

OPEN INNOVATION STRATEGY – OPTIMIZING R&D COOPERATION QUANTITY AND INTENSITY

DARIA PODMETINA
Lappeenranta University of Technology
P.O.Box 20, FI-53851 Lappeenranta, Finland
daria.podmetina@lut.fi

MARIA SMIRNOVA
St. Petersburg State University, Graduate School of Management
St. Petersburg, Russia
smirnova@som.pu.ru

JUHA VÄÄTÄNEN
Lappeenranta University of Technology
P.O.Box 20, FI-53851 Lappeenranta, Finland
juha.vaatanen@lut.fi

MARKO TORKKELI
Lappeenranta University of Technology / Kouvola Research Unit
Prikaatintie 9, FI-45100 Kouvola, Finland
marko.torkkeli@lut.fi

This paper analyses the scale of Russian companies' innovation strategies from closed to open innovation and the role of R&D cooperation with external partners within the open innovation framework. The results of the survey of 206 companies show that the cooperation with external partners clearly depends on the degree of openness of innovation strategy and the proximity of the partner – both in sense of importance and intensity of cooperation. The importance of cooperation with external partners is high for all companies. However, the companies with closed innovation strategy consider the cooperation least important, the increase of importance and intensity of cooperation is observed for companies with internal R&D, in-bound open innovation and out-bound open innovation. However, the most significant effect of cooperation is recorded for companies with full range of open innovation strategies – both in-bound and out-bound. The importance of cooperation with partners on the domestic market is higher than cooperation with foreign partners.

Keywords: Open Innovation, Innovation Strategy, Cooperation, Russia.

Introduction

The role of cooperation in the global and turbulent business environment cannot be underestimated. The cooperation skills create great advantage for the companies' innovativeness, and the capability to utilize external knowledge is a significant factor of innovation performance (Cohen & Levinthal, 1990). The need for collaborative approach has significantly increased in the open innovation era (Enkel et al, 2010).

This paper addresses the R&D cooperation within the open innovation framework. Authors apply the classification proposed by Gassman and Enkel (2004) to define three core processes within Open Innovation: 1) The Outside-In process – search and incorporating the external knowledge of suppliers, customers, competitors, universities and research organizations, etc; 2) The Inside-Out process – transfer of the ideas, technologies, intellectual property to the market; 3) Combination of Outside-In and Inside-Out processes. The authors suggest the differences mainly come from the degree of openness of innovation strategy (adopting zero, one or more of the constructs of OI) and the proximity of the partner – both in the sense of location and in the sense of intensity of cooperation.

The cooperation with stakeholders increases innovation capability of the firm (Lundvall et al., 2002). Companies build links and cooperation in R&D with their stakeholders such as customers, suppliers, competitors and public institutions (Enkel & Gassmann, 2008, Smirnova et al., 2009). The recent trend has been the growing importance of innovation networks (Dittrich & Duysters, 2007; Chesbrough & Prencipe, 2008, Torkkeli et al., 2008). Many studies show that external links and cooperation increase company's innovation capability and have a positive effect on innovation output (Bayona et al., 2001; Kaufmann & Tödting 2001; Klomp & van Leeuwen, 2001; Hagedoorn, 2002; Loof & Heshmati, 2002; Romijn & Albaladejo, 2002; Belderbos et al. 2004b; Vivero, 2004;

Veugelers & Cassiman, 2005). Open innovation framework still lacks empirical evidence how to best utilize the concept (Enkel et al, 2010) and how important cooperation with external partners is in this framework.

This paper studies the role of R&D cooperation with external stakeholders in the framework of the open innovation concept. The paper aims to analyze the degree of openness of innovation strategy. The analyzed factors are the type and importance of R&D cooperation, openness of the innovation model applied, and the innovation and financial performance. The study is based on the survey consisting of 206 Russian R&D oriented companies selected from the most innovative regions. The interviews were conducted in September – December 2009. The survey consists of 110 questions and provides the opportunity to analyze the types and importance of R&D cooperation with external partners, different types of innovation activities, as well as innovation and financial performance with statistical methods.

The paper is structured as follows: Chapter 1 introduces the research topic and sets the research objective. Chapter 2 reviews the literature of open and closed innovation strategies, and the role of R&D cooperation in this context. Chapter 3 describes the research design, survey data and variables. Chapter 4 presents the open innovation strategies and cooperation the sample companies. Chapter 5 presents the key findings of the paper. Chapter 6 discusses on the results and Chapter 7 presents the conclusions and the main implications of the results.

Literature Review

Towards open innovation

The traditional strategy orientation states that companies have to diversify strategies in order to use opportunities and avoid threats emerged due to market turbulence (Porter, 1979). However, business environment was considered still relatively stable in the mid to late 1980s. Since beginning of 1990s, market and environmental turbulence have increased and companies have been forced to competition fight and the flexibility has become a mean for companies' survival. In earlier times companies had orientation to control all stages of innovation process themselves and thus most of R&D were produced internally (in-house R&D) (Wheelwright & Clark, 1992). Not only R&D, but NPD, technology innovations along with commercialization of new products and technologies were conducted within company's borders. This approach is nowadays referred as traditional or closed approach to innovations.

According to Kotler and Caslione (2009), the world economy has entered a new era of uncertainty, characterized by increased risks and turbulence, and consequently chaos. Enterprises need to set new strategic behaviours (*chaotics*) (warning system, scenario construction system and quick response system) which allow them to manage during the time of recession. Kotler and Caslione claim, that the main forces: *globalisation and technology* have caused an increased fragility in the economy, which have resulted in the intensified periods of turbulence. Currently this intensified turbulence is already accepted as normal for the economy and companies have learned how to behave in this situation. What was considered extraordinary and stressful for companies 20 years ago has become everyday situation for modern companies. Due to the degree of turbulence, increased competition and newly emerged technology opportunities, companies have intensified the use of knowledge, both internal and external (Cohen & Levinthal, 1990; Klevorick et al., 1995).

It has become obvious, that traditional approach to innovation and R&D does not fit to this changed environment. Thus many companies have started transition towards new, more open policy on innovations. Companies have to develop more open business models if they want to get the best use of their internal R&D, search and acquire new technologies and use effectively commercialization channels, decrease costs and save time (Christensen, 1997). When Chesbrough (2003; 2006) launched a term "Open Innovation" to describe the new phenomena, it was very appropriate time to describe the latest transformation processes in the field of innovations. Nowadays, open approach has become essential for many companies' innovation practices. The organised search for new ideas is

important for open innovation framework development (Laursen & Salter, 2006). The open innovation can be exploratory (emergent innovation process) and focused (predetermined search) (Holmes & Smart, 2009). Chesbrough (2003) introduced several factors that influenced to the beginning of open innovation era: 1) access to the best available knowledge sources improved both inside and outside the company because of the increase of the educated labor force availability; 2) increased the number of possible sources of financing for R&D projects; 3) companies started to cooperate more and search for ideas and technology outside and incorporate them into innovation policy.

Gassman and Enkel (2004) define three core processes within OI: 1) The Outside-In process – search and incorporating the external knowledge of suppliers, customers, competitors, universities and research organizations, etc; 2) The Inside-Out process – transfer of the ideas, technologies, intellectual property to the market; 3) Combination of Outside-In and Inside-Out processes. And in more modern work they raise a question of necessity to find the optimal ratio between introducing the open innovation practices and investing in the traditional innovations (Enkel et al., 2010). There is empirical evidence, that turbulence of technology and competition on technology markets strengthen the effect of outbound innovations on companies' performance (Lichtenthaler, 2009).

In our study we follow the same approach to open innovation process: R&D cooperation, external technology acquisition (ETA) and technology commercialisation (TC). We consider that companies possess the innovation portfolio which includes in-house R&D, outsourced R&D, technology acquisition, collaborative external partnerships with suppliers, customers, universities and research organizations, and technology commercialisation.

Cooperation supports Open Innovation

The cooperation is the core of open innovation framework (Chesbrough, 2006) and the number of cooperative partners and quality of cooperation matter for the success of introducing the open innovation principles (Kock and Torkkeli, 2008). Open innovation phenomena evolve high degree of cooperation with partners such as other companies in the industry, suppliers, clients (Chesbrough, 2003). The customer value increases when companies exploit the new ideas and develop new product and technologies both themselves (in-house) (Wheelwright & Clark, 1992) and in cooperation with suppliers or competitors (inter-firm). The cooperation gives opportunity to access knowledge and technologies in order to increase the innovativeness of the company, decrease costs and risks (Faria & Schmidt, 2007).

There have been multiple studies on collaborative approach to innovations (Freitag, 2002; Andrew et. al, 2006; Blomqvist & Levy, 2006, Miles et al, 2004; Simonin, 1997; Johnsen & Ford, 2000; Ford & Johnsen, 2001, Hakansson & Eriksson, 1993). Collaborative innovations represent one of the options as addition to in-house R&D and outsourcing (Baglieri & Zamboni, 2005). Unique advantage of this mode is creation of additional value within the partner relationship (Walter et. al, 2001).

The competence to cooperate in R&D sphere or in NPD is valuable for all organizations. Companies with high skills in cooperation (cooperation capability) have access to large range of technologies and can better manage their R&D resources (Torkkeli et al., 2009). The role of contribution of external partners and collaboration is difficult to overestimate. Large companies do not fully rely on internal innovations and tend to increase cooperation in R&D activities (Dodgson, 1993; Freeman & Hagedoorn, 1994) and intent to create own values of cooperation (Smith & Blanck, 2002).

Cooperation in R&D may occur on different levels: strategic (partner selection and management), executive (teams and processes) or infrastructural level (Deck & Strom, 2002). Decision on innovation strategy is based on social interactions and analysis of innovation practices (Neyer et al., 2009). Independent from the level of cooperation, the firms need to develop specific organizational competencies to support this interaction. This cooperation capability is about how companies develop and manage partnerships (Dyer & Singh, 1998). The core of cooperation capability is the integration of skills and tacit knowledge with external partners. The motives for cooperation depend on the type of partner (Tether, 2002, Belderbos et al, 2004b).

The intensified cooperation in innovations in the last decades indicates the lack of companies' internal resources and capabilities to satisfy the need for innovations and R&D (Hagedoorn, 2002; De Propriis, 2002). The simultaneous implementation of innovation and cooperation strategies in the companies has been discussed in large number of studies.

Some companies decide to cooperate based on their internal R&D expertise, and try to balance internal and external R&D based on their internal knowledge – choice between “making and buying” (Cassiman & Veugelers, 2002). Companies can externalize due to their internal weaknesses on innovations (Keupp & Gassmann, 2009). Other companies cooperate with competitors in product R&D, process R&D or both (Lin & Saggi, 2002).

The literature review on R&D cooperation leads us to the conclusion that cooperation is more important for companies with experience on internal R&D and for companies who already have R&D cooperation. Based on our observations, companies experienced with internal R&D and R&D cooperation seem to be more eager expand their technology portfolio towards technology acquisition and cooperate in commercializing internal R&D.

Hypothesis 1: Companies with experience in internal R&D value more the cooperation with external partners and their cooperation is more successful, than companies without experience in internal R&D.

Cooperation with External Partners

Companies can cooperate in innovations with a variety of external parties: suppliers (Hakansson & Eriksson, 1993), competitors (Clark & Fujimoto, 1991), customers (von Hippel, 1988) and research organisations (Gemünden et al., 1996), etc. It is believed that the key sources for innovators are often lead users, suppliers or universities (von Hippel, 1988). Companies use channels (suppliers, users, universities) when they search for innovative opportunities (Laursen & Salter, 2006). The results of their analysis of U.K. manufacturing firms show that the most important channel is suppliers of equipment, materials, and components, followed closely by clients and customers – which indicates that innovations are determined by relations with suppliers and customers.

The partner selection and relationship has been focus of many studies. Many of these studies have been motivated by the open approach to innovations and they have studied the vertical and horizontal linkages. Miotti and Sachwald, 2003 proposed framework to predict the efficiency of R&D co-operation with different partners. Zeng et. al, 2009 found out that vertical and horizontal cooperation with customers, suppliers has a distinct role. Faria et al (2010) emphasised the effect of technology level in partner selection. Tomlinson, 2010 found evidence for link between vertical cooperation and positive innovation performance. Tether and Tajar, 2010 supported the supply chain approach in partner selection. In the previous papers we studied whether certain group of external partners was involved in NPD process (suppliers in Russia; suppliers abroad; customers in Russia; customers abroad; intermediaries; shareholders; competitors; consultants; research organizations and partners in joint ventures). Results indicated that the role of external partners for the firms following joint NPD approach is higher – they depend more on “core” stakeholders. At the same time for those firms following own R&D resources based NPD strategy external partners can still have vital importance.

Hypothesis 2: The importance and the success of cooperation with external partners is more significant for those companies who introduce the more diversified innovation strategy such as open innovation

Some studies have focused on factors that specifically induce companies to cooperate with foreign partners located in other countries to carry out innovative activities (Faria & Schmidt, 2007). The existence of strong relationship between internationalization and innovation is obvious for many companies, especially when international technology transfer is a form of export per se (Robinson, 1988, Filipescu, 2007). The companies' cooperation with foreign suppliers in some part relates with psychological distance concept– what means that companies export or

import to countries which they know better, have better experience and less market uncertainty (Johanson & Vahlne, 1977).

Hypothesis 3: The physical distance factor matters: For companies the cooperation with external domestic partners is more important and more successful, than with foreign partners.

Research Design

The empirical study was conducted during November 2009 – February 2010. 206 Russian companies from various industries agreed to participate in the study through structured interviews. The key respondents were representatives of the innovation department or top management of the firm. The numbers of criteria were used in order to select companies, including region, industry and annual revenue of the company. The sampling method was based on the stratified sample approach, which means not a representative, but a meaningful structure of the sample. The questionnaire consists of 110 questions (some questions include two or more sub-questions). The questionnaire structure was developed based on the recommendations for conducting the innovation surveys (Frascati manual, 1993, Oslo manual, 2007) and using the constructs and scales for analysing cooperation of the companies with internal and external partners, international activities of the companies, and the number of other indicators. The structure of the questionnaire is presented in the table in the Appendix 1.

Due to the selection of key respondents it was possible to obtain information on the innovation activities of the companies and on the cooperation with external partners in relation to R&D. Key information on the sample is presented in the table in Appendix 2. The average age of companies in the sample is 27 years, while the year of foundation varying from 1720 till 2009.

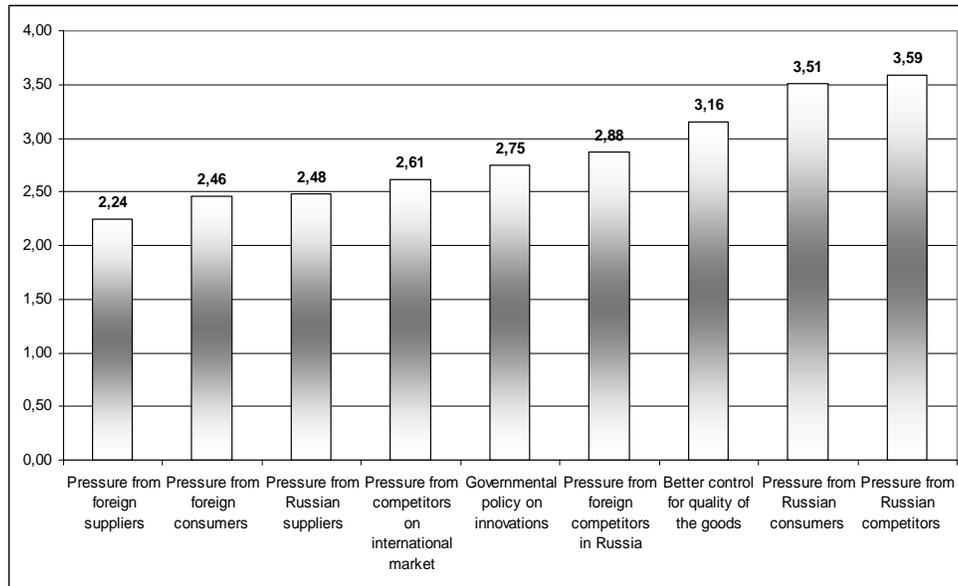
The share of companies conducting internal R&D is high - 78,6 %, of which 42,7 % conduct R&D systematically and 35,9 % irregularly. The R&D intensity (ratio of R&D expenditures in company's sales) is between 1.5 and 3.0 % for 38 % of companies. This corresponds with an average level of R&D intensity for most of high and medium tech industries. Out of the 206 companies in the sample, 1.9 % assessed their economic situation as "near bankruptcy", 10.7% as "bad", 53.4 % - as "satisfactory", 28.6% as "good", and only 3.9 % as "excellent".

Operationalization

Describing existing patterns of innovation strategies and cooperation of Russian companies a number of variables have been applied. The key respondents had to identify cooperation in R&D, conducting internal R&D, acquiring R&D or technologies or commercializing technologies and estimate role of cooperation on the scale from 1 to 5.

The effect of cooperation can be also negative on the innovations of the companies in the sample. The role of external stakeholders on the implementation the innovation is shown on the Figure 1, where the companies were asked to estimate the pressure from the different external stakeholders on their innovations (Linkert scale from 1 to 5). The highest pressure companies feel from the Russian competitors and consumers, as well as from the quality control and foreign competitors located in Russia. The pressure from the supplier's side (both local and foreign) is significantly lower.

Figure 1 The influencing factors of innovations implementation



R&D Cooperation with external stakeholders: A dichotomous question was used to find out whether external organizations (partners) were involved in R&D process. Importance and success of cooperation with the external stakeholders was estimated with a 5-point Likert scale from not important to absolutely important.

Internal R&D: A dichotomous question was used to measure whether company conducts internal R&D. The results of the analysis of this dummy is used in the analyzing the possible innovation strategies of the firms and in order to estimate the role of cooperation depending on innovation strategy.

R&D acquisition: The companies were asked to select from the proposed scale the option which is describing most their possible acquisition of R&D: not acquired, acquired – less that 5 %, from 5 to 10 %, from 10 to 25 %, from 25 to 50 %, from 50 to 100 %. The scales reflect the approximate share of acquired R&D with respect to internal R&D.

Technology Acquisition: A dichotomous question of the next variable “technology acquisition” consists of not acquiring technologies, acquiring sometimes, and acquiring often.

Technology Commercialization: A dichotomous question of the next variable “technology commercialization” consists of not commercializing technologies, selling sometimes, and selling often.

Open Innovation and Cooperation in Russia

Open innovation

The globalization process pushed companies out of the traditional borders, and nowadays, most of the companies aim for time and cost saving and actively cooperating with partners both in home countries and all over the world in order to improve their R&D, innovation and NPD functions and to modernize the innovation commercialization channels. This phenomenon was named Open Innovation by Chesbrough in 2003 and combined the ideas of openness under this one term. For the classifying the sample companies (Table 1) regarding the open innovation paradigm, authors applied the Gassman’s and Enkel’s (2004) taxonomy of OI process on outside-in process (external knowledge, innovation, technology search and acquisition), inside-out process (transfer of innovations to the market) and combination of outside-in and inside-out processes. This taxonomy is often simplified to the categories of technology acquisition and technology commercialization. These are not characterizing the processes of inbound and outbound open innovations as a whole, but provide researchers with opportunity of analyzing the process in parts.

The authors claimed that the differences in the adopting open innovation mainly come from degree of openness to the number of external partners both in sense of outside-in process and inside-out process (intensity of cooperation), and in the sense of location of partner (geographic proximity). The companies, who adopt more complex set of open innovation activities, benefit more from the open innovation effect.

Table 1 Innovation Strategies

<i>Innovation Strategy</i>	<i>N</i>	<i>Share, %</i>
Internal Research and Development		
Internal R&D	162	78,6
No Internal R&D	44	21,4
The Outside-In Process of Open Innovation		
External Technology Acquisition (ETA)	64	31,1
No External Technology Acquisition	142	69,9
The Inside-Out Process of Open Innovation		
Technology Commercialization (TC)	27	13,1
No Technology Commercialization	179	86,9
Combination of Outside-in and Inside-out processes of Open Innovation		
Internal R&D and ETA and TC	14	6,8
Other then OI	192	93,2

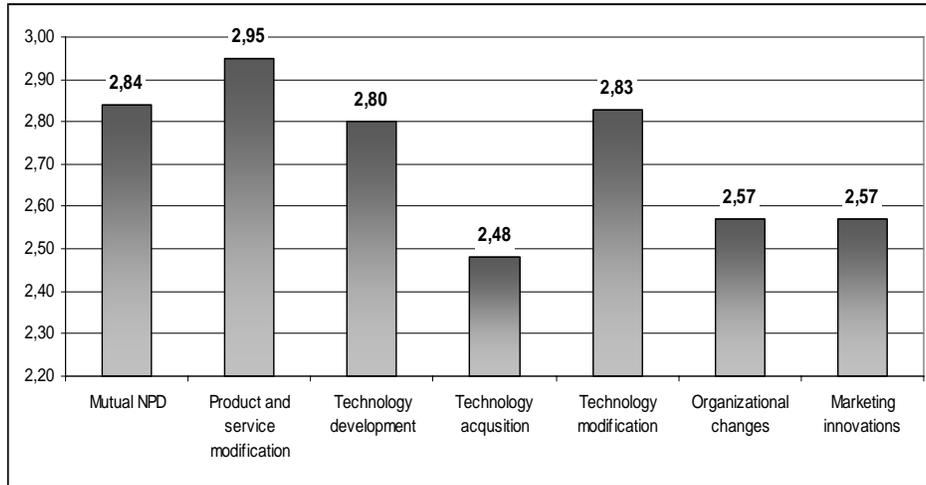
Russian companies traditionally stage open innovation path – from internal R&D, though adopting outside-in process, and towards inside-out process. The companies involving the all stage of OI are more productive and more innovative (Podmetina et als., 2009, 2010). That means that companies who do not have internal R&D function are not involved in external acquisition processes (R&D, technology). And companies, who do not have experience in external acquisition, do not commercialize the technology through external channels.

Cooperation

The analysis of cooperation was dome based on the data indicating the role of external partners (both in Russia and abroad) in R&D, R&D and technology acquisition and technology commercialisation processes. Companies were asked to estimate the importance of cooperation with competitors, customers, suppliers, sub-contractors (developers and producers), other companies in own or other industries, universities or research organizations when searching for technologies to acquire. In R&D cooperation we study the involvement of external partners in R&D, NPD, modification of product, technology developing, technology acquisition, modification of technologies, organizational innovation and business processes, and in marketing innovations.

The figure 2 (Linkert Scale 1 to 5) shows the involvement intensity of external partners (consumers, suppliers, intermediaries, research organizations) in R&D process. Companies cooperate more intense with external partners in product and service modification, technology modification, and in NPD, then in technology acquisition and organizational and marketing innovations.

Figure 2 Involvement of external partners in R&D process

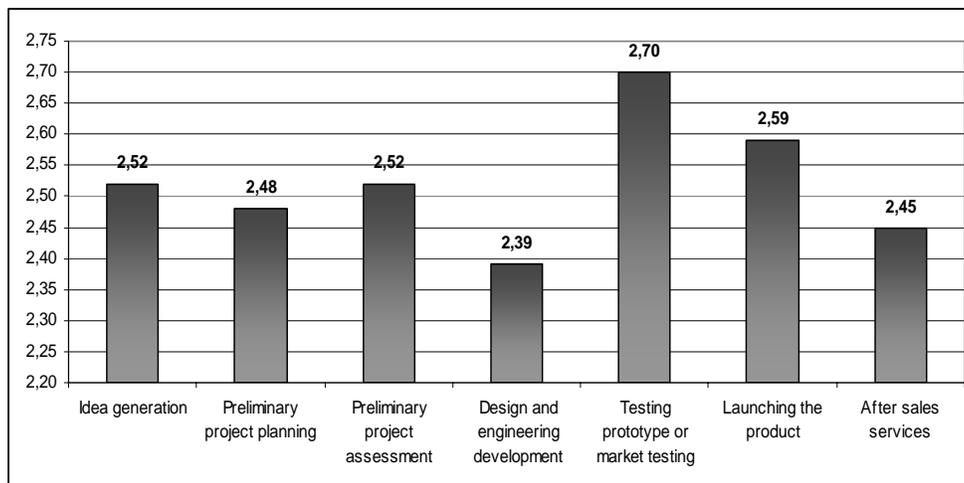


The figure 3 shows the involvement of external partners (consumers, suppliers, intermediaries, research organizations) in the different stages of R&D process. Companies cooperate more intense with external partners in testing prototypes of the product or market testing, launching the product, then in design and engineering stage. The role of cooperation with external partners depends on the choice Russian companies are making regarding the traditional and open approach to innovations. The optimal ratio between open and closed approaches to company's innovation strategy is understudied question (Enkel et al, 2010). However, the role of cooperation is the distinctive factor for these strategies comparison.

Key Findings

The role of R&D cooperation is studied in many research papers (Suzumura, 1992; Leiponen, 2001; Tether, 2002; Veugelers and Cassiman, 2005), they support the evidence that cooperation on R&D with suppliers, customers, or research institutes and universities is important for innovating companies. The role of external cooperation is very important for the most successful Russian firms, and also influence the creation of radically new products (Smirnova, et al., 2009). Based on this background, the role of cooperation on innovation with external was analyzed. Following our observations, the more company is enrolled into the innovations process, the more sophisticated innovation models they implement, and the more significant cooperation is for companies.

Figure 3 Involvement of external partners on the different stages of R&D process



The share of companies implementing the internal R&D is high in the sample – 78.6 % (Table 1). The share of companies which launched new or significantly modified products (services, concepts of products/services) in 2006-2008 was 89.3 %. The share is significantly higher, than found in the other studies about NPD in Russia - 38.8 % of companies with NPD (Dynkin and Ivanova, 1998) and 59 % in the work of Kadochnikov (2004). 80.6 % of companies in the sample implemented new or significantly improved technologies or production processes in 2006 – 2008. The products were developed mostly by company itself (65.5 %). 36.1 % of companies developed new products (services) in cooperation with external partners.

The open innovation strategies implantation was analyzed with the simplified framework propose by Gassman's and Enkel's (2004) - outside-in process (external technology search and acquisition), inside-out process (transfer of innovations to the market) and combination of outside-in and inside-out processes (table 1). 31.1 % of companies sin the sample acquire external technology, and 13.1 % of companies commercialize their innovations to the market. The combination of the outside-in and inside-out is valid for 6.8 % of companies.

The main assumption of this research paper is to prove the important role of cooperation for companies with open innovation strategies compared with companies focusing on the traditional approach to innovations: *The companies more successful in cooperation with external stakeholders are more actively implement the open innovation approach.* The research aims to contribute to the following research proposition: 1. Companies with experience in internal R&D value more the cooperation with external partners and their cooperation is more successful, than companies without internal R&D; 2. The importance and the success of cooperation with external partners is more significant for those companies who introduce the more diversified innovation strategy such as open innovation; 3. The physical distance factor matters: For companies the cooperation with external domestic partners is more important and more successful, than with foreign partners.

Cooperation with external partners

The results of analysis of the share of companies involving external partners in collaboration among companies with internal R&D, external technology acquisition (ETA), technology commercialization (TC) and open innovation (OI) strategy reveal a clear trend –companies following the OI strategy have on average higher share of partners involved in the innovation activities (Table 2). The share of external partners by the companies with OI strategy is particularly high in case of supplies in Russia and R&D partners, as well as consultants. Interesting result is that customers are not among the most actively involved groups of partners by OI companies.

The results presented in the Table 2 support the Hypothesis 2: the trend of increase in share of involved partners for companies with more diversified open innovation strategy and Hypothesis 3: the companies cooperate more intensively with suppliers, client and intermediaries in Russia, than with those abroad. The same conclusion can be dome for the competitors, except for the companies with OI.

Table 2 Intensity of involvement of external partners, %

Type of partner	Innovation Strategy			
	Internal R&D	ETA	TC	OI
Suppliers in Russia	50,0	59,4	70,4	85,7
Suppliers abroad	22,2	32,8	40,7	57,1
Clients in Russia	55,6	45,3	59,3	57,1
Clients abroad	23,5	28,1	33,3	42,9
R&D partners	52,5	62,5	63,0	85,7
Intermediaries in Russia	27,8	34,4	37,0	57,1
Intermediaries abroad	14,8	20,3	37,0	50,0
Stakeholders	24,7	34,4	44,4	50,0
Competitors in Russia	13,6	17,2	22,2	28,6
Competitors abroad	7,4	15,6	18,5	28,6
Consultants	42,0	48,4	59,3	71,4
External commercial R&D organizations	28,4	39,1	44,4	64,3
State R&D centers	33,3	40,6	48,1	71,4
Universities	28,4	32,8	37,0	42,9
Partners in JVs	27,8	40,6	44,4	64,3
Other partners not included in list	20,4	28,1	44,4	64,3
<i>Mean</i>	29,5	36,2	44,0	57,6

Cooperation with external partners for companies with internal R&D

Cooperation with external stakeholders was assessed on the base of analysis of importance of collaboration with given group of external partners and perceived success of collaboration with these partners. Table 3 represents the results of comparison of importance and success of collaboration between firms with and without internal R&D. Additional comparison opportunity is provided by results for the whole sample.

Table 3 Intensity of involvement, importance and success of cooperation with external partners. Case of companies with internal R&D

Type of partner	% ¹	Importance of collaboration				Success of collaboration			
		Whole sample	Int R&D	No int R&D	T-test	Whole sample	Int R&D	No int R&D	T-test
		Mean	Mean	Mean	Sig	Mean	Mean	Mean	Sig
Suppliers in Russia	50,0	3,9	4,0	3,6	0,194	4,0	4,1	3,5	0,049
Suppliers abroad	22,2	3,8	3,9	3,0	0,078	3,8	3,9	3,4	0,356
Clients in Russia	55,6	4,2	4,3	3,8	0,054	4,1	4,2	3,6	0,017
Clients abroad	23,5	3,9	4,0	3,1	0,101	3,7	3,8	3,1	0,256
R&D partners	52,5	4,3	4,4	3,4	0,000	4,2	4,4	3,2	0,000
Intermediaries in Russia	27,8	4,0	3,9	4,1	0,676	3,7	3,7	3,8	0,776
Intermediaries abroad	14,8	3,7	3,8	3,1	0,233	3,4	3,5	3,1	0,576
Stakeholders	24,7	3,9	4,0	3,7	0,448	3,9	4,0	3,5	0,364
Competitors in Russia	13,6	3,6	3,5	3,7	0,683	3,3	3,3	3,4	0,747
Competitors abroad	7,4	3,2	3,2	3,2	0,975	2,8	2,8	3,0	0,820
Consultants	42,0	3,9	4,0	3,7	0,264	3,7	3,8	3,6	0,503
External commercial R&D organizations	28,4	3,9	4,0	3,7	0,507	3,8	3,9	3,3	0,141
State R&D centers	33,3	4,0	4,1	3,8	0,541	3,8	3,9	3,7	0,451
Universities	28,4	3,9	3,9	3,7	0,429	3,6	3,7	3,5	0,611
Partners in JVs	27,8	3,9	4,0	3,4	0,188	3,9	4,1	2,9	0,007
Other partners not included in list	20,4	3,8	3,8	3,2	0,244	3,8	3,9	3,2	0,277
<i>Mean</i>	<i>29,5</i>	<i>3,9</i>	<i>3,9</i>	<i>3,5</i>		<i>3,7</i>	<i>3,8</i>	<i>3,4</i>	

There are not many statistically significant differences in perceived importance and success of collaboration with partners by firms with and without internal R&D. Generally, importance of collaboration in the sphere of innovations is perceived almost equally important by all the firms in the sample, with the only case when firms with internal R&D have higher importance of collaboration – in case of external R&D partners. The means of importance of collaboration varies insignificantly among the groups of partners with relatively highest mean in case of collaboration with customers in Russia. Success of collaboration though is perceived differently. There is statistically significant between firms with and without internal R&D in case of success of collaboration with suppliers and clients in Russia, R&D partners and partners in joint ventures. Descriptive summaries of each of columns show that in case of firms with no internal R&D generally both importance of collaboration and perceived success have lower scores as in case of firms with internal R&D.

The results presented in the Table 3 support the Hypothesis 2: the trend of increase in importance and success of cooperation partners for companies with internal R&D compared with companies without internal R&D. The Hypothesis 3 is supported as well: the cooperation importance and success is higher when companies cooperate with domestic suppliers, client, competitors and intermediaries, than with those abroad.

Cooperation with external partners for companies with inbound open innovation

¹ % means the share of companies involving this type of partners among companies with internal R&D; Int R&D – results for companies with internal R&D; No Int R&D – results for companies without internal R&D; T-test - T-test for differences in means between firms with and without internal R&D

The next step in analysis of collaboration with external partners was conducted as comparison between companies with and without external technology acquisition (see Table 4).

Table 4 Intensity of involvement, importance and success of cooperation with external partners. Case of companies with ETA

Type of partner	%	Importance of collaboration				Success of collaboration			
		Whole sample Mean	ETA Mean	No ETA Mean	T-test Sig	Whole sample Mean	ETA Mean	No ETA Mean	T-test Sig
Suppliers in Russia	59,4	3,9	4,2	3,7	0,058	4,0	4,2	3,9	0,236
Suppliers abroad	32,8	3,8	3,9	3,6	0,505	3,8	3,7	3,9	0,668
Clients in Russia	45,3	4,2	4,2	4,2	0,731	4,1	4,0	4,1	0,703
Clients abroad	28,1	3,9	4,0	3,8	0,648	3,7	3,5	3,9	0,321
R&D partners	62,5	4,3	4,5	4,1	0,072	4,2	4,4	4,1	0,132
Intermediaries in Russia	34,4	4,0	4,1	3,9	0,482	3,7	3,9	3,5	0,167
Intermediaries abroad	20,3	3,7	3,9	3,6	0,448	3,4	3,5	3,3	0,584
Stakeholders	34,4	3,9	4,3	3,6	0,071	3,9	4,3	3,5	0,073
Competitors in Russia	17,2	3,6	3,6	3,5	0,825	3,3	3,4	3,3	0,780
Competitors abroad	15,6	3,2	3,4	2,7	0,249	2,8	3,1	2,3	0,199
Consultants	48,4	3,9	4,2	3,8	0,046	3,7	4,0	3,6	0,145
External commercial R&D organizations	39,1	3,9	4,3	3,6	0,036	3,8	4,3	3,5	0,011
State R&D centers	40,6	4,0	4,2	3,9	0,376	3,8	4,1	3,7	0,219
Universities	32,8	3,9	4,0	3,8	0,411	3,6	3,9	3,5	0,258
Partners in JVs	40,6	3,9	4,1	3,7	0,168	3,9	4,3	3,4	0,012
Other partners not included in list	28,1	3,8	4,2	3,3	0,053	3,8	4,1	3,5	0,201
<i>Mean</i>	36,2	3,9	4,1	3,7		3,7	3,9	3,6	

Comparing the firms acquiring external technologies and those without ETA, some cases of differences in perceived importance of collaboration and success of collaboration can be marked. Thus firms acquiring external technologies place higher importance on collaboration with consultants and external commercial R&D organizations. They also perceive higher success in collaborating with external commercial R&D organizations and partners in joint ventures. There are more cases of differences among groups of firms which could be identified at the level $p < 0.1$. Overall results (summary line at the end of the table) indicate again that firms with ETA share higher perceived importance and success of collaboration with external partners vis-à-vis other firms. The cooperation importance and success is higher when companies with ETA and without ETA cooperate with domestic suppliers, client, competitors and intermediaries, than with those abroad (Hypothesis 3).

Cooperation with external partners for companies with outbound open innovation

Finally, we have compared collaboration with external partners between the firms with and without technology commercialization (see Table 5).

Table 5 Intensity of involvement, importance and success of cooperation with external partners. Case of companies with technology commercialization

Type of partner	%	Importance of collaboration				Success of collaboration			
		Whole sample Mean	TC Mean	No TC Mean	T-test Sig	Whole sample Mean	TC Mean	No TC Mean	T-test Sig
Suppliers in Russia	70,4	3,9	4,1	4,0	,480	4,0	4,0	4,0	,926
Suppliers abroad	40,7	3,8	3,7	3,8	,924	3,8	3,7	3,8	,664
Clients in Russia	59,3	4,2	4,4	4,2	,494	4,1	4,3	4,0	,378
Clients abroad	33,3	3,9	3,9	3,9	,947	3,7	3,7	3,7	,908
R&D partners	63,0	4,3	4,1	4,3	,412	4,2	3,9	4,2	,234

² % means the share of companies involving this type of partners among companies with ETA; ETA – results for companies with ETA; No ETA– results for companies without ETA; T-test - T-test for differences in means between firms with and without ETA

³ % means the share of companies involving this type of partners among companies with TC; TC– results for companies with TC; No TC– results for companies without TC; T-test - T-test for differences in means between firms with and without TC

Intermediaries in Russia	37,0	4,0	3,9	3,9	,942	3,7	4,0	3,6	,313
Intermediaries abroad	37,0	3,7	3,8	3,7	,824	3,4	3,6	3,3	,564
Stakeholders	44,4	3,9	3,9	3,9	,838	3,9	3,8	3,9	,727
Competitors in Russia	22,2	3,6	3,4	3,6	,640	3,3	3,3	3,3	,845
Competitors abroad	18,5	3,2	3,2	3,2	,974	2,8	2,8	2,8	,966
Consultants	59,3	3,9	3,6	4,0	,107	3,7	3,6	3,8	,607
External commercial R&D organizations	44,4	3,9	4,0	3,9	,807	3,8	4,0	3,7	,590
State R&D centers	48,1	4,0	3,7	4,1	,263	3,8	3,6	3,9	,297
Universities	37,0	3,9	3,5	3,9	,251	3,6	3,7	3,6	,986
Partners in JVs	44,4	3,9	3,6	4,0	,217	3,9	3,8	3,9	,930
Other partners not included in list	44,4	3,8	3,6	3,8	,711	3,8	3,6	3,8	,615
<i>Mean</i>	<i>44,0</i>	<i>3,9</i>	<i>3,8</i>	<i>3,9</i>		<i>3,7</i>	<i>3,7</i>	<i>3,7</i>	

In case of analysis of technology commercialization the results reveal no differences in perceived importance and success of collaboration with external partners between the groups of firms. The highest means as expected obtains collaboration with clients in Russia, but also various forms of collaboration with R&D partners has relatively higher scores.

Cooperation with external partners. Companies with inbound and outbound innovation

To make overall conclusions we have split the sample on the base of open innovation strategy criteria, in other words in companies applying all the three elements (internal R&D, technology commercialization and external technology acquisition) and those who have either some or no of these elements. This analysis allows testing assumption that only all the elements implemented by a company can lead to difference in collaboration policy with external partners. Results of this overall analysis are presented in Table 6.

While this overall assumption on the role of open innovation strategy elements combination in shaping company's collaboration with external stakeholders no strong evidence was found to support it. In fact that results confirm statistically significant difference between firms with OI strategy and without OI strategy – in case of collaboration with external commercial R&D organizations, the overall trend identifies higher scores both on importance and perceived success of collaboration by firms following OI strategy.

Table 6 Intensity of involvement, importance and success of cooperation with external partners. Case of companies with open innovation strategy

Type of partner	% ⁴	Importance of collaboration				Success of collaboration			
		Whole sample Mean	OI Mean	No OI Mean	T-test Sig	Whole sample Mean	OI Mean	No OI Mean	T-test Sig
Suppliers in Russia	85,7	3,9	4,7	3,9	0,075	4,0	4,3	3,9	,285
Suppliers abroad	57,1	3,8	4,0	3,7	0,552	3,8	3,8	3,8	,846
Clients in Russia	57,1	4,2	4,6	4,2	0,301	4,1	4,4	4,0	,347
Clients abroad	42,9	3,9	4,3	3,8	0,421	3,7	3,7	3,7	,991
R&D partners	85,7	4,3	4,5	4,3	0,516	4,2	4,5	4,1	,300
Intermediaries in Russia	57,1	4,0	4,2	3,9	0,487	3,7	4,3	3,6	,083
Intermediaries abroad	50,0	3,7	4,2	3,6	0,221	3,4	4,0	3,2	,150
Stakeholders	50,0	3,9	4,4	3,8	0,308	3,9	4,7	3,8	,115
Competitors in Russia	28,6	3,6	3,5	3,6	0,862	3,3	3,3	3,3	,905
Competitors abroad	28,6	3,2	3,5	3,1	0,515	2,8	3,1	2,7	,542
Consultants	71,4	3,9	4,1	3,9	0,585	3,7	4,2	3,7	,192
External commercial R&D organizations	64,3	3,9	4,7	3,8	0,033	3,8	4,7	3,7	,019

⁴ % means the share of companies involving this type of partners among companies with OI; OI– results for companies with OI; No OI– results for companies without OI; T-test - T-test for differences in means between firms with and without OI

State R&D centers	71,4	4,0	4,3	3,9	0,424	3,8	4,0	3,8	,758
Universities	42,9	3,9	4,3	3,8	0,331	3,6	4,4	3,6	,102
Partners in JVs	64,3	3,9	4,0	3,9	0,830	3,9	4,4	3,8	,137
Other partners not included in list	64,3	3,8	4,3	3,6	0,133	3,8	4,4	3,6	,222
<i>Mean</i>	<i>57,6</i>	<i>3,9</i>	<i>4,2</i>	<i>3,8</i>		<i>3,7</i>	<i>4,1</i>	<i>3,6</i>	

Discussion

Companies from transitional economies, such as Russia, experience pressure from the both global turbulence of the market and from the ongoing transformation process within companies. Companies need more resources to compete with foreign rivals and need more knowledge to fulfil the innovation gap caused by the centrally planned economy heritage. Developing the cooperation skills and increasing the innovativeness provides opportunity for companies to compete successfully both on domestic and international markets.

As discussed earlier, the role of cooperation depends on the type of innovation (Srivatas and Dwyer, 2000; Nord and Tucker, 1987; Smirnova, et als, 2009). The role of R&D cooperation is studies in many scientific papers (Suzumura, 1992; Leiponen, 2001; Tether, 2002; Veugelers and Cassiman, 2005), they support the evidence that cooperation on R&D with suppliers, customers, or research institutes and universities is important for innovating companies. The initial findings of this paper show how the process of cooperation is developing in Russia. Our analysis proved that importance of cooperation with external partners, differs for companies with different innovation strategies. Cooperation is important for all companies (5-point Likert scale; not important, absolutely important), however, the clear difference is observed for companies, grouped based on their innovation strategies.

Our main assumption has been that following at least some of the open innovation strategy elements would have impact on company's collaboration policy in regard to external stakeholders. Summing up the findings, we may conclude that all in one, the results show that firms with OI involve more actively external partners (as Table 2).

Research proposition on the role of internal R&D in reliance on cooperation has been supported by study results. We also see that importance of cooperation is more significant for those companies who introduce the more diversified innovation strategy and particularly external technology acquisition. Our results also reveal that physical distance factor matters: thus companies value higher cooperation with domestic partners than with foreign partners. Indeed, for Russian firms collaboration seems to mean first of all collaboration with local partners.

Conclusion

This study has shown that cooperation with external partners play important role for open innovation implementation. The results of the study show that companies with more open and sophisticated innovation strategies tend to indicate higher importance of cooperation. The open innovation theory puts cooperation on the mile stone place in the process of implementing open innovation principles in practice. The logic behind this statement is defined by the nature of this externalization process – the acting through the companies' borders on all stages of innovation process always involve certain level of cooperation with external partners. In addition, the effect of partner location was found in the data analysis. The companies value more the cooperation with domestic suppliers, than foreign suppliers. This is explained by the easier transfer of knowledge locally due to proximity, better communication and cultural similarity.

This study has shown that cooperation with external partners (on the example of suppliers) plays an important role for open innovation implementation. Open innovation considers inbound innovation – search and acquisition of external knowledge, R&D and technology, outbound innovation – promoting the internal innovation through external commercialization channels, and coupled process – combination of inbound and outbound innovation. The role of cooperation for increasing innovativeness of companies is seen even more important for companies from the transition economies, because the issue of competing on the local and international markets is of extreme

importance there. Companies from transitional economies, such as Russia, experience pressure from the both global turbulence of the market and from the ongoing transformation process within companies. Developing the cooperation skills and increasing the innovativeness provides opportunity for companies to compete successfully both on domestic and international markets.

The results are crucially important to managers because they show how cooperation matters for companies with different innovation strategies. These insights are essential especially now, when the internationalization of Russian companies is increasing on the international markets and their business strategies are interesting for other participants of the global markets. Based on the findings of this paper, we foresee the more detailed future research into the cooperation with different types of stakeholders and open innovation paradigm implementation.

Based on the findings of this paper, we foresee the more extensive future research both conceptual and empirical on cooperation with different types of stakeholders and open innovation paradigm implementation.

References

- Andrew J. P., Sirkin H. L. and Butman J. (2006). *Payback: Reaping the rewards of innovation*, Harvard Business School Press.
- Baglieri E., Zamboni S. (2005). Partnering along the demand chain: collaboration in new product development process, 21st IMP Conference Proceedings.
- Bayona C., García-Marco T. and Huerta E. (2001). Firms' motivations for cooperative R&D: an empirical analysis of Spanish firms, *Research Policy*, Volume 30, Issue 8, October 2001, Pages 1289-1307
- Belderbos, Ren'é, Martin Carree, Bert Diederer, Boris Lokshin, and Reinhilde Veugelers (2004a) Heterogeneity in R&D Cooperation Strategies, *International Journal of Industrial Organization*, 8/9, 1237–1264.
- Belderbos, R, Carree, M. and Lokshin, B. (2004b). Cooperative R&D and Firm Performance. *Research Policy*, 33(10), 1477–1492.
- Cassiman B. and R. Veugelers, 2002, R&D Cooperation and Spillovers: Some Empirical Evidence from Belgium, *American Economic Review*, 92, 4, 1169-1184.
- Blomqvist K. and Levy J. (2006). Collaboration capability – a focal concept in knowledge creation and collaborative innovation in networks, *International Journal of Management Concepts and Philosophy*, Vol. 2, No. 1, pp. 31-48.
- Cervantes, M. and Malkin, D. (2001) Russia's Innovation Gap, Organization for Economic Cooperation and Development, *The OECD Observer*, Nov 2001, 229-239
- Chesbrough, H.W. and Prencipe, A. (2008). Networks of innovation and modularity: a dynamic perspective. *International Journal of Technology Management*, 42, 4, 414–425.
- Chesbrough, H. (2007) Why companies should have open innovation business models, *MIT Sloan Management Review*, 48, 2, pp. 22-28,
- Chesbrough, H. (2006). *Open Business Models: How to Thrive in the New Innovation Landscape*. Harvard Business School Press, Boston, Massachusetts. 256 p.
- Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business Press, Boston, Massachusetts. 227p.
- Christensen, C. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business School Press, Boston, MA, USA
- Clark K. and Fujimoto T. (1991). *Product development performance*, Boston, MA: Harvard Business School Press.
- Cohen, W.M. and Levinthal D.A. (1990). Absorptive Capacity - A New Perspective on Learning and Innovation, *Administrative Science Quarterly*, 35, 1, 128-152.
- Deck, M. and Strom, M. (2002). *Research-Technology Management*, Volume 45, Number 3, 1, pp. 47-53.
- De Propriis, L. (2002). Types of innovation and inter-firm co-operation. *Entrepreneurship & Regional Development*, 14: 337 – 353.
- Desai, R. and Goldberg, I. (eds.) (2007), *Enhancing Russia's Competitiveness and Innovative Capacity*, Finance and Private Sector Development Department, World Bank, Washington D.C
- Dittrich, K. and Duysters, G. (2007) Networking as a means to strategy change: the case of open innovation in mobile telephony. *Journal of Product Innovation Management*, 24, 6, 510–521.
- Dodgson, M. (1993), *Technological Collaboration in Industry*, Routledge, London.

- Dyer, J. and H. Singh (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage, *Academy of Management Review*, 23(4), pp. 660–679.
- Dynkin, A., and Ivanova, N. (1998) Technological Innovation in Russia, *Research Technology management*, 41 (Jan/Feb): 44-47.
- Enkel, E. and Gassmann, O. (2008) Driving open innovation in the front end. The IBM case. Working Paper University of St. Gallen and Zepplin University, St. Gallen and Friedrichshafen.
- Enkel E., Gassmann O. and Chesbrough H. (2009) Open R&D and open innovation: exploring the phenomenon, *R&D Management*, 39, 4, 2009
- Enkel E., Gassmann, O. and Chesbrough, H., The Future of Open Innovation. *R&D Management*, Vol. 40, Issue 3, pp. 213-221, June 2010.
- Falke, M., (2002). Community Interests: An Insolvency Objective in Transition Economies?, No. 01/02, Frankfurter Institut für Transformationsstudien.
- Faria, P. and Schmidt, T., (2007). International Cooperation on Innovation: Empirical Evidence for German and Portuguese Firms, ZEW Discussion Papers 07-060, ZEW - Zentrum für Europäische Wirtschaftsforschung / Center for European Economic Research.
- Filipescu, D. (2007). Innovation and Internationalisation. A focus on the Spanish exporting firms, Research work, Doctoral programme: Creation, strategy and management of the firm, Universitat Autònoma de Barcelona, Business Economics Department;
- Ford D. and Johnsen T. (2001). Managing networks of supplier and customer relationships for technological innovation: initial case study, 17th IMP Conference Proceedings.
- Frascati Manual (1993). The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys of Research and Experimental.
- Freeman, C. (1982), *The Economics of Industrial Innovation*, Frances Pinter, London.
- Freytag V. (2002). Innovation in co-operation and co-operation innovation, 18th IMP Conference Proceedings, Dijon, France.
- Freeman, C., Hagedoorn, J. (1994), "Catching up or falling behind: patterns in international interfirm technology partnering", *World Development*, Vol. 22 No.5, pp.771-80.
- Gassmann, O. and Enkel E. (2004) Towards a Theory of Open Innovation: Three Core Process Archetypes, paper presented at R&D Management Conference.
- Gemunden H. G., Ritter T. and Heydebreck P. (1996) Network configuration and innovation success: an empirical analysis in German high-tech industries. *International Journal of Res Marketing*;13(5):449– 62.
- Goldman, Sachs (2003). Dreaming with BRICs: The Path to 2050. [Online]. Available at: <http://www2.goldmansachs.com/ideas/brics/brics-dream.html>.
- Hagedoorn, J. and Shekenraad, J. (1994) The effect of strategic technology alliances on company performance, *Strategic Management Journal*, 15: 4, pp. 291-309
- Hagedoorn, J. (2002). Inter-firm R&D partnerships: an overview of major trends and patterns since 1960, *Research Policy*, Elsevier, vol. 31(4), pages 477-492.
- Hakansson, H. and Eriksson, A-K. (1993). Getting innovations out of supplier networks, *Journal of Business-to Business Marketing*, Vol. 1 (3), pp. 3-34.
- Holmes S. and Smart P. (2009) Exploring open innovation practice in firm-nonprofit engagements: a corporate social responsibility perspective, *R&D Management* 39, 4.
- Johnsen T. and Ford D. (2000). Managing collaborative innovation in complex networks: findings from exploratory interviews. U.K: 16th IMP-conference in Bath, 2000.
- Johanson, J., J-E. and Vahlne (1977) The Internationalization Process of the Firm - A Model of Knowledge Development and Increasing Market Commitment, *Journal of International Business Studies*, Vol. 8, 23-32.
- Johanson, M. (2007). Networks in Transition, Proceedings of the 23th IMP Conference, Manchester Business School, UK.
- Kadochnikov, S., Essine, P. and Slobodyan, S. (2004) What explains the product differentiation of Russian companies: competitive pressure or technological spillovers? *CERGE-EI Policy Brief*, 3 (June): 1-3.
- Kaufmann, A. and Todtling, F. (2001). Science-industry interaction in the process of innovation: the importance of boundary-crossing between systems, *Research Policy*, Elsevier, vol. 30(5), pages 791-804.
- Keupp M. M. and Gassmann O. (2009) Determinants and archetype users of open innovation, *R&D Management* 39, 4.
- Klevorick, A.K. et al. (1995) On the sources and significance of interindustry differences in technological opportunities, *Research Policy*, 24, 185-205.
- Klomp, L. and van Leeuwen G. (2001) 'Linking Innovation and Firm Performance: A New Approach', *International Journal of the Economics of Business*, 8(3), 343–364.

- Kock C. and Torkkeli M. (2008) Open Innovation: A “Swingers’ Club” or “Going steady”?, IE Business School Working paper WP08-11, 05.02.2008
- Kornai, J. (1990). The Affinity between Ownership Forms and Coordination Mechanisms: The Common Experience of Reform in Socialist Countries. *Journal of Economic Perspectives*, 4 (3), p. 131-47.
- Kotler F. and Caslione J. (2009). *Chaotics: The Business of Managing and Marketing in The Age of Turbulence*, Amacom Publishing; May 2009.
- Laursen, K. and Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms, *Strategic Management Journal*, Vol. 27 No. 2, pp. 131-50.
- Leiponen, A. (2001) Why do firms not collaborate? The role of competencies and technological regimes In: A. Kleinknecht and P. Mohnen, Editors, *Innovation and Firm Performance: Econometric Exploration of Survey Data*, Palgrave (2001), pp. 253–277.
- Lichtenthaler, U. and Ernst, H. (2007) External technology commercialisation in large firms, results of a quantitative benchmarking study. *R&D Management*, 37, 5, pp. 383-397.
- Lichtenthaler U. (2009) Outbound open innovation and its effect on firm performance: examining environmental influences, *R&D Management* 39, 4.
- Lin, P. and Saggi, K. (2002) Under-provision of Inputs in Joint Ventures with Market Power, *Bulletin of Economic Research*, Blackwell Publishing, vol. 54(2), pages 189-96, April.
- Loof, H. and Heshmati, A. (2002). Knowledge Capital and Performance Heterogeneity: A Firm-level Innovation Study, *International Journal of Production Economics*, 76(1), 61–85.
- Luecke, R. and Katz R. (2003). *Managing Creativity and Innovation*. Boston, MA: Harvard Business Lundvall, B. A., Johnson, B., Andersen, E.S. and Dalum B. (2002). National systems of production, innovation and competence building, *Research Policy*, Vol. 31, pp. 213–231.
- Miles, R. E., Miles G. and Snow C. C. (2004). *Collaborative Entrepreneurship. How Groups of Networked Firms Use Continuous Innovation to Create Economic Wealth?* Stanford University Press.
- Miotti, L. and Sachwald, F. (2003). Co-operative R&D: why and with whom? An integrated framework of analysis. *Research Policy*, 32: 1481 – 1499.
- Nord, W.R., Tucker, S., 1987. *Implementing Routine and Radical Innovations*. Lexington Books, Lexington, MA.
- Neyer A.K., Bullinger A. C. and Moeslein K. M. (2009) Integrating inside and outside innovators: a sociotechnical systems perspective, *R&D Management* 39, 4;
- Oslo Manual (2007): *Guidelines for Collecting and Interpreting Innovation Data*, 3rd Edition.
- Porter, M.E., 1979. How competitive forces shape strategy, *Harvard business Review*, March/April. Robinson, R. (1988). *The International Transfer of Technology: Theory, Issues, and practice*, Ballinger Publishing Company, Cambridge, Massachusetts
- Rominj H. and Albaladejo, M. (2002). Determinants of Innovation Capability in Small Electronics and Software Firms in Southeast England, *Research Policy*, Amsterdam; Sep; Vol. 31 (7); pp. 1053-1067.
- Salmi P. and Torkkeli M. (2009) Success factors of interorganisational knowledge transfer: a case of a collaborative public–private R&D project, *International Journal of Business Innovation and Research* 2009 - Vol. 3, No.2 pp. 109 - 125
- Sandberg, B. (2005) *The Hidden Market – Even for those who create it? Customer-Related Proactiveness in Developing Radical Innovations*. DSc. Econ. Dissertation. Publications in the Turku School of Economics and Business Administration Series A-5: Turku, Finland.
- Schmidt, T. (2007), “Motives for Innovation Co-operation - Evidence from the Canadian Survey of Innovation”, ZEW Discussion Paper No. 07-018, Mannheim.
- Silva, M.J. and Leitao, J. (2007) Determinants of Innovation Capability in Portuguese Industrial Firms: A Logit Approach, proceeding of EAEPE Conference «Economic growth, development, and institutions - lessons for policy and the need for an evolutionary framework of analysis», 1-3, November, Porto, Portugal
- Smirnova, M. M., Podmetina, D.; Vaatanen, J. and Kouchtch, S. (2009) Key stakeholders' interaction as a factor of product innovation: the case of Russia, *International Journal of Technology Marketing* pp. 230-247(18).
- Smith P. G. and Blanck E. (2002) From experience: leading dispersed teams. *The Journal of Product Innovation Management* 19(4), 294–304.
- Kotaro Suzumura K. (1992) Cooperative and Noncooperative R&D in an Oligopoly with Spillovers *The American Economic Review*, Vol. 82, No. 5 (Dec., 1992), pp. 1307-1320.
- Tether, B. (2002) Who co-operates for innovation, and why. An empirical analysis, *Research Policy*, Amsterdam; Vol. 31; pp. 947-967.
- Torkkeli M., Podmetina D. and Väättänen J. (2009). Knowledge Absorption in Emerging Economy –Role of Foreign Investments and Trade Flows in Russia, *International Journal of Business Excellence*, Vol 2 No ¾.

- Veugelers, R. (1997) Internal R&D expenditures and external technology sourcing, *Research Policy*, Elsevier, vol. 26(3), pages 303-315, October
- Veugelers, R. and Cassiman, B. (1999) Make and buy in innovation strategies: evidence from Belgian manufacturing firms, *Research Policy*, Elsevier, vol. 28(1), pages 63-80, January
- Veugelers, R. and Cassiman, B. (2005). R&D cooperation between firms and universities: some empirical evidence from Belgian manufacturing, *International Journal of Industrial Organization*, vol. 23, N° 5-6, pp. 355 - 379.
- Vaatanen, Juha (2008). Russian Enterprise Restructuring - the Effect of Privatisation and Market Liberalisation on the Performance of Large Enterprises. Dissertation. Lappeenranta University of Technology.
- Vivero, Rafael (2004). The Impact of Process Innovations on Firm's Productivity Growth: The Case of Spain, *Applied Economics*, 34, 1007–1016.
- von Hippel, E. and von Krogh, G. (2006) Free revealing and the private collective model for innovation incentives. *R & D Management*, 36(3): 295-306.
- von Hippel, Eric, *The Sources of Innovation*, Oxford University Pre New York, 1988.
- Walter, A., Ritter, T. and Gemunden, H.G. (2001). Value-creation in buyer-seller relationships: theoretical considerations and empirical results from a supplier's perspective. *Industrial Marketing Management*, Vol. 30, No. 4, pp. 365-377
- Wheelright, S. and Clark K. (1992), *Revolutionizing Product Development, Quantum Leaps In Speed, Efficiency, And Quality*. New York: The Free Press.

Appendices

Appendix 1 Structure of the Questionnaire

<i>Sections</i>	<i>Content</i>
Section 1	Company profile
Section 2	General information about company (age, ownership, privatisation data, number of employees, level of education, B2B or B2C orientation, main clients, and main markets, etc).
Section 3	Information about strategy of a firm, competition, and orientation.
Section 4	Innovation activities – goals and objectives of innovations, barriers and constraints, motivation of innovations, and conducting internal R&D. This section consists of sub-sections: A – Product innovations, B – Technology innovations, C – Technology and innovation search and acquisition, D – Technology commercialization, E – Organizational Innovations, F – Marketing Innovations, G – Innovation output, H – Innovation costs.
Section 5	Data on the cooperation of companies in innovation process. This section includes sub-sections: A – The role of cooperation within the company in case of research and development, B – The role of cooperation within external partners in case of R&D.
Section 6	Information of companies' international operations.
Section 7	Data on the market from the company's point of view
Section 8	The quantitative characteristics of the company
Section 9	Information about the respondent.
Section 10	Feedback about the survey.

Source: Russian Companies Innovation Survey, 2009-2010 (own)

Appendix 2

<i>Key Industries</i>	<i>%</i>
Metallurgy	17.5
Machine building	13.6
Electronics and optics equipment	11.2
IT and telecommunications	10.2
Chemical industry	10.2
Electronic equipment	7.3
Rubber and plastic industry	3.9
Aircraft	3.9
<i>Ownership type</i>	
New companies (after 1991)	86.4
Privatized companies	12.6
State companies	1.0
<i>Number of employees</i>	
less than 20	5.4
from 20 to 50	5.9
from 50 to 100	5.4
100-250	27.3
from 100 to 500	11.7
from 500 to 1000	21.0
From 1000 to 3000	13.2

more than 3000	10.2
<i>Key regions</i>	
Saint-Petersburg and region	29.1
Yekaterinburg and region	14.6
Nizhniy Novgorod and region	13.6
Samara and region	11.2
Rostov-on-Don and region	9.7
Krasnoyarsk and region	5.8
Saratov and region	5.3
Perm and region	3.9
Novosibirsk and region	3.4
Tatarstan and region	2.4

Source: Russian Companies Innovation Survey, 2009-2010 (own)