

# NEW ORGANIZATIONAL MODEL FOR FUNCTIONING OF RESEARCH INSTITUTES IN POLAND — COMPARATIVE ANALYSIS OF ŁUKASIEWICZ AND POLTRIN NETWORKS

**NOWY MODEL ORGANIZACYJNY FUNKCJONOWANIA INSTYTUTÓW BADAWCZYCH W POLSCE  
— ANALIZA PORÓWNAWCZA SIECI ŁUKASIEWICZ I POLTRIN**

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## ABSTRACT

This article concerns the functioning of research institutes in Poland taking into account their legal and organizational changes. The aim of the article is to attempt to answer the question whether networking of research institutes in Poland is an appropriate organizational model for the functioning of these organizations. The introduction outlines the theoretical background for the network analysis and presents general information about research institutes. The author presents solutions concerning networking of scientific institutions in Poland and in selected EU countries. The POLTRIN and Łukasiewicz networks are an example of models of networking research institutes in our country. The author analyzes the activities of these networks, taking into account the benefits of network connections in cooperation with the economy. The research methods used in this paper include: the analysis of source materials, case study, comparison method and bibliometric method.

**Key words:** research and development institutes, science network, innovations, economy, European Union

## ABSTRAKT

Artykuł jest próbą przybliżenia wiedzy dotyczącej funkcjonowania instytutów badawczych w Polsce z uwzględnieniem zmian prawnych i organizacyjnych, które nastąpiły w tym sektorze nauki w latach 2016–2020. Celem artykułu jest próba odpowiedzi na pytanie czy sieciowanie instytutów badawczych w Polsce jest odpowiednim modelem organizacyjnym dla funkcjonowania tych organizacji. We wstępie naszkicowano tło teoretyczne dotyczące analizy sieciowej oraz przedstawiono ogólne informacje o instytutach badawczych. Autorka prezentuje rozwiązania dotyczące sieciowania instytucji naukowych w Polsce oraz w wybranych krajach Unii Europejskiej. Sieci POLTRIN i Łukasiewicz będą przykładem modeli łączenia instytutów badawczych w naszym kraju. Autorka dokona próby analizy działalności owych sieci z uwzględnieniem korzyści, jakie niosą powiązania sieciowe we współpracy z gospodarką. Metody badawcze zastosowane w pracy to analiza poznawcza materiałów źródłowych, studium przypadku, metoda komparacji, metoda bibliometryczna.

**Słowa kluczowe:** instytuty badawcze, sieci naukowe, innowacje, gospodarka, Unia Europejska

JEL: I23, I28

## Introduction

Network analysis has many applications in various research areas and fields. A broad stream of network research has been developed in the social sciences as social network analysis.<sup>1</sup> Various concepts of networks refer to the connections, relationships that are the basic feature of each network. They focus on the shape of the social structure, the position of individuals in these structures and the resulting benefits. It is worth mentioning that there is no single, universal network model. Each is unique, and its formation depends on many factors, including the external world, i.e. the environment.<sup>2</sup> Networks can have different organizational forms from the least to the most formalized. A summary of selected organizational forms of networks is presented in Table 1.<sup>3</sup>

**Table 1. Summary of selected forms of cooperation networks.**

Formalization degree of cooperation networks	Form	Characteristics
1 <sup>0</sup> — open network, non-formalized	Open cooperation network	An open cooperation network of entities of the same sector and related sectors, communities of practice
	Business network of non-competing entities	Open business cooperating network of non-competing entities with a coordinator
2 <sup>0</sup> — formalized network without capital ties	Formal strategic alliance	Share-free strategic alliance based on a formal agreement among network members
	Association	Association established by the network members under the current law
	Chamber of Commerce	Chamber of Commerce established by the network members under the current law
	Foundation	Foundation established by the network members under the current law
3 <sup>0</sup> — formalized network with capital commitment	Capital company	Commercial law company

Source: Knop L., and Olko S., "Ewolucja form organizacyjnych sieci współpracy." *Organizacja i Zarządzanie*, science quarterly, 2008/1, p. 108. (In Polish: "Evolution of the organizational forms of cooperation networks.").

The above comparison allows systemizing and organizing various forms of network cooperation including the models presented in the article below. According to the author, the two presented networks are examples of different degrees of formalization. On the basis of the above Table, the Łukasiewicz Research Network presents the second degree of formalization, while POLTRIN's network presents the first degree. Moreover, according to the author, the typology can be a starting point for new forms of cooperation between research institutes in Poland. The article is an attempt to answer the question whether the organizational model of institutes' networking in Poland and Europe is an appropriate

organizational form for these institutions influencing the increase of their competitiveness in the economy.

Poland still occupies a low position in studies showing the innovativeness of European Union (EU) countries. The level of the Summary Innovation Index for Poland is lower than the average for all EU countries. In the Innovation Union Scoreboard (IUS)<sup>4</sup> published in 2019, Poland was ranked fourth from the end. In comparison with the results of previous years, from weak innovators we advanced to the group of moderate innovators.

Public research institutes are diverse and complex scientific entities. Each has a unique management and organizational culture. They operate in the areas of industry, transportation, energy, medicine, agriculture, public services, infrastructure and defense. Legal framework and organizational framework for research institutes in Poland is set by the Act of 30 April 2010 on research institutes.<sup>5</sup> In the meaning of Article 1(1) they are state organizational units, legally, organizationally, economically and financially separated, which conduct research and development work aimed at implementation and practical application.<sup>6</sup> The most important objectives to be achieved by research institutes include:

- conducting scientific research and development work oriented towards implementation.

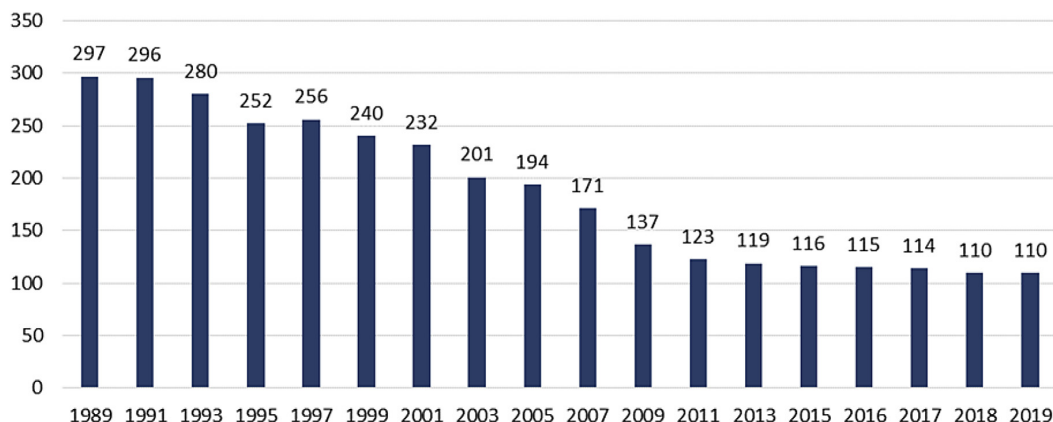
The research institutes are to perform the following activities:

- conducting scientific research and development work aimed at implementation,
- conducting information activities: dissemination of the results of work, training, scientific, technical and economic information,
- teaching activities (specialist training courses), post-graduate and doctoral studies,<sup>7</sup>
- protection of intellectual property,
- standardization, certification and approval activities.

Research institutes are essential in creating and building a Knowledge-Based Economy (KBE) in Poland. They have the intellectual and research

potential to support the national economy. It is the only sector of science that has been thoroughly restructured. Consolidation has been the main direction of restructuring. The table below shows the downward trend in the number of research institutes over the last thirty years.

**Figure 1. Number of research institutes in Poland between 1989 and 2020**



Source: the author's own compilation based on data from the Bulletin of the General Council of Research Institutes, no. 1(104), April 2019, p. 1.

Based on the above summary, it can be concluded that in the years of systemic transformation there has been a clear downward trend in the number of institutes (Figure 1). Their share in the total number of entities conducting research and development activity in Poland has been systematically falling. In 2009–2013, this decline is no longer so rapid, the number of institutes remains at a level of around 120, with minor isolated cases of disbandment, consolidation or privatization of selected entities. It can be assumed that the period of turbulent changes has been survived by the "strongest" units, cooperating with enterprises — units whose research activity is in demand on the market. According to the author, the institutes currently operating owe their survival of the turbulent times largely due to sound policies pursued by the management and changes introduced by individual governments who recognize the necessity of the existence of public research organizations and their important role in the development

of an innovative, knowledge-based economy. A clear shift in the perception of the importance of research and development activities took place when Poland joined the European Union, when it became apparent that one of the Community's top priorities is the creation of a competitive, modern economy. It is impossible to achieve these assumptions without high expenditures on research and development.<sup>8</sup>

The consolidation of research institutes in Poland has been one of the solutions, aimed both at avoiding the liquidation of weaker units and at increasing the effectiveness of R&D work conducted by these organizations. However, the question remains open as to what form the planned consolidation or cooperation of institutes should take?

Between 2016 and 2020, many changes could be observed in Poland regarding the functioning of these units. In December 2016, the law amending *The law on research institutes* was enacted. Its amendment regulates the procedures for the appointment and dismissal of directors of state research institutes and the composition of their scientific councils, including the method of appointing the chairman of the council and his deputies.<sup>9</sup> Subsequently, *The act on research institutes*<sup>10</sup> was amended, a new *Constitution for Science*<sup>11</sup> was adopted and the Łukasiewicz Research Network was established.<sup>12</sup> The purpose of the network is to carry out research projects including international ones, and to commercialize the results of work. Apart from the basic activity, affiliated institutes may also produce unique research apparatus and materials, conduct metrological, standardization and certification activity, develop prototypes of new technological solutions, conduct courses and staff training, and, if necessary, other activity related to their nature. An important aspect of the functioning of the institutes is their activity for the benefit of society, therefore, among the institutes' tasks is also the popularization of science and knowledge of new technologies.<sup>13</sup>

A smaller POLTRIN network was also established to strengthen the potential of research institutes to carry out large research projects both for the development of the economy and the competitiveness of enterprises in the area of land transport.<sup>14</sup> Currently, in Poland we have 110 research institutes, including 33 belonging to the Łukasiewicz Research Network and 3 institutes belonging to the POLTRIN network.

## Networking of research institutes in selected European countries

Analyzing the idea of networking research institutes in Poland, it is necessary to briefly characterize this trend in the EU. In most EU countries, research institutes are public organizations and their functioning is inscribed in the binding structure of the particular national system of financing science. In Western European countries, institutes are associated within thematic groups which form a network of specialized institutions.

Networking of such institutions will be presented below on the example of research institutes functioning in two selected European countries — Germany and France.

In Germany, the equivalent of Polish research institutes are the institutes associated in the Fraunhofer Society. It is Europe's largest non-profit organization involved in applied research and its implementation in industry. The German association disseminates and performs applied research that is useful for private and public enterprises and benefits the whole society. The organization was founded in 1949 and brings together 72 German research institutes (Fraunhofer-Institute) representing more than eighty research sectors. More than 70% of its research income comes from contracts with industry and publicly funded projects.<sup>15</sup> The network's offerings are aimed at the following target groups:

- companies that want to restructure their market position through a new approach to their competitive environment or their internal processes and resources,
- companies seeking to optimize their information logistics through the implementation of in-company and inter-company information and communication systems,
- companies aiming at optimizing information logistics through the implementation of in-company and inter-company information and communication systems,
- companies involved in the development and distribution of innovative products that want to sustainably increase their technology and innovation capacity intermediary organizations such as: chambers of commerce and industry, trade associations,

- social partners and public sector institutions that want to contribute to the development of innovative ideas for standards and regulations or to participate in training and further education.

The research institutes are located throughout the country. The functioning of the individual units in the association is based on decentralization in management and autonomy of the units. The institutes cooperate closely with industry and universities. The organizational structure enables direct technology transfer. For the institutes within the association is important both the implementation of contract research for companies and the public sphere, as well as consultations, expertise, knowledge exchange and staff mobility. The association has considerable autonomy in management. The state administration does not interfere in the selection of research projects, and the evaluation of results is based on the overall contribution to the German economy. The government has some level of power in the selection of the president, but less than institutes in other countries, since the board members come from both industry and science. In budgetary terms, the state only provides a core fund of 1/3 of the total R&D project budget. Another 2/3 must come from industry or other sources such as the European Union. This is a stringent criterion for evaluating the performance of R&D institutes. Half of the contract research comes from large companies and the other half from SMEs. The institute manages a database of alumni. Many graduates contact the association and form partnerships with the companies they currently work for. The institute collaborates with local industry and universities. Furthermore, as the knowledge network becomes more globalized, the association has established branches in the USA, Japan and China, and cooperates with excellent foreign entities (companies, universities, research and technology organizations).<sup>16</sup> The Fraunhofer Institute remains the leader among German research institutions in terms of the annual number of patent applications and industrial property rights. In 2019, 623 patent applications were filed.<sup>17</sup>

CARNOT is a national multidisciplinary network, founded in 2006, bringing together 29 French R&D institutes and laboratories and 9



affiliated research units.<sup>18</sup> In 2019, the CARNOT network reported a 3.9% increase in R&D contracts compared to previous years. The units in the network represent about 15% of the national research and laboratory base and employ 26,000 scientists. The French Ministry of Science and Research directs and oversees the CARNOT network system. The National Research Agency (L'Agence Nationale de la Recherche ANR) is responsible for managing funding, structure and administration. It is a government entity created in 2007, functioning as a research funding agency with the aim of increasing research projects in all scientific fields. Among ANR's main tasks, we can include:

- stimulating the development of basic and applied research and innovation,
- supporting partnership between public and private sectors,
- promoting effective technology transfer to the economic sector.

Implemented projects are selected through competitions based on the criteria of scientific quality and potential application in the business sector. Each research institute associated in the network has its own legal separation and competences in specific research areas. The CARNOT brand is awarded by the Minister for Higher Education and Research to those institutes that cooperate effectively with representatives of the business sector and local communities.<sup>19</sup> The brand is intended to promote partnerships in the research sector and to develop its cooperation with the small and medium-sized enterprises sector. A single entity joins the network by means of an open competition. After a positive evaluation, it undertakes to comply with the conditions and obligations contained in the rights and duties of the network. The Board of Directors consists of 15 representatives elected from among the CARNOT institutes. The network's activities are financed by contributions paid by individual institutes and grants from the government administrations of the various ministries, local authorities and partners involved in promoting research and innovation. Public funding is mostly used for specific purposes (e.g. conferences, information meetings, promotion, etc.).<sup>20</sup>

**Table 2. Comparative overview of Fraunhofer and CARNOT networks**

<b>FRAUNHOFER (Germany)</b>	<b>CARNOT (France)</b>
The largest network in Europe — associates 72 scientific and research institutions	A smaller network — brings together 36 scientific research institutions
It operates as an association, a nonprofit organization at the intersection of the private and public spheres	It comes under the French Ministry of Science and Research
Network activities focused on applied industrial research and R&D work	Network activities focused on applied industrial research and R&D work
The operating model is based on decentralization in management and autonomy of the affiliated institutes	Institutes have their own legal and financial separation
Ongoing R&D projects are 70% funded by entrepreneurs, with the remaining 30% comes from public funds	Ongoing R&D projects are 50% funded by entrepreneurs and 50% by public funds

Source: The author's own elaboration based on network websites: <https://www.fraunhofer.de/en.html> (accessed 2.04.2020), <https://www.instituts-carnot.eu/en/mot-cl%C3%A9s/carnot-network> (accessed 15.04.2020).

The research and financial successes of both network organizations prove that creating networks of cooperating research units is one of the factors of increasing the innovativeness of the country. Such solutions allow for greater knowledge flow and technology transfer. Scientific institutions and entrepreneurs have faster access to knowledge and research results as well as to research infrastructure, shorter time of new technologies implementation, wider didactic offer, possibility to conduct multidisciplinary projects.

## **Research institutes in social and economic environment in Poland**

The contemporary social and economic situation is characterized by complexity and changeability of the processes occurring in it. Research institutes must show particular market activity in order to meet the requirements of the market economy. Commitment to the development of creative and innovative state policy means investments in modern research infrastructure, modern laboratories, direct transfer of knowledge and

technology to the economy. Research institutes operating in a free market economy, should, to an increasing extent, be open for business and adapt their offer to specific market needs. The activity of these entities undoubtedly creates an opportunity to eliminate disproportions in applied research and development works between Poland and Western European countries. Currently, many of them are an important source of scientific and technological knowledge. However, research institutes are very heterogeneous. On one hand, the potential of some units, starting from the 1990s, has been gradually shrinking, on the other hand, many institutes have won international prizes and awards, successfully participate in research programs. It is worth noting here that before the state created conditions for cooperation and obtaining subsidies, many institutes had been independently seeking external contacts. The creation of thematic networks and bilateral agreements testify to the resilience of their activities and contradict the thesis that many units should be liquidated or privatized.<sup>21</sup>

Research institutes play an extremely important role in building modern, positive relations between science and business. They are closest to the economy due to the tasks they perform, i.e. conducting development and industrial research focused on implementation. Due to the fact that research institutes are a set of heterogeneous institutions operating in different areas of the economy, it is difficult to unequivocally assess their links and direct effectiveness of their impact on the economy. It is worth noting that despite low and decreasing subsidies from the state budget, institutes are one of the most important sources of obtaining funds from orders from entrepreneurs. However, the scope of this cooperation is still insufficient. The reason for poor cooperation between business and institutes is the lack of incentives for entrepreneurs and huge bureaucratic barriers, which make cooperation difficult.<sup>22</sup> With this in mind, the Ministry of Science and Higher Education is trying to create certain facilitations and special programs for research institutions, which are supposed to intensify cooperation with the economy. A good example of these activities are projects announced by the National Centre for Research and Development, where the so-called scientific-industrial consortia are preferred. Another example is the Constitution for Business introduced in 2018. Constitution for Business, i.e. a package of laws aimed at reforming

economic law to serve the development of entrepreneurship and innovation.<sup>23</sup> Additionally, the establishment of scientific networks bringing together research institutes was initiated.

## **Legal and organizational framework of operation of Łukasiewicz and POLTRIN networks — comparative analysis**

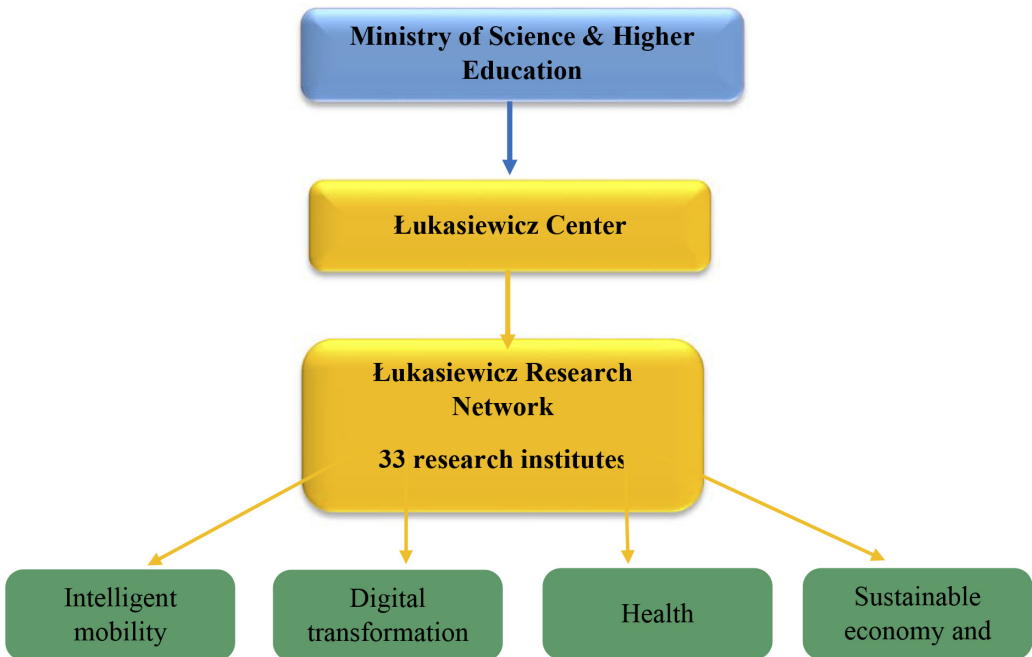
Established in our country, in 2019, the Łukasiewicz Research Network is the third largest research network in Europe. It currently gathers 33 Polish institutes<sup>24</sup> divided into specific research groups. The Network was created by incorporating a part (mostly subordinated to the Ministry of Entrepreneurship) of currently operating research institutes that have adequate potential to achieve the purpose of the Network's activities. It is a structure which has considerable autonomy in the performance of tasks set out in the Act.<sup>25</sup> The Łukasiewicz Centre is responsible for planning and coordination of research work carried out in the institutes. Additional tasks of the institutes include: production of unique research equipment, metrological, standardization and certification activity, development of new prototypes and technological solutions.

Affiliated institutes may also conduct training, workshops and courses for entrepreneurs. The activity for the benefit of society is important. The institutes operating within the network maintain separate legal personality, act in their own name and on their own account. The activities of the network are evaluated by the minister responsible for higher education and science. Currently, the network operates in the area of four research groups: intelligent mobility, digital transformation, health and sustainable economy. The Łukasiewicz is the first in Poland and the third largest in Europe integrated network of research institutes with technical, substantive and organizational facilities to conduct scientific and implementation activities.

The primary objective of the Łukasiewicz Network is to conduct applied research and development work relevant to the Polish economy and national development strategy. The group of institutes was formed mainly from entities subordinate to the Ministry of Entrepreneurship and

Technology. The goal is to provide attractive, complete and competitive business solutions in the areas of automation, chemistry, biomedicine, ICT, materials, and advanced manufacturing.

**Figure 2. Łukasiewicz network organizational structure**

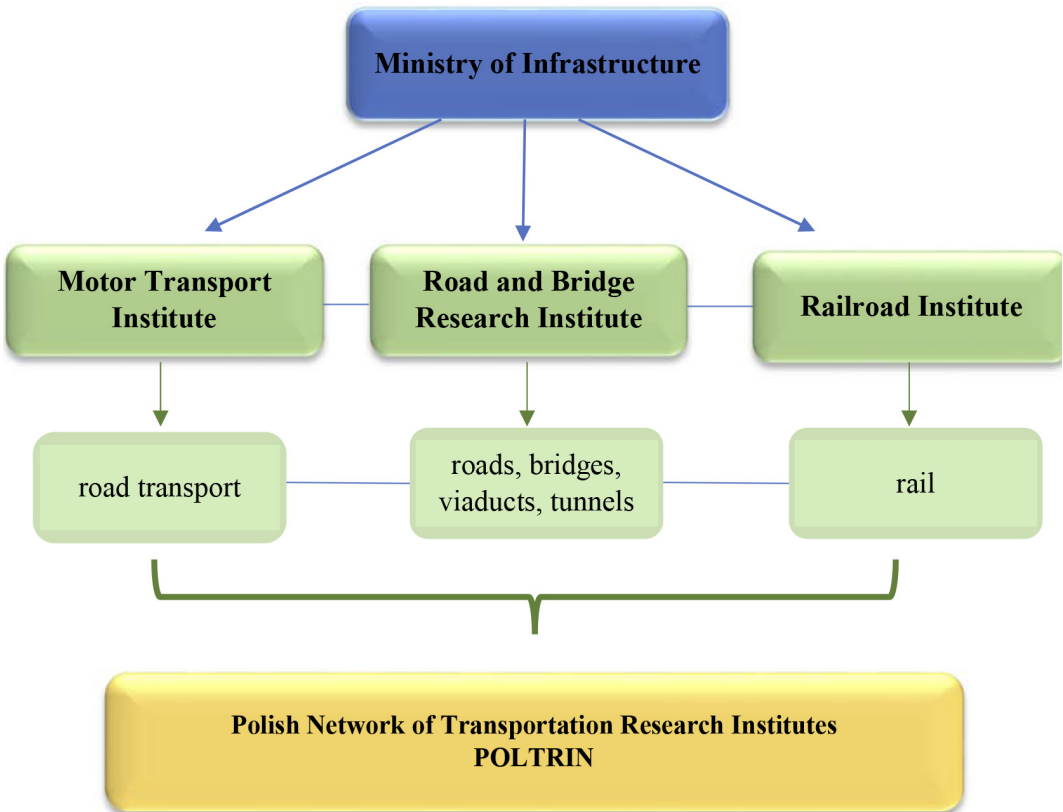


Source: own elaboration.

In 2018, the second network in Poland started its activity which is formed by institutes operating in the field of land transport not affiliated with the Łukasiewicz Research Network. Their main task is the implementation of national as well as international R&D projects and commercialization of research results.<sup>26</sup> The mission of the network is to strengthen the potential of research institutes, enabling the implementation of large research projects for the development of transport, economy and competitiveness of enterprises. A characteristic feature of the network is the operation of this group of institutes within the competencies of the minister responsible for transport and focusing its activities on land

transport. This area has been identified as one of the six most important in the SOR including among the thirteen strategic projects of the state. Decisions in the Network are most often made by agreement. They are made by the directors of the institutes, who meet periodically throughout the year. In addition, persons from the individual institutes are designated for working cooperation. They carry out specific activities independently of their superiors' meetings. An important advantage of the Network is that its management is practically costless, as the implemented activities are performed within the existing duties of its participants. POLTRIN continues the previous activities of the associated institutes, especially in the field of projects, and has also cooperated/participated in the Transport Day, organized annually in September by the Ministry of Infrastructure.<sup>27</sup>

**Figure 3. POLTRIN's organizational structure**



Source: own elaboration.

Institutes, within the network, operate on the basis of Regulations and Organizational Statutes approved by the supervising minister. They retain a separate legal personality and act in their own name and on their own account. The Network's mission is broadly understood cooperation with the Polish economy in the field of road and rail transport. All institutes are headquartered in Warsaw, they do not require any restructuring or legal changes. The institutes associated in the network run complementary activities and have been cooperating for many years, both in terms of scientific and research projects, and e.g. in the area of certification. They are linked by many short-term and long-term agreements. Creating a network of scientific units allowed systematizing all the activities and facilitates taking joint initiatives on an ongoing basis. Of particular importance will be undertakings related to large transport projects across the country, such as the construction of new roads and freeways and the modernization of railroad lines. Cooperation between the institutes, in particular, includes:

- performing tasks important for planning and implementation of state policy, necessary to ensure the development of innovative, efficient, safe and low-emission land transport,
- identifying common problems concerning the sector and taking actions aimed at solving them with the use of expertise, scientific potential and research equipment at the disposal of the institutes,
- shaping strategic research programs as well as initiating and implementing a joint research and implementation program in the area of land transport,
- implementation of joint scientific and development work as well as implementation and dissemination of their results,
- cooperation between the laboratories of the institutes and exchange of research experience,<sup>28</sup>
- representation of the network on the international arena in the area of scientific research and development.<sup>29</sup>

The scope of the network's activities is primarily aimed at:

- performing tasks important for the planning and implementation of state policy in the development of innovative, efficient, safe and low-carbon land transport,

- identifying and solving common problems in the transport and infrastructure sector and infrastructure,
- shaping strategic research programs,
- initiating and implementing a joint research and implementation program in the area of land transport.

**Table 3. Comparison of activities of the Łukasiewicz and POLTRIN networks**

Łukasiewicz Research Network	POLTRIN Network
Large centralized institution with 36 institutes subordinated to the Ministry of Science and Higher Education	A small network of 3 institutes under one thematic group under the Ministry of Infrastructure
The affiliated Institutes have legal autonomy The principles of managing the organization have been unified by establishing the Łukasiewicz Research Center	Institutes have separate legal identity, statutes, and act independently
Evaluated by the MSHE through an evaluation	Evaluated by the MSHE through an evaluation
The research scope covers four thematic groups: Smart Mobility, Digital Transformation, Health and sustainable economy	The research scope includes: road transport, rail transport, bridges, viaducts, tunnels
They are under the authority of the minister responsible for higher education and science	They are under the authority of the Minister of Infrastructure
Objective — creating innovative solutions for the development of the Polish economy	Objective — to work with the economy on road and rail transportation

Source: the author's own elaboration based on analysis of materials.

## Conclusions and recommendations

Creating research networks is a modern international trend. In Europe, excellent examples are the CARNOT network in France and the Fraunhofer Society in Germany. The effect of the activity of such structures results in an increase in the level of innovativeness of a given country. In Poland, the process of activity of two scientific networks associating research institutes has begun.



After analyzing the experience of networking of institutes in other European countries, it can be concluded that the model of functioning of scientific institutes associated in networks allows for:

- optimal use of research infrastructure,
- unification of organization within the institutes, which will increase their economic efficiency,
- strengthening the potential of research institutes,
- capacity to implement large R&D projects,
- increased success rate in European programs (Horizon 2020),
- faster transfer of knowledge and new technologies from science to the economy.

After one year of functioning of the Łukasiewicz and POLTRIN networks in Poland, the following benefits of their activities may be noticed: easier and faster access to the staff of specialists, more effective use of research potential and experience of the affiliated institutes, possibility of participation in interdisciplinary projects, innovative and adequate approach to the market demand for R&D services. When setting directions for future activities, research institutes should place even greater emphasis on active cooperation with enterprises, universities and institutes of the Polish Academy of Sciences in order to jointly implement national and international research projects.

Research institutes can be treated as "hybrid" organizations. They are located at the interface between science and economy. They operate on the borderline of science with close relations to industry. They represent a kind of dichotomy between science and applied research while bridging the gap between universities and entrepreneurs. Institutes are forced to develop an appropriate model of functioning in order to fit into the expectations of the economy and science. They are research organizations that are much less subject to scientific analysis than their counterparts, such as universities. Research institutes should be perceived in two dimensions — they occupy the position of an intermediary between science and economy, operating under the pressure of global challenges.<sup>30</sup>

It should be mentioned that the literature on the characteristics and evaluation of the functioning of research institutes in Poland is not very extensive. This article may be a starting point for further research related to the role and place of research institutes in the system of science in our country. The question remains open how to develop an optimal model of networking these institutions in Poland?

The presented activities of both networks indicate that the mission, objectives and tasks facing research institutes are the same. What needs to be solved is the model of their functioning (organizational form), supervision, management and financing within the structures of Polish science and economy.

## Endnotes

<sup>1</sup> See: Wicher-Baluta, A., "Znaczenie kapitału społecznego opartego na analizie sieciowej w metodach zatrudniania pracowników." (In Polish: "Importance of the social capital based on the network analysis in the methods of employing workers."), in: *Praca, społeczeństwo, gospodarka*, J. Osiński (ed.), Oficyna Wydawnicza SGH, Warszawa 2011, pp. 222–223.

<sup>2</sup> See: Wicher-Baluta A., "Polityka oparta na klastrach jako czynnik stymulujący innowacyjność gospodarki Unii Europejskiej", in: *Kwartalnik Kogelium Ekonomiczno-Społeczne*, Warszawa 2012, no. 4, pp. 253–268.

<sup>3</sup> Knop, L., and Olko, S. "Ewolucja form organizacyjnych sieci współpracy" (In Polish: "Evolution of the organizational forms of cooperation networks."), in: *Organizacja i Zarządzanie*, scientific quarterly, 2008/1, pp. 101–116.

<sup>4</sup> [https://ec.europa.eu/growth/industry/policy/innovation/scoreboards\\_en](https://ec.europa.eu/growth/industry/policy/innovation/scoreboards_en) (accessed March 25, 2020)

<sup>5</sup> The provisions of the Act shall not apply to research institutes of higher education and establishments of the Polish Academy of Sciences.

<sup>6</sup> Act of 30 April 2010 on Research Institutes, (Journal of Laws of 2010, No. 96, item 618).

<sup>7</sup> If it meets certain requirements laid down in the Act of 30 April 2010 on Research Institutes, (Journal of Laws of 2010, No.96 item 618).

<sup>8</sup> Barcikowska R., *Instytuty badawcze w polskiej polityce innowacyjnej w warunkach członkostwa w Unii Europejskiej* Instytut Politologii Uniwersytetu Kardynała Stefana Wyszyńskiego w Warszawie, (In Polish: *Research institutes in the Polish innovation politics in the conditions of EU membership*, PhD thesis, The Institute of Political Science, Cardinal Stefan Wyszyński University in Warsaw 2015).

<sup>9</sup> According to the amendment, the minister supervising state research institutes will appoint the institute's director from among candidates presented by a competition committee. The minister will also have the right not to appoint the director if, among others, none of the candidates guarantees the proper performance of the institute's tasks. Furthermore, the amendment provides that the supervising minister will appoint (upon the director's motion) and dismiss deputy directors of a state research institute. In the case of the scientific council of a state research institute, the amendment provides that it will consist of at least 50% of the institute's employees as defined in the institute's statutes and at least 50% of persons appointed by the supervising minister. At the same time, the amendment provides that the chairman of the scientific council of a state research institute will be elected only from among the members of the scientific council appointed by the supervising minister.

- <sup>10</sup> Act of 30 April 2010 on Research Institutes, (*Journal of Laws of 2010*, No. 96, item 618.).
- <sup>11</sup> <https://konstytucjadlanauki.gov.pl/> (accessed March 25, 2020).
- <sup>12</sup> <https://lukasiewicz.gov.pl/> (accessed March 25, 2020).
- <sup>13</sup> <https://www.gov.pl/web/nauka/lukasiewicz> (accessed July 27, 2020)
- <sup>14</sup> Polish Transport Research Institutes Network POLTRIN
- <sup>15</sup> <https://www.fraunhofer.de/en.html> (accessed April 2, 2020 r.)
- <sup>16</sup> Intarakumnerd P., Goto A. "Role of public research institutes in national innovation", *Research Policy* 47(2018), pp. 1309–1320.
- <sup>17</sup> <https://www.fraunhofer.de/en/media-center/publications/fraunhofer-annual-report.html> (accessed August 3, 2020).
- <sup>18</sup> <https://www.instituts-carnot.eu/en/mot-cl%C3%A9s/carnot-network> (accessed April 15, 2020).
- <sup>19</sup> The Carnot label is awarded by the MNiB through a call for competitive proposals announced by the ANR there. The selection procedure consists of an evaluation by a special Commission, after a positive evaluation, the institute in question receives the so-called CARNOT accreditation for five years.
- <sup>20</sup> Barcikowska R, Sieciowanie instytutów badawczych narzędziem rozwoju polityki innowacyjności w wybranych krajach europejskich, *Marketing Instytucji Naukowych i Badawczych*, 2018. (In Polish: Networking of the research institutes as a development tool of the innovation politics in the selected European countries, *Marketing of Scientific and Research Organizations*, 2018).
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- <sup>22</sup> See: Praca zbiorowa pod redakcją Bromski K., *Współpraca nauki i biznesu, Doświadczenia i dobre praktyki wybranych projektów w ramach Programu Operacyjnego Innowacyjna Gospodarka na lata 2007–2013*, Polska Agencja Przedsiębiorczości, Warsaw 2013 (In Polish: Collective work edited by K. Bromski, *Cooperation of science and business: Experiences and good practices of the selected projects in the framework of the Operational Program "Innovative Economy for 2007–2013"*, Polish Agency for Entrepreneurship Development).
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- <sup>28</sup> POLTRIN activity report for 2019, submitted to the Ministry of Infrastructure.
- <sup>29</sup> <https://www.gov.pl/web/infrastruktura/powolanie-polskiej-sieci-instytutow-badawczych-transportu-poltrin> (accessed March 20, 2020).
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