

Małgorzata Stefania Lewandowska

Szkoła Główna Handlowa w Warszawie

Partners and barriers in innovation cooperation – a survey of Polish exporters

Firms in Central and Eastern Europe (including Poland), need to improve innovation performance and base their competitive strategies more on offering differentiation in order to be more competitive internationally. As theoretical concepts of firm international competitiveness underline the importance of external sources of competitive advantage, empirical studies on innovation cooperation and identification of major collaboration partners as well as importance of cooperation barriers may bring insight into this field. The study elaborates on the research question of whether the openness for cooperation has a positive influence on process, product, marketing and organizational innovation output as well as on the new products sales intensity and export intensity. The impact of different cooperation barriers is measured as well. The paper is based on the results of the study on innovation cooperation of 209 Polish exporters from manufacturing sectors. Descriptive statistics as well as ordered probit regression were applied to answer the research questions. The analysis shows, that horizontal, vertical as well as institutional cooperation is important for all types of innovations introduced by Polish exporters. Different partners clusters were found in the context of new products sales intensity and export intensity. Barriers for cooperation in the researched areas were also distinguished.

Partnerzy i bariery w innowacjach – wyniki badań polskich eksporterów

Przedsiębiorstwa krajów Europy Środkowo Wschodniej (w tym Polska), aby być konkurencyjne na rynkach międzynarodowych, muszą wzmocnić swój potencjał innowacyjny i przeorientować strategię konkurencyjności w stronę dyferencjacji produktowej. Międzynarodowa konkurencyjność przedsiębiorstw zależy w dużym stopniu od przewag wynikających ze współpracy z innymi podmiotami rynku. W tym kontekście identyfikacja partnerów współpracy w innowacjach, jak również znaczenie występujących w niej barier wydaje się uzasadnione. W prezentowanym artykule badany jest związek pomiędzy współpracą z różnymi partnerami w innowacjach procesowych, produktowych, marketingowych i organizacyjnych a intensywnością ich wprowadzania, jak również poziomem eksportu i udziałem sprzedaży innowacyjnych produktów w sprzedaży ogółem. Analiza przeprowadzona jest na próbie 209 polskich eksporterów. W badaniu wykorzystano analizę opisową i regresję logistyczną. Uzyskane wyniki pokazują, że zarówno współpraca wertykalna, jak i horyzontalna i instytucjonalna, mają wpływ na intensywność innowacyjną badanych przedsiębiorstw, intensywność eksportu i sprzedaży nowych produktów. Wykazany został też zróżnicowany wpływ barier kooperacji na poziom innowacyjności.

Keywords: innovation, cooperation, partners, barriers, Polish exporters

Introduction

Theoretical concepts as well as business practice underline the importance of both internal and external sources of firm international competitiveness. The resource-based theory of a firm emphasizes the role of intangible resources, the importance of intellectual capital for firms' competitiveness and economic performance [Prahalad, Hamel, 1990; Barney, 1991; Hamel, Heene, 1994; Collis, Montgomery, 1997]. The literature suggests that intangible resources comprise also relational resources i.e. firm's relationships with its stakeholders and firm's reputation [Lowendahl, 1997; de Wit, Meyer, 2005], resulting from relationship-specific assets, joint learning, combining complementary resources (which often leads to joint creation of new products and technology), and lower transaction costs due to reduced opportunistic behavior of partners [Dyer, Singh, 1998].

The analyses of firms' competitive strategies in Central-Eastern European countries show that the behavior of these firms is still based on the same foundations as in the earlier years of transition. They resemble many characteristics of cost/price competitive firms [Wziątek-Kubiak, 2010; Stojcic et al. 2011], and their abilities to increase competitive advantage based on offering differentiation (resulting from innovation) are still insufficient, although improving. As compared with their competitors in other European countries, Polish firms are ranked low in innovation performance [Eurostat Statistics Database (inn_cis6_prod, inn_cis6_mo), PARP, 2010], but relatively high as for innovation cooperation [GUS, 2006, 2008].

1. Theoretical background and research question development

Nowadays, the literature strongly emphasizes the importance of cooperation/networking in innovation activities [Freeman, 1991; Bell, 2005], underlying its positive influence on innovation performance [Miotti, Sachwald, 2003]. The idea of innovation networking has also found support in the recent concept of open innovation (OI) that has questioned the dominant importance of internal capabilities as a determinant of the firm's success. Open innovation is defined as the use of purposive inflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively. OI is a paradigm that assumes that firms can and should use external ideas as well as internal ones and internal and external path to the market, as they look to advance their technology [Chesbrough, 2003a].

As the network partners (vertical, horizontal and institutional) are different in terms of their competencies and behaviour patterns, firms should manage partners for each type of innovation separately [Frenz, Ietto-Gilles, 2009].

Cooperation in innovations may occur **vertically** (within the supply chains) and engage customers and suppliers in product-, process-, marketing and organizational innovations. The intensity of interactions within the supply chains may depend on the type of conveyed knowledge and technology. Thus, if technology applied by the partners is closely interrelated, innovations in the supply chain must be coordinated in details, as the changes in technological configuration of one product component have to take into account the changes in the remaining elements. On the other hand, if technologies are fully modular, the firm assembling the final product may communicate with other suppliers according to market principles and the interaction is mostly based on the purchase of equipment or services containing the new know-how [Oslo Manual, 2005, pp. 85–86].

Vertical cooperation increases firm efficiency by contributing important information on technologies and changing market environment, facilitating new product or technology commercialization and reducing risk of innovative activities, particularly when the innovation is radical and complex in character [von Hippel, 1988; Biemans, 1991].

Changing customers' preferences and firm capabilities to meet them through product development must be reflected in product innovation. Customers' abilities to express precisely their changing value expectations and their propensity to share the knowledge with suppliers helps to build vertical partnership relationships [Flint et al., 2002].

Customer-related competencies differ in industrial (B2B) market and consumer (B2C) market. Knowledge that is useful in industrial market is both technical (tangible) and market context-related is possessed mainly by direct clients, and by end-users. Thus customers - especially those experienced and highly knowledgeable: lead users (who extend the areas of product's application, suggest new product features etc. to achieve more complete customer solutions) are suitable for collaborative product innovation [von Hippel, 1986; Meyer, Schwager, 2007, Best, 2009].

Knowledge obtainable from customers in the consumer market is predominantly informal, tacit, emotional-value-related, which may increase the risks in product innovation. However, active collaboration in product innovation with customers in developing and testing a new product can result in better understanding of customer needs, raising acceptance of new product (thus reducing risk of its commercialization), and strengthening relationships with customers. Recent trends of digitalization of business and social communication and rapidly expanding social networking offer new opportunities for individualized and collective - mass collaboration with customers and other stakeholders on the global base [Tapscott, Williams, 2006; Prahalad, Krishnan, 2008; Kotler et al., 2009]. Prahalad and Ramaswamy [2004], suggest that co-creation is a core part of marketing today and thus, may be useful both in product as well as market innovation cooperation. Interactions enabling an individual customer to co-create unique experi-

ences with the company are the key to unlocking new sources of competitive advantage.

Networking with suppliers and customers is also suitable for process innovation. This type of innovation is focused on manufacturing/assembling efficiency, which requires resources and knowledge (usually industry specific) directly related to solving specific technological problems. Skills and solutions developed by both up-stream and down-stream partners are important for improving production process. Moreover, the risk of their opportunistic behaviour is reduced because process innovation does not have a direct impact on product performance and sales and is more difficult to imitate than product innovation [Kim, Lui, 2010].

Collaboration success in vertical linkages in all types of innovation cooperation, depends, however, on the propensity of value chain partners to reduce their opportunistic attitude in order to increase value for end-customers through joint innovative activities.

Cooperation in innovations may also proceed **horizontally**. In this case, enterprises work together with other firms (domestic and foreign competitors, firms of the same capital group). Benefits of innovation cooperation with competitors (co-competition), include cost barrier reduction, innovation risk reduction, accelerating innovation process, access to partners' complementary resources (recently focused on intangibles), effective joint learning and knowledge sharing, control over partners' innovation activities, increased capabilities to set new technical standards, increased lobbying and bargaining power, building collective innovation-related competitive advantage of international collaborating network etc. [Hamel et al. 1989 ; Tether, 2002; Gnyawali et al., 2006; Luo, 2007 ; Luo et al., 2007; Prahalad, Krishnan, 2008].

However, the decision to enter into cooperation depends also on the assessment of potential costs and risks – those related to partners' opportunistic behaviour, unwanted outflow of knowledge and cost-benefit asymmetries.

And lastly, there is **institutional** cooperation that occurs with public research institutions such as centers of technology transfer, R&D units, universities or other scientific institutions. Moreover, self-government and government agencies, as well as consulting firms may also become cooperation partners. As the institutional partners possess advanced technical knowledge, they are more likely to provide inputs for new product features. Moreover, as they are not directly affected by changes in relative market share resulting from new product launch and less likely to behave opportunistically as partners, they are suitable collaborators in product innovation [Kim, Lui, 2010]. Additionally, product innovation requires knowledge on product features and functions which is to big extent tangible, and technical in character and is possessed either by suppliers of materials and product components or by institutional partners [Handfield et al., 1999; Wynstra et al., 2003; Möller, Törrönen, 2003; Damanpour, 2009].

As product innovation needs complementary assets to go through development, but also commercialization, marketing and distribution, the latter processes

are typically transferred to other than institutional organizations [Chesbrough, Vanhaverbeke et al., 2006].

In cooperation with universities or research organizations, maximizing incoming spillovers (flow of explitable external knowledge that come in the firm) is important for a cooperating firm, whereas collaboration with other enterprises (suppliers, customers or competitors) in addition to incoming spillovers may result in outgoing spillovers (amount of a firm's knowledge that leaks out of the firm and can be utilized by others). While incoming spillovers may motivate a firm to seek cooperation with institutions [Kaiser, 2002; Veugeleres, Cassiman, 2005; Lopez, 2008], outgoing spillovers may be one of the cooperation barriers.

The literature identifies three main types of cooperation / partnering **barriers**: cultural, organizational and industrial [Post, Altman, 1994].

Cultures that are characterized by conservatism and inflexibility are considered to be a vital barrier of cooperation [Ng et al., 2002]. Trust, on the other hand, facilitates the management of an alliance and the exchange of competencies between partners, while distrust may strongly hamper cooperation [Gulati, Singh, 1998]. In Poland, the level of trust is three times lower than the average for the European Union (PARP, 2010) and is considered as an important cooperation barrier. Organizational barriers are those related to firms resources, processes, competences of potential partners. High innovation costs and scarce financial resources are frequently reported as an important cooperation barrier.

Competitive pressure, government regulations are the most common examples of industrial barriers, potentially serving as barriers to change in general, and thus innovation cooperation.

As current research focuses on innovation methods and managing innovation processes, the following research questions are formulated:

1. What type of collaboration partner will be considered significant for the firms with high product, process, marketing and organizational innovation performance as well as for those of high sales of innovative products in total sales and high export intensity?
2. What type of barriers are considered as important in cooperation in process, product, marketing and organizational innovation?

2. Scope of the research and description of the research sample

The paper is based on the results of the study on innovation cooperation of Polish exporters from manufacturing sectors. The empirical data used in this study were collected with the application of the CATI method from the survey entrusted to the Centre of Marketing Research "Indicator" in Warsaw. Interviews were conducted in May 2011. The research survey sample consisted of 209 medium-size and large enterprises, of which 54 represent the food processing in-

dustry (C10 – NACE, Rev. 2); 52 firms – the chemical-pharmaceutical industry (C20, C21 – NACE, Rev. 2); 51 firms – the automotive industry (C29 – NACE, Rev. 2), and 52 enterprises - the electronic industry (C26 - NACE, Rev. 2). The sample was chosen randomly from the base owned by “Indicator” but with the proportions to keep all the samples from each industry of a similar size. All respondents surveyed were managers responsible for day-to-day processes within firms. The structure of the sample does not reflect the structure of the whole population.

The terminology used in the study is based on the commonly agreed definitions of innovation and cooperation on innovation, provided by the Oslo Manual [OECD/Eurostat, 2005, 2008, p. 85], where **innovation** is defined as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. Therefore the manual defines four types of innovation: product innovation, process innovation, marketing innovation, and organizational innovation. **Cooperation on innovations** means active collaboration with other enterprises or public research centers for innovation activities (which may include purchase of knowledge and technology). The parties of such cooperation do not have to derive immediate economic gain from their projects, but active participation of all cooperating partners in the joint activity is indispensable.

This study focuses on process, product, marketing and organizational innovations as the measure of innovation performance. Since the share of sales of newly developed products is also considered to be an accurate indicator of innovation performance, it will be also included. The ability to develop export sales is one of the important indicators of firm international competitiveness. As new products and technologies resulting from innovative projects contribute to firm’s competitive advantage in the international market and create earnings from export [Bernard, Jensen, 1999; Roper, Love, 2002], the export intensity (measured as the share of export in firm’s total sales revenues) will be introduced as an indicator of international competitiveness of Polish exporters. The split of research sample for new products sales intensity and export intensity is presented in Table 1.

Table 1. Sample characteristics – new product sales intensity and export intensity

		Frequency	Percent
Valid	Less than 30% of innovative products in total sales	124	59,3
	More than 30% of innovative products in total sales	85	40,7
	Total	209	100,0
Valid	Export less than 30%	108	51,7
	Export more than 30%	101	48,3
	Total	209	100,0

Source: Research outcomes; own calculations in SPSS, version 19.0. The group “less than 30% includes the indications for 30%”.

3. Method used

Descriptive statistics are used in order to describe the main features of collected data. Table 2 presents descriptive statistics for all four types of innovation cooperation, whereas Table 3 contains descriptive statistics for barriers of cooperation¹. Data show that process innovations were undertaken in cooperation most frequently (mean 1.9; max. 5) and were followed by product innovations (mean 1.1, max. 4), marketing innovations (mean 0.89, max. 7) and organizational innovations (mean 0.95, max. 9).

Cooperation barriers were pointed most frequently (mean 3.44) in product innovation, followed by process innovation (mean 2.84), organizational (mean 2.40) and marketing innovation (mean 2.22).

Table 2. Descriptive statistics – process, product, marketing and organizational innovation introduced in cooperation

Descriptive statistics for innovation in cooperation	Process innovation	Product innovation	Marketing innovation	Organizational innovation
Mean	1,88	1,12	0,98	0,95
Std. Error of Mean	0,11	0,08	0,11	0,11
Median	2,00	1,00	0,00	0,00
Mode	0,00	0,00	0,00	0,00
Std. Deviation	1,54	1,21	1,63	1,62
Variance	2,38	1,48	2,67	2,63
Skewness	0,40	0,80	2,17	2,27
Kurtosis	0,17	0,17	0,17	0,17
Minimum	0,00	0,00	0,00	0,00
Maximum	5,00	4,00	7,00	9,00

Source: Research outcomes; own calculations in SPSS, version 19.0. Scale used: "0" for "no"/"1" for "yes".

To answer the first research question the probit regression analysis is used for predicting of the probability of an event occurrence by fitting data to a logic function.

Dependent variables in models were as follow: process innovation performance (takes the value 1 if the firm introduced a new process in cooperation); product innovation performance (takes the value 1 if the firm introduced a new product in cooperation); marketing innovation performance (takes the value 1 if the firm in-

¹ Descriptive statistics for all types barriers as well for all types of partners are not presented in the article due to the limited space, but are available on request (mlewando@sgh.waw.pl).

roduced a marketing innovation in cooperation) and organizational innovation performance (takes the value 1 if the firm introduced organizational innovation in cooperation); new products sales intensity (takes the value 1 if the firm sales more than 30% of innovative products in total sales) and export sales intensity (takes the value 1 if the firm export more than 30% of its products).

Table 3. Descriptive statistics –cooperation barriers

Descriptive statistics for cooperation barriers	Barriers of cooperation in:			
	process innovation	product innovation	mrketing innovation	organizational innovation
Mean	2,84	3,44	2,22	2,40
Std. Error of Mean	0,20	0,19	0,20	0,20
Median	2,00	3,00	1,00	1,00
Mode	1,00	2,00	,00	,00
Std. Deviation	2,92	2,87	2,89	2,92
Variance	8,56	8,26	8,39	8,54
Skewness	1,61	1,43	1,72	1,72
Std. Error of Skewness	0,16	0,16	0,16	0,16
Kurtosis	2,64	2,16	2,63	2,96
Std. Error of Kurtosis	0,33	0,33	0,33	0,33
Minimum	0,00	0,00	0,00	0,00
Maximum	13	13	13	13

Source: Research outcomes; own calculations in SPSS, version 19.0. Scale used: "0" for "no"/"1" for "yes".

There were six probit models built to test probability of relation of cooperation partners such as: domestic and foreign clients; domestic and foreign suppliers of fitting components and software; domestic and foreign competitors; other enterprises of the same capital group; R&D units; universities and research units of PAN (Polish Academy of Science); consulting firms and internet forums with process; product; marketing and organizational innovation performance as well as export intensity and sales of new products intensity.

Other four models were built in order to answer the second question concerning the probability of relation of cooperation barriers such as: bad experience in cooperation; difficulty to find a competent collaboration partner; difficulty to find a partner willing to cooperate; legal barriers; language/cultural barriers; technical barriers; necessity to share profits with partners; poor fit of collaboration partners offerings; lacking financing; necessity to share intellectual property rights; unclear intellectual input in cooperation outcomes; long-lasting and complicated

procedures with process; product; marketing and organizational innovation performance.

4. Research results

Table 4 presents the results of probit regression for process innovation performance; export intensity and sales of new product intensity for cooperation partners and cooperation.

Data show, that foreign clients (Sig. = .051) and consulting firms (Sig. = .049) are significantly important partners for firms with high process innovation performance. Consulting firms play also important role in firms with high new products sales intensity and high export intensity (Sig. = .024 and .032 respectively) It seems that cooperation with domestic (Sig. = .014) and foreign clients (Sig. = .004) as well as domestic competitors (Sig. = .011) brings additional value for firms with high export propensity.

Difficulty to find a partner willing to cooperate (Sig. = .029) as well as technical barriers (Sig. = .023) were reported as most significant in process innovation cooperation. See table 4 for details.

In product innovation cooperation (see table 5 for details.), foreign suppliers (Sig. = .010) as well as universities (Sig. = .028) and consulting firms (Sig. = .006) are the most important partners for firms with high product innovation performance. Foreign clients (Sig. = .000); domestic competitors (Sig. = .014) and consulting firms (Sig. = .019) are important cooperation partners for export intensive firms, while universities (Sig. = .031) and again foreign clients (Sig. = .014) are important partners for firms with high sales of innovative products. No cooperation barriers are reported to be significant in product cooperation.

In marketing innovation cooperation no significant partners were pointed by surveyed firms. Instead three barriers such as distrust of collaboration partner (Sig. = .015); necessity to share profits with partners (Sig. = .044) as well as necessity to share property rights (Sig. = .039) were pointed as significant. Domestic clients (Sig. = .037) and other enterprises in capital group (Sig. = .014) are important collaboration partners in marketing innovation for firms with high sales of innovative products. See table 6 for details..

In organizational innovation cooperation foreign clients (Sig. = .000), as well as consulting firms (Sig. = .017) are important partners for firms with high organizational innovation performance.

Other enterprises of the same capital group were significant both for firms with high export intensity and high sales of new products intensity (Sig. = .054 and .028 respectively). No cooperation barriers were reported as significant. See table 7 for details.

Table 4. Partners and barriers in process innovation cooperation

Partners and barriers in process innovation cooperation	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower B.	Upper B.
2k = 1	.553	.295	3.506	1	.061	-.026	1.131
Partners in process innovation cooperation							
Domestic clients	-.306	.280	1.200	1	.273	-.855	.242
Foreign clients	.553	.284	3.794	1	.051	-.003	1.109
Dom. suppliers of fittings, comp., software	.441	.265	2.774	1	.096	-.078	.960
Foreign suppliers of fittings, comp., software	.050	.260	.037	1	.847	-.460	.560
Domestic competitors	-.784	.431	3.311	1	.069	-1.629	.061
Foreign competitors	.033	.432	.006	1	.939	-.814	.880
Other enterprises of the same capital group	-.408	.291	1.961	1	.161	-.979	.163
R&D Units	.457	.304	2.262	1	.133	-.139	1.053
Universities / Research units of PAN	.014	.320	.002	1	.966	-.614	.641
Consulting firms	.620	.315	3.884	1	.049	.003	1.236
Internet forums	-.033	.401	.007	1	.935	-.819	.753
Partners in process innovation cooperation with significant influence on high share of new products in total sales							
Consulting firms	.619	.275	5.065	1	.024	.080	1.158
Partners in process innovation cooperation with significant influence on high share of export in total sales							
Domestic clients	-.657	.269	5.983	1	.014	-1.184	-.131
Foreign clients	.834	.288	8.370	1	.004	.269	1.398
Domestic competitors	-1.040	.407	6.543	1	.011	-1.838	-.243
Consulting firms	.621	.290	4.589	1	.032	.053	1.189
Barriers in process innovation cooperation							
Bad experience in cooperation	-.037	.421	.008	1	.929	-.862	.787
Difficulty to find a competent collab. partner	-.417	.309	1.820	1	.177	-1.022	.189
Difficulty to find a partner willing to coop.	-.638	.292	4.764	1	.029	-1.210	-.065
Legal barriers	.183	.321	.326	1	.568	-.446	.813
Language/cultural barriers	.263	.389	.459	1	.498	-.498	1.025

Technical barriers	.692	.304	5.174	1	.023	.096	1.288
Distrust of collaboration partner	.530	.395	1.804	1	.179	-.243	1.304
Necessity to share profits with partners	-.310	.408	.576	1	.448	-1.110	.490
Poor fit of collaboration partners' offerings	.351	.337	1.083	1	.298	-.310	1.011
Lacking financing / scarce financing resources	-.155	.275	.316	1	.574	-.693	.384
Necessity to share intellectual property rights	.494	.498	.985	1	.321	-.481	1.469
Unclear intellectual input in coop. outcomes	.060	.611	.010	1	.921	-1.137	1.258
Long-lasting and complicated procedures	.059	.282	.044	1	.835	-.494	.611

Goodness of Fit: Chi-Square Pearson=144.694; Sig.=.122; Cox and Shell=.198 (for partners and barriers); Chi-Square Pearson=81.828; Sig.=.224; Cox and Shell=.173 (for export intensity); Chi-Square Pearson=79.842; Sig.=.273; Cox and Shell=.069 (for new products sales intensity). Significance at 0.05 level.

Source: Research outcomes; own calculations in SPSS, version 19.0.

Table 5. Partners and barriers in product innovation cooperation

Partners and barriers in product innovation cooperation	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower B.	Upper B.
Product innovation, 2k = 1	.181	.332	.298	1	.585	-.469	.832
Partners in product innovation cooperation							
Domestic clients	.256	.334	.589	1	.443	-.398	.911
Foreign clients	-.304	.383	.629	1	.428	-1.055	.447
Dom. suppliers of fittings, comp., software	.114	.336	.115	1	.735	-.544	.771
Foreign suppliers of fittings, comp., software	.930	.362	6.625	1	.010	.222	1.639
Domestic competitors	.515	.582	.782	1	.376	-.626	1.656
Foreign competitors	-.185	.529	.122	1	.727	-1.222	.852
Other enterprises of the same capital group	.117	.361	.105	1	.746	-.590	.824
R&D Units	-.384	.430	.797	1	.372	-1.228	.460
Universities / Research units of PAN	-.885	.402	4.842	1	.028	-1.673	-.097
Consulting firms	1.165	.427	7.436	1	.006	.328	2.003

Partners in product innovation cooperation with significant influence on high share of new products in total sales							
Foreign clients	.776	.315	6.070	1	.014	.159	1.394
Universities / Research units of PAN	-.803	.372	4.673	1	.031	-1.531	-.075
Partners in product innovation cooperation with significant influence on high share export in total sales							
Foreign clients	1.215	.346	12.326	1	.000	.537	1.894
Domestic competitors	-1.411	.572	6.079	1	.014	-2.532	-.289
Consulting firms	.836	.358	5.460	1	.019	.135	1.537
Barriers in product innovation cooperation							
Bad experience in cooperation	-.781	.504	2.396	1	.122	-1.769	.208
Difficulty to find a competent collab. partner	-.096	.346	.078	1	.780	-.774	.581
Difficulty to find a partner willing to coop.	.177	.304	.338	1	.561	-.419	.772
Legal barriers	.222	.359	.384	1	.536	-.481	.926
Language/cultural barriers	-.172	.450	.147	1	.702	-1.053	.709
Technical barriers	.336	.349	.925	1	.336	-.348	1.020
Distrust of collaboration partner	-.366	.417	.772	1	.380	-1.184	.451
Necessity to share profits with partners	.556	.433	1.648	1	.199	-.293	1.404
Poor fit of collaboration partners' offerings	.495	.395	1.573	1	.210	-.279	1.269
Lacking financing / scarce financing resources	-.046	.345	.018	1	.894	-.722	.630
Necessity to share intellectual property rights	-.143	.399	.128	1	.721	-.924	.639
Unclear intellectual input in coop. outcomes	-.284	.481	.349	1	.555	-1.228	.659
Long-lasting and complicated procedures	-.223	.308	.524	1	.469	-.827	.381

Goodness of Fit: Chi-Square Pearson=109.442; Sig.=.132; Cox and Shell=.236 (for partners and barriers); Chi-Square Pearson=63.570; Sig.=.130; Cox and Shell=.220 (for export intensity); Chi-Square Pearson=73.521; Sig.=.021; Cox and Shell=.141 (for new products sales intensity). Significance at 0.05 level.

Source: Research outcomes; own calculations in SPSS, version 19.0.

Table 6. Partners and barriers in marketing innovation cooperation

Partners and barriers in marketing innovation cooperation	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower B.	Upper B.
Marketing innovation, 2k = 1	.076	.287	.071	1	.790	-.486	.639
Partners in marketing innovation cooperation							
Domestic clients	-.394	.408	.936	1	.333	-1.193	.404
Foreign clients	.034	.454	.006	1	.940	-.856	.925
Dom. suppliers of fittings, comp., software	.004	.393	.000	1	.992	-.766	.774
Foreign suppliers of fittings, comp., software	.944	.543	3.021	1	.082	-.121	2.009
Domestic competitors	-.574	.741	.600	1	.439	-2.027	.879
Foreign competitors	-.044	.765	.003	1	.954	-1.543	1.456
Other enterprises of the same capital group	-.590	.466	1.607	1	.205	-1.503	.322
Consulting firms	.722	.407	3.142	1	.076	-.076	1.519
Partners in marketing innovation cooperation with significant influence on high share of new products in total sales							
Domestic clients	-.778	.373	4.350	1	.037	-1.509	-.047
Other enterprises of the same capital group	1.036	.420	6.095	1	.014	.214	1.859
Barriers in marketing innovation cooperation							
Bad experience in cooperation	-.232	.759	.093	1	.760	-1.718	1.255
Difficulty to find a competent collab. partner	-.149	.542	.076	1	.783	-1.211	.912
Difficulty to find a partner willing to coop.	.702	.505	1.931	1	.165	-.288	1.693
Legal barriers	-.353	.657	.289	1	.591	-1.642	.935
Language/cultural barriers	-.564	.783	.518	1	.471	-2.099	.971
Technical barriers	-.423	.600	.497	1	.481	-1.600	.753
Distrust of collaboration partner	1.756	.720	5.957	1	.015	.346	3.166
Necessity to share profits with partners	-1.803	.897	4.046	1	.044	-3.561	-.046
Poor fit of collaboration partners' offerings	-.377	.512	.542	1	.462	-1.379	.626
Lacking financing / scarce financing resources	-.129	.443	.085	1	.771	-.998	.740

Necessity to share intellectual property rights	2.619	1.268	4.268	1	.039	.134	5.104
Unclear intellectual input in coop. outcomes	-1.562	1.110	1.978	1	.160	-3.738	.615
Long-lasting and complicated procedures	.678	.626	1.171	1	.279	-.550	1.906

Goodness of Fit: Chi-Square Pearson=64.293; Sig.=.118; Cox and Shell=.292 (for partners and barriers); Chi-Square Pearson=34.999; Sig.=.170; Cox and Shell=.086 (for export intensity); Chi-Square Pearson=45.231; Sig.=.021; Cox and Shell=.141(for new products sales intensity). Significance at 0.05 level.

Source: research outcomes; own calculations in SPSS, version 19.0.

Table 7. Partners and barriers in organizational innovation cooperation

Partners and barriers in organizational innovation cooperation	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower B.	Upper B.
Organizational innovation, 2k = 1	-.336	.423	.632	1	.427	-1.164	.492
Partners in organizational innovation cooperation							
Domestic clients	.440	.581	.575	1	.448	-.698	1.578
Foreign clients	13.425	.973	190.350	1	.000	11.518	15.332
Dom. suppliers of fittings, comp., software	-.374	.522	.512	1	.474	-1.398	.650
Foreign suppliers of fittings, comp., software	-13.666	.000	.	1	.	-13.666	-13.666
Domestic competitors	-27.191	.000	.	1	.	-27.191	-27.191
Foreign competitors	47.219	.000	.	1	.	47.219	47.219
Universities / Research units of PAN	.393	.614	.409	1	.522	-.811	1.597
Consulting firms	-2.597	1.090	5.672	1	.017	-4.734	-.460
Partners in organizational innovation cooperation with significant influence on high share of new products in total sales							
Other enterprises of the same capital group	.807	.366	4.857	1	.028	.089	1.525
Partners in product innovation cooperation with significant influence on high share of export in total sales							
Other enterprises of the same capital group	1.496	.775	3.723	1	.054	-.024	3.016
Barriers in organizational innovation cooperation							
Bad experience in cooperation	-1.322	.906	2.127	1	.145	-3.098	.455
Difficulty to find a competent collab. partner	-.542	.774	.490	1	.484	-2.059	.976

Difficulty to find a partner willing to coop.	-.264	.596	.196	1	.658	-1.433	.904
Legal barriers	6.648	4976.976	.000	1	.999	-9748.046	9761.342
Language/cultural barriers	-7.703	4976.976	.000	1	.999	-9762.397	9746.992
Technical barriers	.941	1.015	.860	1	.354	-1.048	2.930
Distrust of collaboration partner	.964	.984	.960	1	.327	-.964	2.891
Necessity to share profits with partners	-21.343	6977.517	.000	1	.998	-13697.025	13654.339
Poor fit of collaboration partners' offerings	.410	.675	.369	1	.544	-.913	1.733
Lacking financing / scarce financing resources	-.381	.690	.305	1	.581	-1.734	.972
Necessity to share intellectual property rights	21.211	6977.517	.000	1	.998	-13654.471	13696.892
Unclear intellectual input in coop. outcomes	19.193	9591.909	.000	1	.998	-18780.603	18818.989
Long-lasting and complicated procedures	.321	.612	.274	1	.600	-.879	1.520

Goodness of Fit: Chi-Square Pearson=39.468; Sig.=.899; Cox and Shell=.448 (for partners and barriers); Chi-Square Pearson=25.600; Sig.=.142; Cox and Shell=.145 (for export intensity); Chi-Square Pearson=27.307; Sig.=.098; Cox and Shell=.140 (for new products sales intensity). Significance at 0.05 level.

Source: research outcomes; own calculations in SPSS, version 19.0.

Conclusion

Research data indicate, that the scope of innovation cooperation partners differs for four types of surveyed innovations, showing that the cooperation is strongly multidisciplinary.

Consulting firms were pointed as significant partners in process, product and organizational innovation cooperation, maybe due to the fact, that this type of collaboration maximize incoming spillovers and minimize outgoing ones.

Cooperation with universities and research units of PAN has significant influence on product innovation performance as well high share of sales of new products.

The use of knowledge of institutional partners is much more important in low and medium tech industries rather than high tech industries (Heindenreich, 2009), suggesting that the need for qualified external knowledge is of great importance for those firms.

Cooperation with foreign clients has significant value for firms with high export intensity. This falls in line with the suggestion of Johanson and Mattson (1988), that internationalization is related to the development of network ties with

firms that operate in the foreign market. With established international ties, firm share resources with its strategic partners and hence generate unique competitive capabilities to seek new business opportunities and offer new products and services. This seems to be of great importance for Polish firms with limited international knowledge as well as experience, but eager to compete on foreign market.

Indications for cooperation barriers significance are not similar for process, product, marketing and organisational innovations introduced in cooperation. Surprisingly, out of thirteen innovation cooperation barriers, only few of them were reported as significant. In majority of cases they were related to problems with potential collaboration partners (lack of competences, distrust, necessity to share profits and share property rights), and not to scarce financing resources, what would be more expected as outcome for Polish firms.

It should be underlined, that presented outcomes, although important both from theoretical as well as empirical point of view, can be biased by the sample structure and limited size and thus can not be treated as representative for the whole population.

References

- Barney J., 1991, *Firm Resources and Sustained Competitive Advantage*, Journal of Management, vol. 17, no. 1, pp. 99–120.
- Bell G.G., 2005, *Clusters, networks, and firm innovativeness*, Strategic Management Journal, vol. 26, pp. 287–295.
- Bernard A., Jensen, J.B., 1999, *Exceptional exporter performance: cause, effect, or both?*, Journal of International Economics, vol. 47, no. 1, pp. 1–25.
- Best R. J., 2009, *Market-based management. Strategies for growing customer value and profitability*, 5th ed. Pearson Education, Upper Saddle River, N.J.
- Biemans W.G., 1991, *Innovative networks*, Routledge, London.
- Chesbrough H., 2003, *Open innovation: the new imperative for creating and profiting from technology*, Harvard Business Press, Boston.
- Chesbrough H., Vanhaverbeke W. et. al., 2006, *Open innovation: researching a new paradigm*, Oxford University Press, Oxford.
- Collis D.J., Montgomery, C.A., 1997, *Corporate Strategy. Resources and the Scope of the Firm*, Irwin/McGraw-Hill, Chicago.
- Damanpour F., 2009, *An integration of research findings of effects of firm size and market competition on product and process innovation*, British Journal of Management (DOI: 10.1111/j.1467-8551.2009.00628.x).
- Dyer J.H., Singh H., 1998, *The relational view: cooperative strategy and sources of interorganizational competitive advantage*, Academy of Management Review, vol. 23, no. 4, pp. 660–679.
- Eurostat Statistics Database [inn_cis6].
- Flint D.J., Woodruff R.B., Gardial S.F., 2002, *Exploring the phenomenon of customers' desired value change in a business-to-business context*, Journal of Marketing, October.
- Freeman C., 1991, *Networks of innovators: a synthesis*, Research Policy, vol. 20, no. 5, pp. 499–514.

- Frenz M., Ietto-Gilles G., 2009, *The impact on innovation performance of different sources of knowledge: evidence from the UK Community Innovation Survey*, Research Policy, vol. 38, pp. 1125–1135.
- Gnyawali D. R., He J., Madhavan R., 2006, *Impact of cooptation on firm competitive behavior: An empirical examination*, Journal of Management, vol. 32, no. 4, pp. 507–530.
- Gulati R., Singh H., 1998, *The architecture of cooperation: managing coordination cost and appropriation concerns in strategic alliances*, Administrative Science Quarterly, vol. 43, no. 4, pp. 781–814.
- GUS, (2006), *Działalność innowacyjna przedsiębiorstw w latach 2002–2004*, Warszawa.
- GUS, (2008), *Działalność innowacyjna przedsiębiorstw w latach 2004–2006*, Warszawa.
- Hamel G., Doz Y., Prahalad C.K., 1989, *Collaborate with your competitors and win*, Harvard Business Review, vol. 67, no. 1, pp. 133–139.
- Hamel G., Heene A., 1994, *Competence-Based Competition*, J. Wiley, Chichester.
- Handfield R., Ragatz R.L., Petersen K.J., Monczka R.M., 1999, *Involving suppliers in new product development*, California Management Review, no. 1.
- Heidenreich M., 2009, *Innovation patterns and location of European low- and medium technology industries*, Research Policy, no. 28, pp. 483–494.
- Hippel E. von, 1986, *Lead users: an important source of novel product concepts*, Management Science, vol. 32, no. 7, pp. 791–805.
- Hippel E. von, 1988, *The Sources of innovation*, Oxford University Press, Oxford.
- Johanson J., Mattsson L.-G., 1988a, *Internationalisation in industrial systems—A network approach*, [in:] eds. N. Hood, J.-E. Vahlne, *Strategies in global competition*, Croom Helm, London, pp. 287–314.
- Kaiser U., 2002, *An empirical test of models explaining research expenditures and research cooperation: evidence for the German service sector*, International Journal of Industrial Organization, vol. 20, no. 6, pp. 747–774.
- Kim Y., Lui S. S., 2010, *Networks and firm innovation in emerging markets: the case of Korean manufacturing firms*, Paper presented at the 36th European International Business Academy Annual Conference, Porto, Portugal.
- Kotler Ph., Keller K.L., Brady M., Goodman M., Hansen T., 2009, *Marketing management*, Pearson Education, Harlow.
- Laursen K., Salter A., 2006, *Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms*, Strategic Management Journal, vol. 27, pp. 131–150.
- Lopez A., 2008, *Determinants of R&D cooperation: evidence from Spanish manufacturing firms*, International Journal of Industrial Organization, vol. 19, no. 1, pp. 113–136.
- Lowendahl B.R., 1997, *Strategic Management of Professional Business Service Firms*. Copenhagen Business School Press, Copenhagen.
- Luo X., Rindfleisch A., Tse D.K., 2007, *Working with rivals: the impact of competitor alliances on financial performance*, Journal of Marketing Research, vol. XLIV, pp. 73–83.
- Luo Y., 2007, *A cooptation perspective of global competition*, Journal of World Business, vol. 42, pp. 129–144.
- Meyer Ch., Schwager A., 2007, *Understanding customer experience*, Harvard Business Review, vol. 87, no. 1.
- Miotti L., Sachwald F., 2003, *Co-operative R&D: why and with whom? An integrated framework of analysis*, Research Policy, vol. 32, no. 8, pp. 1481–1499.

- Möller K.E., Törrönen P., 2003, *Business supplier's value creation potential*, Industrial Marketing Management, no. 3.
- Ng T., Rose T., Mak M. and Chen S.E., 2002, *Problematic issues associated with project partnering – the contractor perspective*, International Journal of Project Management, vol. 20, no. 6, pp. 437–449.
- Oslo Manual, 2005, *Guidelines for collecting and interpreting innovation data*, Joint publication by OECD and Eurostat. 3rd ed., OECD Publishing.
- PARP, 2010, *Innowacyjność 2010 [Innovativeness 2010]*. PARP, Warsaw.
- Post J., Altman B., 1994, *Managing the environmental change process: barriers and opportunities*, Journal of Organizational Change, vol. 22, no. 6, pp. 64–81.
- Prahalad C. K., Hamel G., 1990, *The Core Competence of the Corporation*, Harvard Business Review, vol. 68, May-June, pp. 79–91.
- Prahalad C. K., Ramaswamy V., 2004, *The future of competition: co-creating value with customers*, Harvard Business School Press, Boston.
- Prahalad C.K., Krishnan M. S., 2008, *The new age of innovation. Driving co-created value through global networks*. McGraw-Hill, New York.
- Roper S., Love J.H., 2002, *Innovation and export performance: evidence from the UK and German manufacturing plants*, Research Policy, vol. 31, no. 7, pp. 1087–1102.
- Science, technology and innovation in Europe*, Eurostat, 2010 edition.
- Stojcic N., Hashi I., Telhaj S., 2011, *Innovation activities and competitiveness: empirical evidence on behaviour of firms in new EU member states and candidate countries*, CASE Network Studies and Analyses, no. 424, Warsaw.
- Tapscott B.D., William A.D., 2006, *Wikinomics: how mass collaboration changes everything*, Penguin Group, New York.
- Tether B.S., 2002, *Who co-operates for innovation and why? An empirical analysis*, Research Policy, vol. 31, pp. 947–967.
- Wit B. de, Meyer R., 2005, *Strategy synthesis: Resolving strategy paradoxes to create competitive advantage*, Thomson Learning, London.
- Wynstra F., Weggemann M., van Weele A., 2003, *Exploring purchasing integration in product development*, Industrial Marketing Management, no. 1.
- Wziętek-Kubiak A., 2010, *Zróżnicowanie wzorców działalności innowacyjnej przedsiębiorstw przemysłowych o niskiej i wysokiej technologii. Analiza porównawcza*, Studia Ekonomiczne PAN, nr 2 (LXV), pp. 141–168.
- Veugelers R., Cassiman B., 2005, *R&D cooperation between firms and universities. Some empirical evidence from Belgian manufacturing*, International Journal of Industrial Organization, vol. 23, no. 5/6, pp. 355–379.