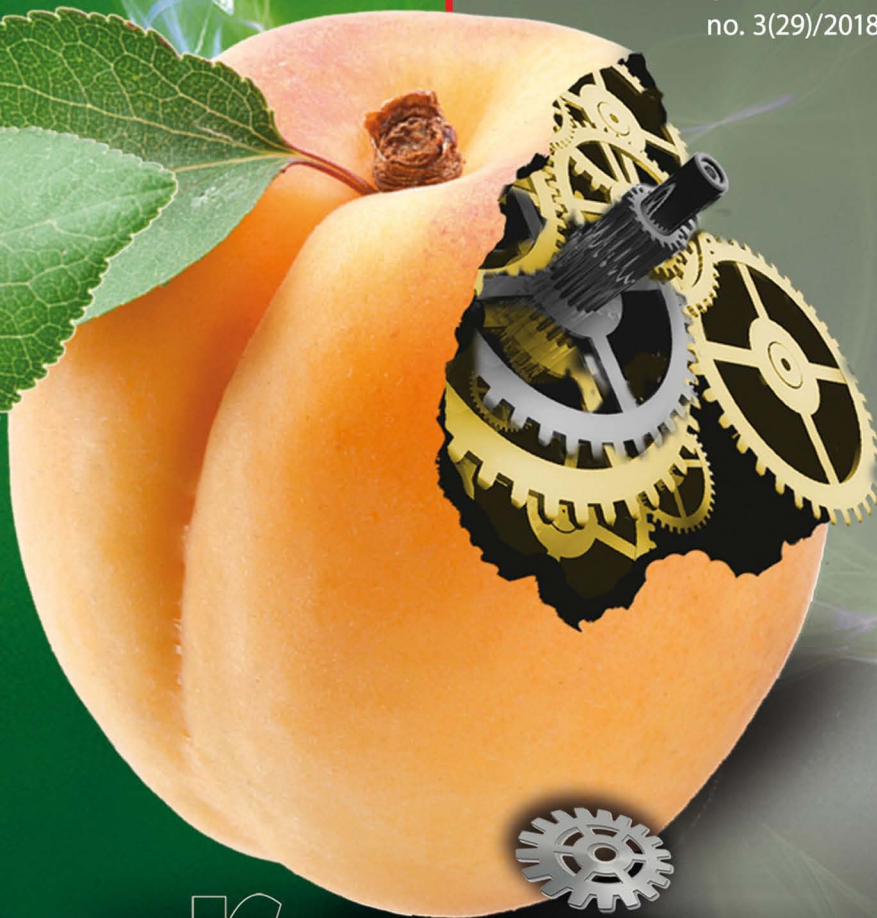


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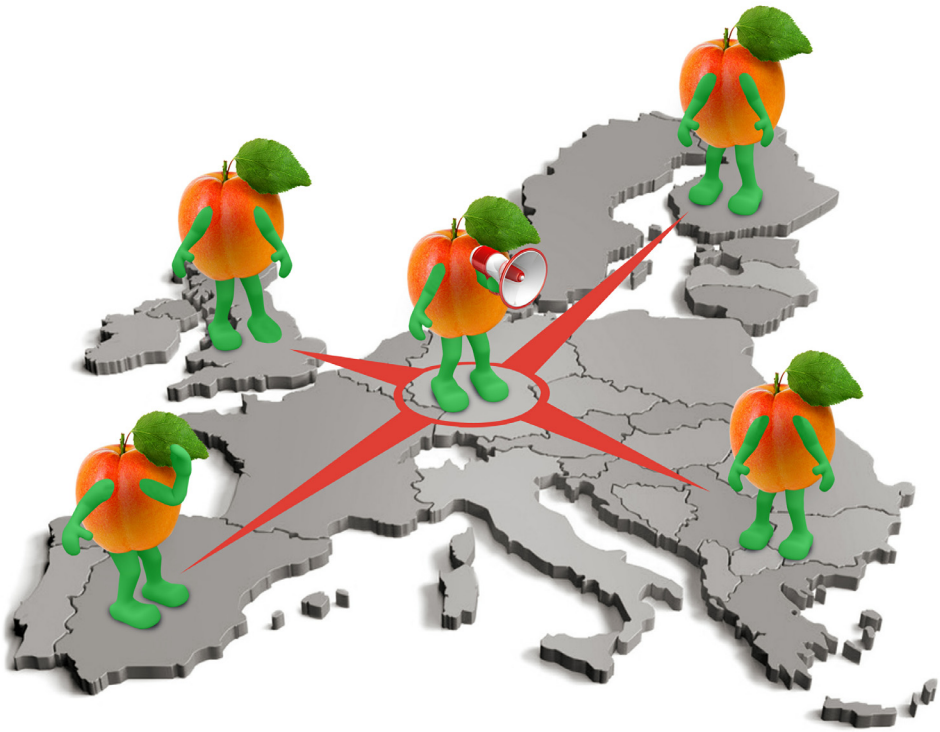


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NETWORKING OF RESEARCH INSTITUTES IN SOME EUROPEAN COUNTRIES

NETWORKING OF RESEARCH INSTITUTES IN SOME EUROPEAN COUNTRIES

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Summary

Analysing the functioning of research-development units in some European countries, it is necessary to take into consideration legal-organizational conditions for their operation within the structures of science in a given country. In the recent years networking of research institutes has become an international trend and in Poland it has become a solution promoted by government administration. The article is an attempt to take a closer look at the activity of similar research organizations in Germany and France. The goal of this article is to present to the reader organizational solutions concerning research institutes in France and Germany. The research methods applied in this article are: analysis of source materials, comparative analysis and two case studies: Carnot network and Fraunhofer network.

Keywords: research networks, science, research institutes, innovativeness, development policy

Introduction

In most countries of the European Union research institutions are public organizations and their functioning is ingrained in the binding structures of a particular national system of financing science. In the chosen countries of Western Europe they are gathered in thematic groups, which form a network of specialized units. Solutions of this kind will be presented based on the example of research institutes functioning in these two chosen European countries - Germany and France. The choice of networking solutions for research institutes in the two given countries was made following the proposal of government administration in Poland concerning the possibility of following the German and French models in the process of forming Narodowy Instytut Technologiczny (National Institute of Technology) and later Łukasiewicz Research Network.¹ The intention of this article is to illustrate the functioning of research institutes based on the German and French models, with particular consideration of the influence of solutions of this kind on the development of innovative economy, the results achieved by institutes gathered in networks, in cooperation with the economy and in international projects. The research methods applied in this work are: analysis of source materials (Internet websites presenting institutes in Germany and France, scientific literature about research institutes in Europe, magazines published by Polish Agency for Enterprise Development, Main Council of Research Institutes, two case studies and the comparative method of Carnot and Fraunhofer institutes.

Research-development system in Germany

In Germany there is a vast and diversified landscape of scientific specializations and innovations. Research works are conducted by many different public and private institutions. The federal composition of Germany gives both the federation and the lands opportunities for financing German scientific research without the need to pass separate acts on support for research. For example, public institutions are financed not just with public funds, but also with other resources, including resources from the economy. At the same time, private scientific-research works are also

partially financed with public funds. Moreover, in the scientific-research landscape of Germany also Framework Programmes of Scientific Research of the European Commission play an important role. The federation and lands cooperate with each other on providing support for institutions and scientific-research programmes of supraregional significance. This is associated with their joint responsibility for research, which in many cases requires coordinated activities and taking into consideration the nationwide interest. An important entity in the German scientific-research landscape are companies. They allocate to research up to two thirds of funds invested each year, both to own research and to joint projects carried out together with partners from the world of science. Scientific research conducted in this sector is naturally characterized by strong focus on the possibility of using the effects of research in practice and obtaining tangible results. Primary research in Germany is conducted at universities and financed in almost 100% with public grants. Development and industrial research to the stage of prototype is to a large extent financed by private companies.

The counterpart of Polish research institutes are institutes gathered in Fraunhofer Society. Fraunhofer Society is the biggest non-profit organization in Europe dealing with applied research and the implementation of research results in the industry. The organization was established on March 26, 1949 and it groups 72 German scientific-research institutes (Fraunhofer-Institute) representing over 80 research branches. At the end of December 2015 the Society had 24, 500 scientific employees. The annual budget in 2016 reached EUR2.1 billion.²

Over 70% of revenues from research under the contract of Fraunhofer-Gesellschaft come from contracts with the industry and projects financed with public funds. Research works of Fraunhofer-Gesellschaft are focused on particular applications and results. The German association disseminates and conducts applied research projects in an international context. The results of such projects are useful for private and public companies and bring benefits to the whole society. Through the development of technological innovations and new systemic solutions for their clients, Fraunhofer Institutes help to strengthen the competitiveness of the economy in the region, in whole Germany and Europe. The scientific activity of the association arises from the statutory duties of institutions. Fraunhofer-Gesellschaft receives funds both from the public sector (about

30%), from the German federal government and the governments of regions and from revenues generated by ordered research projects (about 70%). The main clients are: industry, service sector and public administration. Institutes function in 8 thematic groups (table 1.).

Table 1. Thematic groups in Fraunhofer network

No.	Name of group	Number of institutes
1.	Materials and components	15
2.	Microelectronics	18
3.	ICT	17
4.	Production	7
5.	Life sciences	7
6.	Light and surface	6
7.	Defense and security	7
8.	Innovative research	5

Source: <https://www.fraunhofer.de/en.html>, (26.03.2018 r.)

Research institutes are located on the territory of the whole country. The functioning of particular units in the association involves the decentralisation of management and autonomy of units. Institutes gathered in the organization cooperate closely with the industry and universities. The organizational structure enables direct transfer of technologies. For institutes within the association it is important to carry out contractual research projects for companies and the public sphere. Also, providing consulting, opinions, exchange of knowledge and mobility of the personnel are important things for them.³ The organizational structure of the network consists of 72 institutes and:

- The senate of Fraunhofer-Gesellschaft, which consists of renowned people from the world of science, business, industry, public life, as well as representatives of the national and regional governments and members of the Technical-Scientific Council. The Senate has 30 members. Sessions of the Senate take place twice a year. The senate is responsible for decisions concerning the basic scientific and research policy. It also formulates decisions concerning the establishment, incorporation, or transfer, merging and dissolution of research units

which belong to Fraunhofer Gesellschaft. The Senate is also responsible for appointing members of the Management.

- General meeting consists of the members of Fraunhofer-Gesellschaft. Official membership is open to members of the Senate, Management, institute directors, senior management and managing councils. Ordinary membership is open to natural persons and legal persons who want to support the work of Fraunhofer-Gesellschaft. Honorary members can be chosen from the group of scientific employees and patrons of Fraunhofer-Gesellschaft recognized for their outstanding contribution to the work of the organization. General Meeting is held once a year. It chooses members of the Senate and assigns duties to the Management. It also formulates decisions concerning statutory changes.
- Scientific-Technical Council is an internal advisory body of the organization. It consists of directors and senior management of institutes, as well as a chosen representative of scientific and technical personnel of every institute. The Scientific-Technical Council advises the Management and other bodies on basic issues. It produces recommendations concerning research and personnel policy. Moreover, Scientific-Technical Council issues declarations on opinions concerning the creation of new institutes, or liquidation of existing institutes and participates in the nomination of institute directors. Official duties of the Scientific and Technical Council are performed by a standing committee consisting of nine members.
- Managing Councils are external advisory bodies associated with institutes and consist of the representatives of science, industry, business and public life. In case of each institute about twelve members are appointed to the management by the management by consent of the director (directors) of the institute. Annual meeting is attended by at least one member of the Management.

Fraunhofer Society participates in research programmes financed with public funds. Some examples of projects carried out in cooperation with the public sector are: "Information Technology" and "Work and Technology" of the German Federal Ministry of Education and Scientific Research (BMBF) within the framework of European Union programmes and programmes financed by lands. Research projects are conducted in direct cooperation with small and medium companies, as well as with industrial corporations.

Among the tasks of the institute there is support for companies in the process of identification of technologies which are crucial for their activity, participation in planning of implementation of technologies for a whole company, as well as in individual projects. The network cooperates with other research institutions. The offer of the network is addressed to the following target groups:

- companies which want to restructure their position on the market through new approach to their competitive environment, or to their internal processes and resources;
- companies which want to optimize their information logistics through the implementation of information and communication system within the company and between companies;
- companies participating in the creation and distribution of innovative products which want to durably boost their capacity in the area of development of technologies and innovations;
- brokering organizations such as commercial and industrial chambers, branch associations, social partners and institutions from the public sector which want to participate in the creation of innovative ideas concerning norms and regulations, or want to participate in trainings and continued education.⁴

The network offers many research services, pre-competition research, ordered research, trainings, seminars and workshops, especially adapted consulting services for companies and institutions from the public sector. The Society also has publications in its offer. Branch projects and ordered research projects are the first kind of services offered by the network, which carries out many projects on direct order from branch clients.

Fraunhofer Society also takes part in primary research projects conducted by the German Research Foundation (DFG). Moreover, the association is involved in a series of programmes including market-based strategic business research projects.

Fraunhofer-Gesellschaft is one of the biggest global research organizations. An organization of this size requires decentralized organizational structure which makes it possible to develop efficient strategic orientation based on centralized control mechanisms.

Research-development system in France

In France the issues of science are handled by the General Directorate for Research and Innovation (DGRI), which proposes the directions of development of scientific policy and manages the resources necessary for this purpose. Together with the Directorate for Financial Matters it prepares the budget for higher education and research and in contact with the General Directorate for Higher Education — it prepares the allocation of funds for research to academic units. One of its important duties is preparation and implementation of a national research strategy through supervision over such thematic programmes as e.g. directions of research, multidisciplinary scientific and technological research, space research, research from the area of environment and resources management. Apart from strategic programmes, the Directorate is responsible also for operational missions which are aimed at the development of information programmes and recruitment systems in the sector of science. It also defines assumptions concerning research facilities and activities within the framework of European programmes.⁵

CARNOT is a national, multidisciplinary network grouping 29 French research-development institutes and laboratories, as well as 9 associated research units. It was established in 2006. Units grouped in the network constitute about 15% of the state's research-laboratory basis and have a total of 26000 scientists. The French Ministry of Science and Research manages and supervises the Carnot network system. The French National Research Agency (L'Agence Nationale de la Recherche — ANR) is responsible for financing, structure and administration. This is a public administration unit established in 2007. It operates as an agency financing research and its goal is to raise the number of research projects in all areas of science. The duty of ANR is stimulating the development of primary and applied research, as well as innovativeness, supporting partnership between the public and the private sector, working towards efficient transfer of technology to the economic sector. Projects are chosen in course of contests on the basis of the criteria of scientific quality and the possibility of potential application in the company sector.

Each research institute from the network has its legal personality, specialization and competences in particular areas of research. The Carnot brand is awarded by the minister of higher education and research to units which

efficiently cooperate with representatives of the sector of companies and local communities.⁶ The brand is supposed to promote partnership in the research sector and the development of its cooperation with the sector of small and medium companies. An individual entity joins the network in course of an announced contest. Following a positive assessment it obliges itself to comply with conditions and obligations contained in the list of rights and duties of the network. The Supervisory Board includes 15 representatives chosen from Carnot institutes.

Operation of the network is financed with fees paid by particular Carnot Institutes and subsidies from government administration, from particular ministries, local authorities and partners engaged in promoting research and innovations. Public co-funding is allocated mainly to particular goals e.g. conferences, informational meetings, promotions etc⁷. The network is divided into 7 subject groups (table 2).

Table 2. Thematic groups in Carnot network

No.	Name of the group
1	information and telecommunication technologies
2	mechanics, materials science
3	energy and transport
4	humanities and social sciences
5	building, civil engineering
6	landscaping and landscape design
7	environment, natural resources, health and technologies for health, nutrition ⁸

Source : <http://www.instituts-carnot.eu/en> (30.04.2018 r.)

CARNOT network consists of certified and accredited laboratories, specialized experts whose goal is the development of economy based on knowledge by means of modern technologies and innovations. The network was designed to develop research based on partnership, conducted by state-owned laboratories in cooperation with social-commercial entities, mainly from the sector of small and medium companies.

The scope of activity covers conducting primary and applied research, as well as research-development support for the industry through the adaptation of the research offer to the current market requirements. The services and ventures of CARNOT are used by: corporations, big

companies, SME's, start-ups, public sector (local administration, government agencies). In France almost 50% of financial resources for R&D activity comes from the state budget. The state supports research-development units in the purchase of modern equipment, which in the future can be used in joint ventures with entrepreneurs. Financing research is based also on orders from the industry: this is EUR400m in research contracts financed directly by the industry (including EUR125m - 30% from SME)⁹. Thanks to the combination of public R&D activity and industry and "good" cooperation it is possible to achieve the best results in national and European projects: multi-year national research programmes, EU framework programmes¹⁰, international projects. Every year over 7500 R&D contracts between institutes and industry are signed. The network cooperates with its European and world counterparts (Fraunhofer¹¹, TNO, VTT, MIT,). The network keeps adding new units.

Conclusions

Examples of achievements in research and financial results of both networking organizations show that establishing networks of research units cooperating with each other constitutes one of factors raising the innovativeness of a country. Thanks to these solutions the flow of knowledge and the transfer of technology can be more intensive, entrepreneurs and universities get faster access to knowledge and research results, as well as to research infrastructure (thanks to uniformed procedures), shortened time of implementation of new technologies, broader didactic offer. A network can offer more attractive work conditions for outstanding specialists. Thanks to interdisciplinary scientific teams it is possible to achieve higher quality of research. Uniform and at the same time flexible and autonomous structure of management (the fact that Carnot institutes retain individual legal personality) facilitates cooperation between science and business.

As has already been mentioned, the network of Carnot institutes established by government structures in 2006 was created to improve the efficiency and the influence of the best public research institutes in France on the economy. Only the best institutes focused on cooperation with the

industry and implementations can join the network through contests. The institutes gathered in the network have to comply with the common Charter of Ethics and Standards of Conduct, including the issues of intellectual property rights management. Membership in the Network in practice is associated only with the right to use the Carnot Label arising from confirmed high quality of research and following rules common for all institutes. There is no integrated system of coordination, or supervision over the Network. To improve cooperation, strengthen synergy within the network, building a common image and integrated communication members of the network established Carnot Association (AiCarnot). Currently, Carnot Network institutes have a total of about 27,000 scientists and a total budget of EUR2.2bn.¹²

At the same time, Fraunhofer Society doesn't have its own legal personality, but has a broad autonomy and delegated responsibility for carrying out tasks from the area of applied research. Currently, the society has about 23,000 scientific employees and an annual budget of about EUR2bn. The structure of revenues points to efficiency in commercialization of R&D results and in acquisition of public funds in contests, as they generate a total of about 70% of revenues. The remaining 30% comes from the federal budget and from the budgets of regional governments and in character resembles financing basic activity (an equivalent of Polish statutory subsidy). The Society carries out tasks ordered by both industrial partners and public administration of different levels. Fraunhofer institutes cooperate closely with universities due to, among others, the fact that in Germany it is only universities that have the right to award scientific degrees and titles. An interesting requirement is that institute directors have to be nominated university professors, which in a way makes it possible to institutionalize cooperation between both segments of the system of innovation in science.

In the described cases a part of funds for financing research institutes comes from the public sector and a part comes from the private sector. In analysed countries the research infrastructure for state-owned units is mostly financed with funds from the state budget and these funds constitute public aid from the state.

It is necessary to emphasize that in the mentioned two countries the share of public spending on research-development activity was originally

(in the period of development of Economy Based on Knowledge) higher than the share of funds from private sources, but the proportion has been changing gradually. The private sector has been encouraged to raise spending on research activity. That's why it is so important for the state to support investments in modern, innovative research infrastructure allowing the development of industry. The assumptions behind the creation of institute networks follow the trends dominant in Europe. Institutes gathered in networks have a greater chance to succeed in international research projects. Also, uniformed rules of conduct in the most important areas, especially in the area of commercialization of the results of R&D works with the guarantee that units can participate in the effects of the implementation of the results of conducted works generate tangible benefits. Institutes grouped in thematic groups are more competitive on the market. The combined potential of research institutes gives the capacity to carry out big R&D projects supporting the economic development of a particular country. It also facilitates international cooperation. The functioning of networking organizations in Europe and in this case in France and Germany, shows the efficiency of this kind of solutions which lead to the growth of innovative solutions in the economy.

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- ⁶ The Carnot Label is awarded by the Ministry of Science and Research in course of an invitation to submit applications in contests announced by ANR. The procedure of selection involves the assessment by a special Commission. Following positive assessment a particular Institute gets the so-called Carnot accreditation for five years.
- ⁷ In 2015 the annual budget of the network was EUR 1.3 m.
- ⁸ Every thematic group is additionally divided into a few more specialized research fields.
- ⁹ Data for 2015.
- ¹⁰ In 2014 the revenues of Carnot network from international research reached EUR 200 m
- ¹¹ For example: Carnot institutes and the German Fraunhofer institutes signed in 2008 a joint 3-year programme concerning the financing of French-German cooperation on the implementation of innovative projects in the area of energy, environment protection, health, information technologies and transport.
- ¹² Data from 2017 r, <http://www.instituts-carnot.eu/en> (30.04.2018 r.).

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