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Cooperation for Innovation and Its Influence on Enterprises' Innovativeness Level¹

ABSTRACT

Innovation is one of the key sources in obtaining competitive advantage by enterprises. The ability to innovate is generally accepted as a critical success factor for competitiveness and firms' performance. The paper discusses cooperation for innovation and its influence on enterprises' innovativeness level. The main aim of the article is to determine the relationship between cooperation for innovation and innovativeness of the surveyed companies, which is investigated empirically. The paper discusses the channels and level of cooperation taking place in enterprises corresponding to its sources, specific character and determining the significance of the impact of cooperation for innovation on the actual level of innovativeness. The specific objectives of the article relate to examining what kind of cooperation for innovation occurs in enterprises and whether there is a relationship between the cooperation and innovativeness level of the enterprise. The study is based on a survey of firms ($n = 100$) located in Poland. The article first establishes the research framework, then deduces the research hypothesis and finally describes the analysis tools, the sample structure and statistical methods. The analysis has been done with the SPSS software. The statistical method used in the survey is multiple step regression. The study has determined the positive relationship between cooperation and innovativeness of the surveyed enterprises. The relation between cooperation and innovativeness is positive concerning the channels of vertical cooperation, especially in the area of cooperation with suppliers of equipment, materials, components or software. These findings suggest that the measurement of cooperation for innovation and its channels should be

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developed further in order to make it a more relevant concept for empirical studies of enterprises' innovativeness and competitiveness.

Keywords: cooperation for innovation, innovativeness, vertical cooperation, horizontal cooperation
JEL Classification Codes: O30, C50

Introduction

Global competition, fast and dynamic technological changes, growing importance of technology transfer, shorter life cycles of products and dynamic changes in processes have changed the current environment of enterprises. Firms have to gain a sustainable competitive advantage, and the only way is to invariably upgrade processes and activities through innovation [Drew, 1997, pp. 427–441]. Innovation is the key to maintaining the competitiveness and market position of enterprises [Zhuo, Min, 2016, p. 14].

Moreover, the evolution of innovation models over the years has shown its development and adaptation to changing market conditions. Enterprises are forced to seek for continuous access to new knowledge, information and technologies, which give them the opportunity to achieve an advantageous position both on the local and international market. Modern enterprises, to create innovation, are obliged to use opportunities offered by the different innovation sources. What makes it possible is the openness to the environment of customers, suppliers, companies, research institutes or universities within the organization. Openness has a positive impact on firms' performance [Jong, Marsili, 2006, pp. 213–229]. It has also been pointed out that firms need to open themselves up to external networks and relationships [Laursen, Salter, 2006, pp. 131–150].

In the modern economy, cooperation as part of the innovation process is becoming more and more important. Through cooperation enterprises have a chance to develop innovative solutions, reduce costs and share risk with co-operators. Regardless of the firm's size class, enterprises can receive benefits which are difficult or even impossible to achieve without cooperation. Thus, cooperation for innovation becomes an important factor in the innovation process, enabling enterprises to achieve a competitive advantage as well as to increase the overall level of their innovativeness.

The research problem of the survey is a low innovativeness level and weak competitive position of Polish enterprises, as well as an insufficient usage of cooperation for innovation channels in Polish enterprises. The main aim of the article is to determine the relationship between cooperation for innovation and innovativeness of the surveyed firms, which is investigated empirically. The paper discusses the channels and level of cooperation taking place in Polish enterprises corresponding to its sources, character and determining the significance of the impact of cooperation for innovation on the actual level of innovativeness.

The specific objectives of the article relate to examining what channels of cooperation for innovation activity appear in firms and whether there is a relationship between cooperation and innovativeness of the companies. Detailed issues regarding cooperation for innovation were determined based on a study conducted on a sample of 100 Polish enterprises. The data was collected during individual interviews conducted with the highest level of management and owners of the surveyed enterprises. As part of the study, the cooperation taking place in Polish companies was determined and its specific channels and their significance for innovativeness and competitiveness. As part of the article, recommendations for enterprises in the scope of increasing the level of innovativeness through cooperation for innovations were formulated.

1. Theoretical background

Enterprises look for competitive advantages in various areas of activity, in marketing, production, research and development or business management. It is important to manage efficiently the implementation processes of new solutions in the products or processes. Innovation is one of the key sources of gaining a competitive advantage. Enterprises, in order to be able to compete, must introduce new technologies, products, services or organizational systems, which are a condition for their innovativeness performance.

Innovation can be achieved in many ways, within many sources and their combinations. Innovation can be built on the basis of the internal research and development (R&D) activity and domestic potential of a firm, but also it can be generated by using the ready-made or created in cooperation solutions, available in the external environment. Thus, external sources and collaboration allow enterprises to gain improved knowledge, give an ability to access new markets and have a positive effect on reducing costs of R&D activity [Glaister, Buckley, 1996, pp. 301–332]. Conducting internal R&D requires appropriate resources, which are often beyond the reach of most enterprises. Internal limitations of firms, especially smaller ones, in the form of insufficient financial resources, make cooperation in the field of innovation an important element of business operations. Acquisition of knowledge from the outside is becoming more important and research indicates significant connections in the scope of corporate involvement in cooperation agreements and access to new knowledge and technologies [Gallego, Rubalcaba, Suárez, 2013, pp. 2034–2041]. Acquiring technology within the framework of extensive internal R&D activity as well as the use of knowledge from internal sources of innovation are most often beyond the reach of Polish companies. Thus, cooperation for innovation based on jointly developed, proven, ready-made solutions becomes the main opportunity to increase competitiveness and innovativeness by Polish enterprises.

There are many reasons for firms to cooperate with external organizations, one of them is joint innovation activity. The cooperation of enterprises takes place through its various channels, within which information and knowledge are available for free or can be acquired

[Hewitt-Dundas, 2013, pp. 93–115]. Cooperation on the industry-science line has a positive effect on the innovative development of enterprises and forms of cooperation can take many channels [Veugelers, Cassiman, 2005, p. 357]. Cooperation within the framework of strategic alliances – bilateral agreements between companies – is becoming increasingly important for the innovative activity of enterprises [Teece, 1992, p. 1].

Firms' cooperation enables them to access R&D results and to participate in complex innovative processes. Cooperation with other companies or research institutes gives the opportunity to access new technological knowledge and increase the technological potential of cooperating entities, which may contribute to faster development of innovations, improvement of market access, economies of scale and reduction in operating costs of an enterprise [De Faria, Lima, Santos, 2010, p. 1083]. A firm can improve its innovation either by its internal R&D efforts or by forming external collaborative R&D. Within the classification of place, it can be national and international collaboration [Huang, Yu, 2011, pp. 383–403].

Firms initiate and develop contacts with other companies in order to achieve a market benefit and to take advantage of new opportunities that would not be possible to achieve without cooperation support. Companies engage both formally and informally in joint activities, such as cooperation in marketing, resources or shopping [Bönte, Keilbach, 2005, pp. 2–6]. Cooperation may appear both from research institutes through a vertical transfer, as well as from other companies – horizontal transfer [Mansfield, 1975, p. 372].

To become more innovative, firms need exposure to technology and innovations from external sources through cooperation for innovation. Cooperation based on dialogue, access, risk reduction, and transparency of information between customers and the company positively influences innovation [Prahalad, Ramaswamy, 2000, pp. 79–90]. In line with this, the following hypothesis was put forward:

Hypothesis: Horizontal and vertical cooperation, establishing the spin off/out firms and joint-venture agreement – channels of cooperation for innovation – all relate positively to innovativeness of enterprises.

2. Method of the research

Analysis and evaluation of enterprise innovativeness is complicated and raises a lot of doubts. Based on the literature in the field of innovation and cooperation, it can be concluded that the sources of innovation in enterprises are widely reported [Utterback, Abernathy, 1975, pp. 639–656]. However, there is a detailed approach to the subject of cooperation for innovation and its place in the innovation process and the relative configuration of cooperation for innovation and innovativeness. For this purpose, a research model defining the relationship between cooperation for innovation and innovativeness of enterprises has been developed. The study examines the relationship between cooperation for innovation and innovativeness of enterprises.

The measure of innovativeness – a dependent variable – includes standardized values of individual dimensions of innovation implementation in the companies:

- new or significantly improved products;
- new or significantly improved process;
- new marketing solutions;
- new organization methods.

Cooperation for innovation – an independent variable – was defined due to the divisions of its channels:

- technology received as part of cooperation with private enterprises – horizontal cooperation for innovation;
- technology received as part of cooperation with R&D institutes – vertical cooperation for innovation;
- technology received as part of establishing the spin off/out firm;
- technology received under a joint-venture agreement.

In the survey a variant of partial study was adopted. This means that the study covered only part of the population. The research sample of enterprises was drawn randomly (probabilistically) from the population of Polish manufacturing enterprises. If the company which was randomly selected as part of the study did not express its willingness to participate in the survey or no longer existed in the market, the selection was repeated, so that the research sample would always be 100 companies.

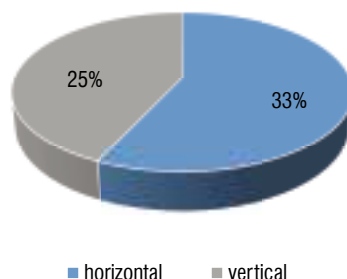
The survey used a multi-stepwise regression modelling and was tested through the hypothesis using data collected from 100 randomly selected respondents. The questionnaire contained 20 questions concerning detailed aspects of innovativeness and cooperation for innovation and was dedicated for the highest management level in the organizations.

3. Data analysis and results

In the survey it was important to determine the channels of cooperation for innovation in enterprises, as well as define specific nature and sources of cooperation. Almost 25% of the enterprises declared cooperation with scientific institutions – vertical cooperation, and 33% with enterprises – horizontal cooperation, during the period of the last three years (chart 1).

The frequency of cooperation in the surveyed population depended on the number of entities with which the enterprise was cooperating under horizontal and vertical cooperation for innovation. Most of the firms declared vertical cooperation only with one organization that it had been cooperating with during the last three years. The share of enterprises that cooperated with two partners was 7%, with three partners – 4%, with four and five partners – 3%. The cooperation with six entities was declared in the last three years only by 1% of the surveyed firms.

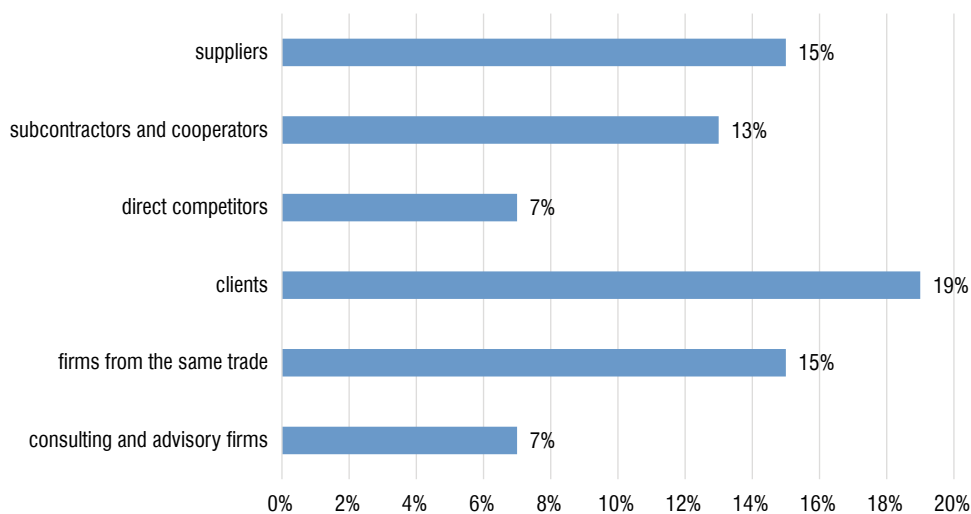
Chart 1. Percentage of enterprises (%) as part of vertical and horizontal cooperation for innovation



Source: the author's own calculations based on the survey among 100 enterprises from Poland.

In horizontal cooperation for innovation, the largest share were the enterprises cooperating with clients – 19%, then cooperating with enterprises from the same non-competition area and suppliers – 15%. About 13% of the enterprises cooperated for innovations with subcontractors and cooperators and 7% with consulting and advisory companies as well as with direct competitors (chart 2).

Chart 2. Horizontal cooperation for innovation: partners of cooperation (%)



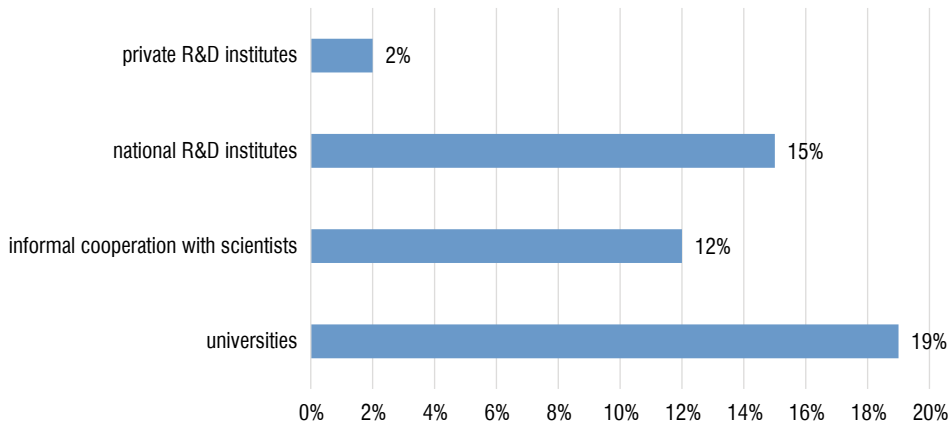
Source: the author's own calculations based on the survey among 100 enterprises from Poland.

Vertical cooperation was based mainly on the cooperation with universities – 19% of the surveyed enterprises declared cooperation with universities during the last three years. The second, most important type of cooperation, was cooperation with national R&D institutes. Almost every tenth surveyed enterprise cooperated with scientists but as a part of informal cooperation and only 2% of the firms cooperated for innovation with private R&D institutes.

The nature of cooperation for innovation due to its scope was mostly part of the national dimension. The majority of cooperating enterprises cooperated with firms and R&D institutes

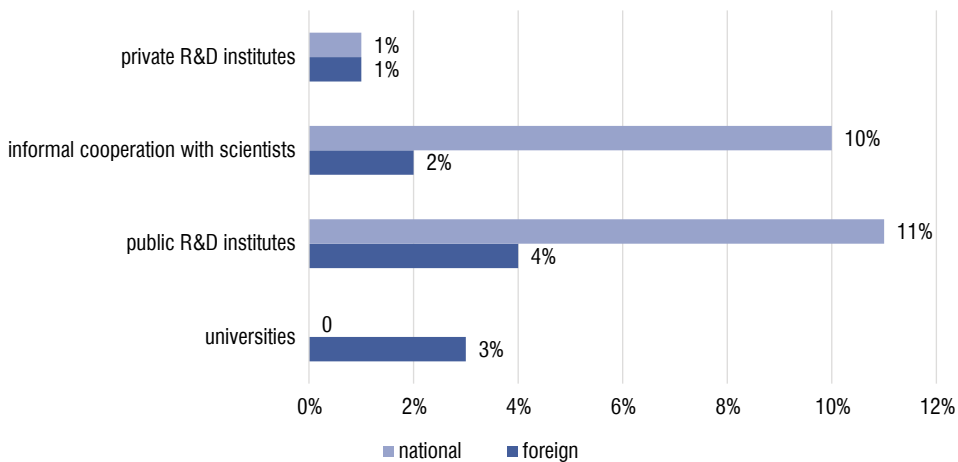
from Poland. Only 3% of the surveyed firms cooperated for innovation with a foreign university, and 4% with a foreign R&D institute (chart 4). In the case of informal contacts with scientists, 2% of the companies declared that they cooperated with foreign scientists (from Germany and the USA).

Chart 3. Vertical cooperation for innovation: partners of cooperation (%)



Source: the author's own calculations based on the survey among 100 enterprises from Poland.

Chart 4. National and foreign partners of cooperation for innovation



Source: the author's own calculations based on the survey among 100 enterprises from Poland.

In the surveyed population 3% of the enterprises received technology through a joint-venture agreement and none of the companies got the access to technology as part of the spin off/out company.

The next step of the survey was to verify the influence of all channels of cooperation for innovation on innovativeness of the surveyed enterprises. Hypothesis testing was performed by the complicated nature of multiple regression supported by the SPSS software. A further

object under the survey was the verification of the defined hypothesis and determination whether cooperation for innovation effects innovativeness of the firm.

In defining the relationship between innovativeness and cooperation for innovation, it was important to determine whether within the model of the impact of cooperation for innovation and innovativeness there is a statistically significant relationship and which of the detailed variable dimension of cooperation for innovation is important in terms of innovativeness of the surveyed enterprises.

Table 1 presents the coefficient of regression equations between the size of the innovativeness index and statistically significant explanatory variables (significance level $p < 0.05$) and the coefficient of determination (R^2) in the group of the surveyed enterprises.

The verified model is statistically significant (table 1) and is characterized by a strong statistical dependence between the variables of innovativeness and horizontal cooperation for innovation ($p = 0.00$).

Statistically significant explanatory variables ($p < 0.05$) determine the innovativeness of enterprises. The remaining variables included in the explanatory variable – cooperation for innovations – are not statistically significant and as part of the verification they did not enter the statistical model, therefore, they do not determine the innovativeness of the surveyed enterprises.

The examination of the model in terms of the R^2 indicated its correctness, although for the estimated model R^2 is very low (0.24), so it explains 24% of the variability of the explained variable – innovativeness of firms. This means that 24% volatility of the surveyed firms' innovativeness can be explained by the level of the explanatory variable – cooperation for innovation – horizontal cooperation for innovation.

Table 1. Regression coefficient of a dependent variable – innovativeness, and a statistically significant independent variable – cooperation for innovation

Variable	b	Standard error b	t	p
Free term	6.67	0.61	10.99	0.00
Horizontal cooperation for innovation	1.55	0.39	3.96	0.00

$R^2 = 0.24$; $F(1.97) = 15.70$

Source: the author's own calculations based on the survey among 100 enterprises from Poland.

In the case of cooperation for innovation, only horizontal cooperation – cooperation with other enterprises – was statistically significant.

Summary

The article discusses cooperation for innovation in Polish enterprises and defines its channel and their significance in the innovative activity of enterprises.

The results of the survey pointed out an insufficient level of enterprises' involvement in cooperation for innovation, which directly translates into a low level of company innovativeness and thus entails difficulties in obtaining a competitive advantage by firms. The surveyed enterprises differ significantly in terms of innovativeness and cooperation for innovation activity.

In the case of cooperation channels, the cooperation is mainly in the horizontal dimension, mostly between companies, customers and suppliers. In the field of vertical cooperation, it can be stated that it has little importance and rather an insignificant character in the case of enterprises' activity. In general, every fourth company declared cooperation with a scientific institute, and cooperation with other enterprises was made by every third.

The frequency of cooperation for innovation is not impressive, as most companies in the last three years cooperated only with one institution. As part of horizontal cooperation, enterprises mostly cooperate with clients, then companies from the same industry and suppliers. The nature of cooperation for innovation due to its scope for the most part is in the national dimension. This may suggest the early phase of development for cooperation and its non-technological advancement.

Polish enterprises do not sufficiently engage in cooperation with both enterprises and scientific institutions. As the survey showed, not all of declared by the firms channels of cooperation for innovation influence positively innovativeness performance in enterprises. The statistical analysis indicated a positive impact on innovativeness, in the case of those companies that pledged to achieve new technology through horizontal cooperation for innovation. The detailed analysis of statistical models indicated that in terms of cooperation for innovation the most important was horizontal cooperation with suppliers of equipment, materials, components or software. According to that, the research hypothesis was verified negatively. Only one out of four surveyed channels of cooperation – horizontal cooperation for innovation – positively influences innovativeness of firms.

On this basis, an attempt was made to formulate recommendations concerning cooperation for innovation and the effective use of cooperation increasing the level of innovativeness and competitiveness of Polish enterprises. The first recommendation is a need to increase activity in the area of horizontal cooperation for innovation with all partners, both national and foreign. Secondly, enterprises should open to foreign cooperation with partners and cooperators and put an emphasis on searching for opportunities for international cooperation. Cooperation for innovation should be performed in the field of R&D cooperation and joint R&D projects with other enterprises.

There is a need for future research. The most important points for future surveys are:

- cooperation aspects and its influence on detailed types of innovation, like innovation in products, processes or non-material innovation like marketing and organization innovation;
- channels of cooperation for innovation and their influence on the competitiveness of Polish enterprises.

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