahagia, S. (phases of the life cycle of an innovative company) [14] ; Hittmar, S., Varmus, M. and Lendel V. (effectiveness of the innovative strategy of business structure development) [4].

Aims. The purpose of the study is to substantiate the impact of innovative factors on improving the efficiency of network companies.

Methods. The method of a systematic approach – to systematize all innovative factors influencing the economic integration of companies, the method of statistical analysis – to assess statistics on the development of network business structures, data series analysis (to determine dynamic changes) are the methodological basis of the research. The measuring is based mainly on the use of parametric indicators, which allow to reliably and objectively assess the nature of innovation activities of network companies.

Results. The innovative activity of network companies has a certain specificity owing to the ability to use complementary resources to create value that meets market needs, the ability to reduce all costs by increasing the scale of activity, increasing production by expanding the distribution network, risk-sharing among participants and reducing uncertainty, joint efforts for staff training, which may be carried out through the improvement of information exchange of knowledge and experience. In addition, due to the orientation of network structures on the strategy of open innovation, the involvement of a wide range of participants, which contribute to the development and implementation of effective innovation solutions, is ensured.

The concept of «network companies» is widely represented in the references [15; 16; 5, p. 194; 6, p. 376-377; 10, p. 39; 13]. The generalization of these approaches has provided us with the possibility to determine the main essential features of network companies: partnership, «soft integration», common values of participants, common resource base of participants, synergy effect of a network company, readiness for external challenges, existence of a single management centre, network specialization, transparency of relations and interdependence among participants and openness to change, high level of commitment of network participants, mobility of network interaction and functioning, speed of transactions, innovation. The key functions of network structures are coordination of network participants, cooperation and interaction among participants, creation and maintenance of stable, long-term partnerships, joint management, ensuring

competitive positions of participants and business network as a whole, joint management of resource base, risks, financial efficiency, optimization of management through the use of innovative measures, unity of legal support for a network company within the selected type. Based on the identification of the main essential features and the establishment of the functions of these business entities, we have made an attempt to formulate the essence of the concept under research. In particular, a network company is a business structure of participants (commercial, non-commercial companies, natural persons-entrepreneurs), which operates on the principles of innovation, openness, mobility, use of horizontal and vertical links of formal (informal) cooperation (partnership) among the parties, which cooperate within the framework of their own specialization, commitment, interdependence to achieve common goals. Their specific advantages are related to a single resource base, the ability to ensure a synergistic scale effect, adaptability to environmental conditions.

Let us describe the main advantages and disadvantages of network companies. It has been established based on the study of scientific sources [3; 6; 12] that their main advantages include the following. Increasing trust reduces transaction costs and uncertainty, increases predictability in the form of expectations; intensive information flow increases the emergence of new business opportunities, access to new technologies, expansion of markets; voluntary and long-term cooperation provides companies with flexibility, strengthens their receptivity to innovation and focus on the end-consumer; mutual free access to resources owned by network participants; possible reduction of production and sales costs.

Strategic partnerships can replace mergers and acquisitions, which are a more costly and risky development model. On the other hand, the disadvantages of network interaction are the growth of monopoly and reduced competition in the market; reducing the efficiency of activities in the absence of a firm consolidation of the goals of network participants and slowing down decision-making procedures under its significant expansion; growth of dependence, restriction of actions of separate subjects and loss of independence by a company; reduction of management flexibility; blurring the boundaries among organizations due to the complicated links among network participants; increase in transaction costs as a result of increased investment in support and development of inter-firm relations, which may be ineffective [3; 6; 12]. Therefore, the main conditions for the effective formation of inter-firm relationships are defining and agreeing on partners' goals, developing an innovative strategy for formation and development within the process of interactive interaction, organization of control and monitoring of relationships.

Thus, the advantage of network companies is their unique and additional opportunities for innovation. The orientation of network structures on innovative development, which is reflected in the production of new products (services), development of new markets, development of new competencies of companies and their staff, allows to master new markets, create new technologies and become direct participants in industry development at national and international levels. The combination of the advantages of innovative development and network interaction

contributes to the strengthening of market share, the growth of financial, economic and technological indicators. If a network company is not innovation-oriented, the interaction of participants in such a partnership can become burdensome for more powerful entities, and all structural units will lose market position.

Problems of innovative development of network interaction will be considered in this article on an example of various branches. Three network companies have been selected, in order to analyse the peculiarities of innovative development. Using the chosen methods of analysis, indicators of evaluation of innovative development of network companies taking into account their integration into international markets have been selected. All indicators have been grouped into four subsystems:

- financial indicators that characterize the innovative development potential, which include the level of knowledge-intensity of products (services) of a network company, the level of intellectual capital, the level of company's integration into international markets, the level of savings in total expenses related to the cost of sold products (works, services) due to scale effect;

- indicators of the personnel system, which characterize the innovative potential of development, cover the share of costs for material incentives for staff in the total payroll (carried out on the basis of innovative performance indicators), the correlation of costs for staff motivation and sales of innovative products, and net revenue from sales of innovative products, the share of costs for training, education, retraining of staff of network structure participants in the total expenses, the correlation of changes in knowledge-intensity of products on the introduction of training, education, retraining of staff for each participant in the network structure;

- indicators of the logistics system that characterize the innovative development potential (including in the international market), measured by the share of equipment used for innovation in the total equipment;

- indicators of evaluation of the strategy of innovation process management within network companies, which include the compliance of the declared strategy of innovation process management with the actual one and the nature of the integration of a network company into international markets (open, closed).

The business networks studied in the article have produced competitive products (services), which are characterized by a high level of innovation that allows them to ensure integration into international markets.

Let us analyse the innovative development of these network companies, taking into account their functioning in international markets during 2016-2018. The initial data of financial statements, internal documents have been obtained from data sources of network companies. For the purposes of comparative analysis, we present the results of measuring the main indicators of innovative development of the networks under research.

Evaluation of the innovative activity of PJSC «DATAGROUP» for the period 2016-2018 (Table 1) has shown that the main advantages of the network include effective cooperation in the joint formation of the logistics system. In particular, during the period under research, the share of equipment used for innovation in the total equipment has increased, which is associated with the acquisition by participants

of certain technical means necessary to work on joint programmes (expansion of the Internet, customer service). The main obstacles to the innovative development of PJSC «DATAGROUP» (including integration into international markets) were the deterioration of financial and human resource indicators for basic components. The reasons for the deterioration of financial indicators of innovative development are the reduction of the volume of services of an innovative nature due to the predominance of the focus on the provision of traditional services (without the innovation component).

Table 1. Dynamics of the basic indicators of innovation activity of PJSC «DATAGROUP» for the period 2016-2018

№	Stage / Indicator	Value		
		2016	2017	2018
1	*1st stage of evaluation – financial indicators that characterize the innovative development potential (including in the international market)*			
1.1	Level of knowledge-intensity of products (services) of a network, %	30,84	31,83	30,46
1.2	Level of intellectual capital, %	28,73	27,55	24,8
1.3	Level of savings in total expenses related to the cost of sold products (works, services) due to scale effect, %	20	21	19
2	*2nd stage of evaluation – Assessment of the impact of innovative development potential on the level of international business development*			
2.1	Share of sold products (works, services) of an innovative nature in the total sales of products (works, services) in international markets, %	52	41	44
3	*3rd stage of evaluation – indicators of the personnel system, which characterize the innovative potential of development (including in the international market)*			
3.1	Share of employees engaged in innovation activities in the company, %	52	40	44
3.2	Share of costs related to material incentives for staff in the total payroll %	3	6	8
3.3	Correlation of the level of changes in the costs for staff motivation (Cm) and the level of changes in sales of innovative products (services), %	Cm (-9,6), CD (18,2), No correlation	Cm (354,9), CD (-8,94), No correlation	Cm (160,8), CD (19,69), Direct correlation between the growth
3.4	Share of costs for training, education, retraining of staff of network structure participants in the total expenses, %	2,5	3	4
3.5	Impact of the correlation of changes in knowledge-intensity of products (services) and the introduction of targeted training, education, retraining of staff for each participant in the network structure, %	Ineffective. Upscinn1 - Upscinn0) = -2,94, (Uckin 1 – Uckin0) = 0,5.	Effective. Upscinn1 - Upscinn0) = 0,99, (Uckin 1 – Uckin0) = 0,5.	Ineffective. Upscinn1 - Upscinn0) = -1,37 (Uckin 1 – Uckin0) = 1.
4	*4th stage of evaluation – indicators of the logistics system that characterize the innovative development potential (including in the international market)*			
4.1	Share of equipment used for innovative activity in the total equipment, %	71	76	78
4.2	Impact of change in the share of equipment used for innovative activity in the total equipment on change of volumes of sold products (works, services) of innovative character of a network	Not subject to evaluation	There is no positive impact	Positive impact on the growth

Source: compiled according to internal data of the firm

For three years, this trend has occurred due to an insufficiently effective approach to the sale of innovative services. The reason for the decrease in the indicator of savings in total expenses related to the cost of services of an innovative nature due to the scale effect of a network company was the inefficient approach to management in the field of procurement of materials and related services. The inefficiency of targeted training, education, retraining for each participant of the network structure has been revealed. Factors that slowed down the innovative development of this network were: network organization of supply of materials and services necessary for the provision of services (due to lack of a common approach to finding profitable offers, the network could not increase the production and sale of innovative services); market factor associated with the predominant focus of the network structure on consumers of traditional services (products), which have been positioned in the market for a long time. As a result, despite the fact that the network participants were able to provide the joint acquisition of the necessary technological support, it did not cause an increase in financial, economic and human resource indicators of innovation potential.

Another situation has developed in PJSC «Research Institute of Radiation Protection of the Academy of Technological Sciences of Ukraine». Similarly, through the evaluation of four groups of indicators of innovative development, data for the network under research has been obtained. The analysis has revealed the following trends:

- financial indicators that characterize the innovative development potential (including in the international market) for 2016-2018 have been marked by a reduction. The level of knowledge-intensity of products (services) decreased from 45.59% to 32.72%. At the same time, in 2018, due to certain efforts of the participants to combine scientific and technical functions, the volume of sales of innovative products had increased, which affected the growth of knowledge-intensity. The level of intellectual capital decreased from 0.83% to 0.34%, which indicates a reduction in the provision of a network with software, technology that affects the specificity. The level of savings in total expenses related to the cost of sold products (works, services) of an innovative nature due to the scale effect decreased from 32% to 16% which is a negative trend that indicates an increase in material consumption. In general, this is due to the inconsistency of participants' actions regarding the assessment of the quality of materials (large share of defective products affects costs) and marginal prices for materials;

- the share of sold products (services) of an innovative nature in the total sales of products (services) in international markets showed fluctuations from 76% in 2016, 75% in 2017 to 78% in 2018.

- indicators of the personnel system, which characterize the innovative potential of development (including in the international market) had the following values. The share of employees engaged in innovation activities in the company fluctuated for three years in direct proportion to the fluctuation of the share of sold products (services) of an innovative nature in the total sales of products (services) in international markets. It amounted to 78% in 2016, 76% in 2017, 81% in 2018.

Similar directly proportional changes have been seen in relation to the share of costs related to material incentives for staff in the total payroll (4.5% in 2016, 7% in 2017, 6% in 2018). The direct correlation of the level of changes in the cost for staff motivation (Cm) and the level of changes in sales of innovative products (services) over three years has been observed;

- the share of equipment used for innovation in the total equipment was characterized by growth in 2016-2018 (72% in 2016, 73% in 2017, 75% in 2018). The positive impact of the change of the share of the equipment used for innovative activity in the total equipment on change of volumes of sold products (services) of an innovative character in the international markets has been revealed.

The analysis has shown that the main advantages of innovative development of this network are joint participation in the costs of material incentives, training, education and retraining of staff through network interaction, which has led to increased production and sales of innovative products (services) and increased knowledge-intensity of products (services) of the network in 2018; network cooperation in relation to the creation of a material and technical system that has had a positive impact on the increase of innovative products (services).

Based on the analysis, the main obstacles to innovative development of PJSC «Research Institute of Radiation Protection of the Academy of Technological Sciences of Ukraine» (including integration into international markets) include a decrease in the level of intellectual capital, the level of savings in total expenses related to the cost of sold innovative products due to the scale effect of the network company. The reason for this situation is the reduction of innovative services due to the expansion of traditional services. This is due to the growth of imported consumables for the production of innovative services (highly accurate evaluation of the level of radioactive effect, environmental pollution). The main factors that contributed to the innovative development of the network were the factor of human resources potential of participants in the network interaction, which provided the growth of the production, promotion and sale of products (services) of an innovative nature and increase of knowledge-intensity; technological factor, which made it possible to increase the competitiveness of the network company by increasing productivity and creating new products.

Another research object was PJSC «PHARMSTANDART-BIOLIK». Guided by the selected methodological support used for the two previous networks, an analysis of the state of indicators of innovative development in relation to PJSC «PHARMSTANDART-BIOLIK» has been carried out. The evaluation has provided the possibility to determine the following:

- in terms of financial indicators, the following facts have been identified. The level of knowledge-intensity of the network's products in 2016 was 15.09%, in 2017 – 14.76%, in 2018 – 14.59%. It has been established that, owing to the general reduction of the volume of innovative products (mainly in the domestic market), the knowledge-intensity decreased. This is due to the lack of successful cooperation of participants to create new innovative products. The level of intellectual capital decreased from 0.66% in 2016, 0.12% in 2017 to 0% in 2018;

- with regard to the share of sold products of an innovative nature in the total sales of products in international markets, its growth from 28% in 2016, 30% in 2017, 36% in 2018 has been determined. Despite the overall reduction of innovative products, there was an increase in its share in international markets while declining in domestic ones. This is due to the impact of the price factor, namely, foreign consumers had a greater demand for innovative products of the network compared to domestic ones;

- regarding the indicators of the personnel system, which characterize the innovative potential of development (including in the international market), the following has been revealed. With the growth of the share of employees engaged in innovation activities in the company (31% in 2016, 32% in 2017, 37% in 2018), there was an increase in the share of costs related to material incentives for staff in the total payroll (4.5%) in 2016, 5% in 2017, 7.5% in 2018), an increase in the share of costs for training, education, retraining of staff of network participants in the total expenses (0.5% in 2016, 1, 6% in 2017, 2.3% in 2018). The direct correlation of the level of changes in the costs for staff motivation and the level of changes in sales of innovative products for three years, the negative correlation of changes in knowledge-intensity of products and the introduction of targeted training, education, retraining of staff for each network participant in 2017, 2018, has been revealed;

- regarding the indicators of the logistics system, the following has been proved. The share of equipment used for innovation in the total equipment was characterized by the growth (from 72% in 2016, 74% in 2017, 76% in 2018). There is a positive impact of this indicator on the growth of sales of innovative products.

The problem that narrowed the innovative capabilities of the network is the inefficiency of targeted training, education and retraining of staff for each of its participants. Each of the participants independently approved expenses and the programme of training and development, but due to the lack of coordination of activities, this programme did not provide the expected effect.

Comparative analysis shows that the highest level of knowledge-intensity of products (services) had those network structures that were involved in providing services, in particular, PJSC «Research Institute of Radiation Protection of the Academy of Technological Sciences of Ukraine» (change from 45.59% to 32, 72%), PJSC «DATAGROUP» (change from 30.84% to 30.46%). PJSC «PHARMSTANDART-BIOLIK» (change from 15.09% to 14.59%) (Fig. 1) has been ranked the third in terms of this indicator due to the unpredictable increase in procurement costs, which causes high prices for products, and, accordingly, reduction in demand.

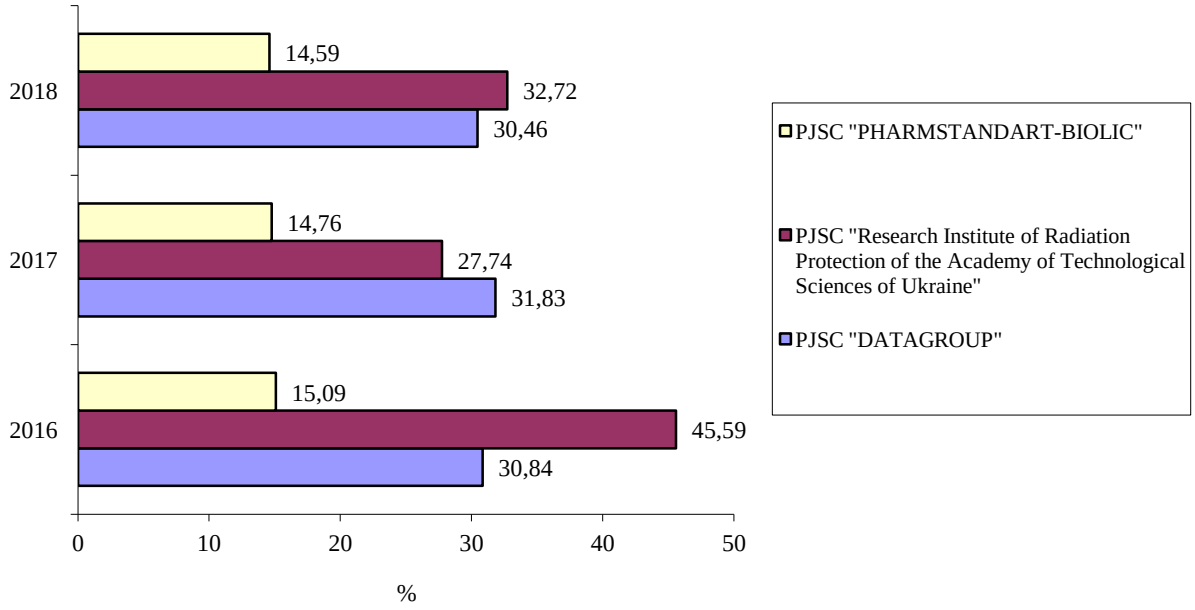

Figure 1. The level of knowledge-intensity of products (services) of network companies for 2016-2018.

Source: compiled according to internal data of the firm

The authors found a general trend of reducing the level of intellectual capital (Fig. 2).

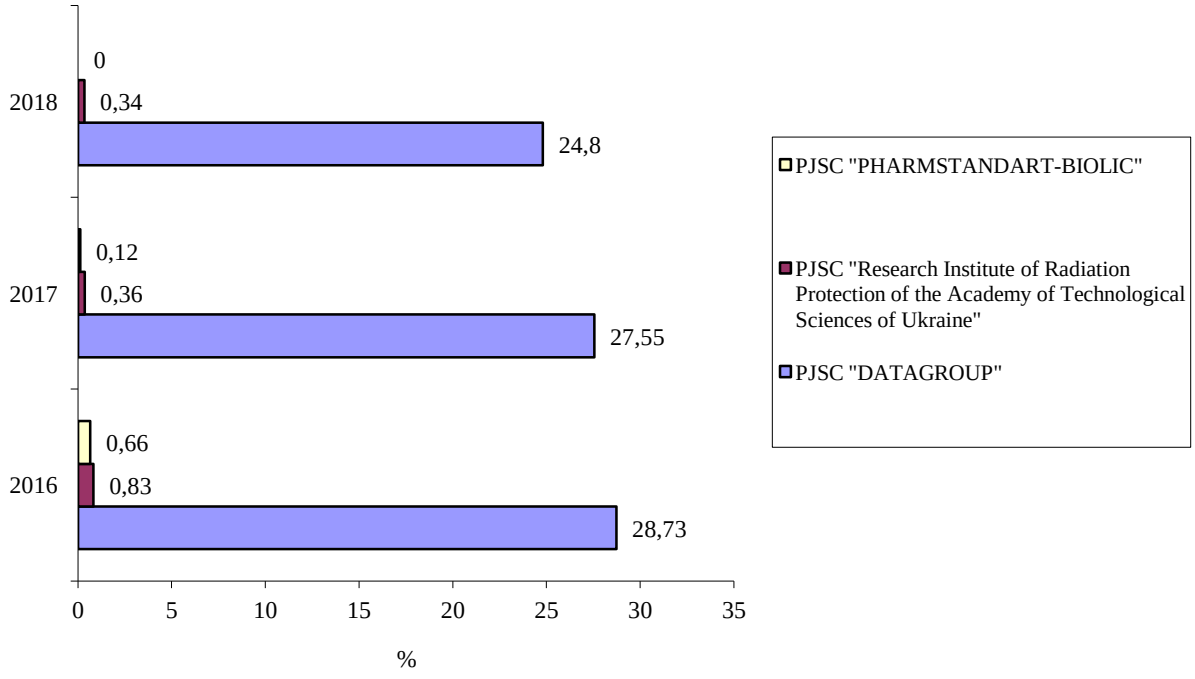

Figure 2. The level of intellectual capital of network companies, 2016-2018

Source: compiled according to internal data of the firm

The highest value of this indicator had PJSC «DATAGROUP» (change from 28.73% to 24.8%), the other networks had at less than 1, which is due to the low level of technology upgrades.

The analysis has shown that the growth of innovation activity of network structures depended on the share of equipment used for innovation in the total equipment (from 65% to 80%).

The innovative development of network structures was also influenced by the agreement of their participants on joint motivation programmes for staff, which was observed especially in 2018, that, in turn, led to increased productivity.

Discussion. Based on the research, the suggestions have been made, in particular**,** the creation of effective models of interaction to ensure the effect of joint efforts in the field of procurement of materials, raw materials (services); increasing the intellectualization of network companies through the formation of intangible assets (acquisition of high-tech assets); achieving harmonized actions of network companies through creating joint education programmes, staff training, increasing the readiness of staff to perform innovative functions.

Conclusion. The importance of innovative development for the successful economic integration of the network companies under research has been substantiated. The authors have proved that the innovative development of network companies is determined by increasing the level of competitiveness through the use of their capabilities for rapid product upgrades, coordination of efforts to develop new products and technologies, active dissemination of innovations and their implementation. In turn, it has been shown that the factors of innovative development have a specific effect on each network. We can state that the combination of the advantages of economic and technological integration with the possibilities of innovative development provides the possibility to strengthen the competitiveness of network companies. To enhance the factors of innovative development, the following has been proposed: formation of models of network interaction for joint procurement of materials, related services; increasing the level of technological support, which will increase the intellectualization of network companies; improving the skills and readiness of staff to develop and implement innovative solutions.

Author contributions. The authors contributed equally.

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