LAPPEENRANTA UNIVERSITY OF TECHNOLOGY

Faculty of Technology Management - Department of Industrial Management

MASTER'S THESIS

APPLICATION OF OPEN INNOVATION PARADIGM IN SMALL AND MEDIUM ENTERPRISES IN RUSSIA

The subject of the thesis has been approved by the head of the Department of Industrial Management on the 2th of May 2011

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ABSTRACT

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The objective of this study is to explore how the Open Innovation paradigm is applied in by small and medium-size enterprises in Russia. The focus of the study is to understand how the processes of research and development and commercialization proceed in these kind of companies and to which extent they apply open innovation principles. Russian leadership makes certain steps for transition from the export of raw materials to an innovative model of economic growth. The research aims to disclose actual impact of these attempts.

The closed innovation model and the erosion factors which lead to the destruction of an old one and emergence of new model are described. Features of open innovation implementation and intellectual property rights protection in small and medium enterprises are presented.

To achieve the objective, a qualitative case study approach was chosen. Research includes facts and figures, views and opinions of management of studied companies related to innovation process in the company and in Russia in general.

The research depicts the features of Open Innovation implementation by SMEs in Russia. A large number of research centers with necessary equipment and qualified personnel allow case companies to use external R&D effectively. They cooperate actively with research institutes, universities and laboratories. Thus, they apply inbound Open Innovation. On the contrary, lack of venture capital, low demand for technologies within the domestic market and weak protection of intellectual property limit the external paths to new markets. Licensing-out and creation of spin-off are isolated cases. Therefore, outbound Open Innovation is not a regular practice.

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Vladislav Merzlyakov

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ABBREVIATIONS

CEO - Chief Executive Officer

OEM - Original Equipment Manufacturer

OI – Open Innovation

MNE – Multinational Enterprise

SME – Small and Medium-Sized Enterprises

IP – Intellectual Property

IPR - Intellectual Property Rights

IPO - Initial Public Offering

R&D – Research and Development

RTTN - Russian Technology Transfer Network

RVC - Russian Venture Company

UdSU – Udmurt State University

1 INTRODUCTION

1.1 Background

Mankind cannot live without changes and changes are impossible without innovation - its role in history is hard to overestimate. Ideas often get ahead of time, give a breakthrough to industries, and finally to a whole country. In this case, the owners of technology do their best to protect know-how and exclusive rights for their products. Secrets recipes are carefully preserved and handed down from a father to a son. However history reveals experience when parties were in win-win situation from sharing ideas and technologies with each other. An example of this can be the partnership between the Russian Emperor Peter the Great and Dutch colleagues. In return for the knowledge of sciences and shipbuilding obtained in the Netherlands, the Russian Tsar gave the Dutch navigators and traders significant benefits, rights and support in Russia. (Venevitinov, 1897)

Thus smart people sought to gain maximum benefit from cooperation, external relations, common ideas and interests. Now, in the 21st century, when information is transferred from a source to a receiver in a second, any person can be anywhere in the Earth quite easily, communication and relationships in the business cover many countries and regions, and economic trends are predominated by multinational enterprises (MNEs), the closed nature is not correlated with age.

Therefore it is possible to say that the closed business models lose their power, become irrelevant. The world is rapidly moving towards the destruction of borders between countries and nationalities. And business cannot stay unchangeable in the changing world.

Russia is the largest country in the world with powerful natural, economical and human resources. Russia is the birthplace of many great inventors and innovators – Mendeleev, Lomonosov, Tsiolkovsky, Korolev and many others (Chernyj, 2005).

Russia plays a significant role in the global economy. Vast territories with rich natural resources give the country certain advantages. However it is impossible to build the economy through the wealth of natural resources only, further development requires following an innovative way. Science base remains one of the strongest in the world and allows carrying out serious research and development in applied and fundamental sciences. It is vital to find the ways of realization for Russian science, its brains, and technologies.

The support of small business is crucial in national innovation system. Its contribution on January 1, 2009 accounted for 21% of total Russian GDP (OECD, 2009). The official Russian government bespeaks to support innovative small and medium enterprises (SME) and to create favorable conditions for the development of science and technology. Some activities are taken on the state level. (OECD, 2011) In 2011 more than 17.5 billion Rubles (approximately 435 million Euros) were allocated from the federal budget for the development of special economic zones, technoparks and science cities (STRF, 2011). In 2011 742 billion Rubles totally (approximately 18.5 billion Euros) from federal budget were allotted to innovations, which is approximately twice the amount of 2010 (Rbcdaily, 2011). On the initiative of President Medvedev the creation of Innovation center Skolkovo was launched. This project provides unique tax benefits, simplified regulatory processes and facilitation of interaction with authorities for its participants. (RIA Novosti, 2010a) The political leaders of Russian Federation have announced innovation as a national priority and a number of specific Presidential initiatives prove that it is not just rhetoric. (OECD, 2011) However, difficulties in developing of this direction have been identified. The current processes are ambiguous and require careful analysis. The objective of this work is to understand and represent how innovative SMEs operate in Russia and how they can apply the Open Innovation (OI) paradigm, what are the opportunities, constraints and prospects.

1.2 Research objectives, problem and question

Henry Chesbrough (2003, 2006a), the author of the term "Open Innovation", constructed the evidence based on the experience of large multinational companies such as Xerox, IBM Corporation, Procter & Gamble, Microsoft, etc. Academic community and practitioners support OI paradigm and quite many studies are dedicated to OI paradigm implementation; its features, limitations, possibilities and prospects in multinational enterprises are described explicitly. For the Russian market Open Innovation paradigm is still a fairly new concept. Assessment of OI is a new and pressing issue for the world and for Russia in particular. But there is limited number of studies devoted to OI in Russia (Torkkeli, Kock and Savitskaya, 2009; Podmetina et al., 2011; Podmetina, 2011). And only few researches explore OI implementation in SMEs in Russia (Savitskaya, 2009; Edelmann and Volchek, 2010). In addition, the existing studies devoted to innovation in SMEs in Russia mostly consider companies from Central or North-Western regions of Russia.

Researchers consider that OI in SMEs in Russia with practical examples remain the promising topic for the further study (Vanhaverbeke, Torkkeli and Trifilova, 2010). The goal of this work is to represent current trends, opportunities and challenges faced by SMEs operating in Russia and utilization of OI principles by them. The evidence is based on particular experience of innovative companies in Russia. This study examines companies from different parts of Russia, including the Asian part of the country.

When writing this work, I was guided by a desire to disclose the opinions of definite business people, their view on processes associated with innovation in their company and in the country in general. This research gives insight into the difficulties faced by SMEs in terms of innovations, development and promotion of new technologies, intellectual property (IP) protection. It helps to assess the possibility of applying the Open Innovation paradigm, prospects for the use of it and to evaluate the measures

taken in Russia for the development and support of Russian technologies and their actual effect.

The research itself sets the following main questions:

How is the Open Innovation paradigm used by SMEs in Russia?

- *What are the possibilities and limitations of applying the Open Innovation paradigm by SMEs in Russia?*
- *How do SMEs operating in Russia organize research and development (R&D) and subsequent commercialization of technology?*

1.3 Methodology

According to the specific research objectives for the study, multiple case studies were selected as a research strategy. (Yin, 1994) The purpose of data collection in multiple case studies is to replicate the phenomenon in a systematic way, to explore different dimensions or to examine different levels of research variables (Marschan-Piekkari & Welch, 2004) Research question is about “how” and “why”. (Yin, 1994) Control over behavioral events is not needed. In this research the phenomenon will be studied and objective to change existing models will not be pursued. Focus is on the contemporary events – work of Russian SMEs under existing conditions and applying Open Innovation by them.

The method of research execution enables to examine a contemporary phenomenon within its real-life context and allows to cover corresponding conditions – the conditions of doing business in Russia within the local and international environment. In addition, case study enables to use multiple sources of evidence. The strategy allows examining the issue of open innovations application in Russia from different perspectives, and reflecting the actual situation with innovation business in Russia. (Yin, 1994) Moreover, it is of highest importance to present the opinions of competent in the innovation field respondents, the technology market situation and

Russian peculiarities of doing innovation business. Case studies involve multiple sources in data collection such as verbal reports, personal interviews, observation and written reports (archives, financial reports, budget and operating statements). Triangulation is one of the defining features of a case study. (Marschan-Piekkari & Welch, 2004)

One of the most important issues in case studies is how to select cases. It is important to decide the target population for the research: firms, individuals, groups or elements that will be represented in the study. The cases should comply with theoretical framework and the variables. (Marschan-Piekkari & Welch, 2004)

For this study, SMEs of different sizes in various Russian regions, with different resources in different conditions and situations are selected. Selection takes place in such a way as to reflect the application of the Open Innovation paradigm from different angles. For the selection several criteria were used. First, it should be SME engaged in innovative activities. Second, different types of organizations should be considered. Third, they should represent different field of science. Fourth, it is useful if the study includes innovative companies of varying degree of success in order to understand where the problem is and what could be possible solution.

The selection of case companies took up more than one month. It was important to select companies that truly innovate, not just declare that they do that. Therefore before negotiations each company was carefully studied for innovative activity. A company has to be permanently engaged in new developments (no matter if it has internal or external R&D), to own intellectual property, to participate in scientific conferences or in any other kind of knowledge exchange.

BVN-Engineering was chosen as a company that represents light industry sector, textile manufacturing. It was selected as a medium-size company with a large number of external links. It is located in Rostov region, South Federal district. According to information found on the Internet, BVN-Engineering is active in seeking new

opportunities to realize their innovative potential (InTeh-Don, 2011; BVN Engineering, 2011). The choice of this case company is determined by the possibility to observe how a company, operating in Russia, can function under modern open principles of doing business

Kamsky Bereg Stankostroy represents the machinery sector, woodworking equipment, in particular. Company has a significant number of existing products and developments. It was selected as a middle-size company, actively engaged in new product development. It is located in Udmurt Republic, Volga Federal district. It was chosen to demonstrate how the traditional approach to innovation is working in Russia, when the whole cycle from idea to market is made by the company.

Prikladnaya Electronica is a small enterprise engaged in precision engineering. It is situated in Tomsk Region, Siberian Federal district. First of all, the company is interesting in terms of complete integration with research laboratory located in Siberian Branch of Russian Academy of Sciences.

Nanopowder Technology was chosen as a company engaged in solutions based on nano-materials. It is a micro enterprise which is located in Novosibirsk region, Siberian Federal district. Despite its size, the company has a significant reserve of development and it is always looking for partners to implement their ideas (Nanopowder Technology, 2011). This company was chosen because nanotechnologies in Russia are officially one of the priority directions; for the development of this scientific sphere the special organization RUSNANO was established, which is owned by the Russian government.

SonarSouce S.A. is different from other case companies. It is a micro Swiss IT company engaged in Open Source platform. One of the key employees of the company is working in Saint-Petersburg, Russia. And it is planned to open representative office there. This company was chosen due to several reasons: first, to show how Open principles of work can unite developers all over the world; second,

to demonstrate how foreign companies can successfully collaborate with Russian developers; third, to observe the differences of approaches and conditions between Russian and European innovative companies.

Engineering-chemical laboratory of the Udmurt State University is specialized in pipeline transport and heat transmission technologies. There are two regular and fifty part-time employees. The laboratory is located in Udmurt Republic, Volga Federal district. It was chosen in order to demonstrate how University science in Russia can profit from its developments.

Interview is applied for the research execution. Most case studies are about human affairs, and this research is not an exception (Yin, 1994). The study utilizes a focused interview with specific questions pursuing certain logic, as well as following open-ended and conversational manner, which enables to reflect the respondents' opinions on the problem. The choice of the method can be explained by the fact that the respondents are mostly either people heading the companies or senior top managers. Taking into account the tight schedules of such persons, the researcher has to follow certain logic and ask precise questions to prevent time-consuming.

Document observation is an important part of the study. In order to compile the whole picture of the situation with the innovations in Russia, a variety of the sources can be used, such as Russian and international newspapers, business journals, and information from the Internet. The web-sites of the companies may serve as a source of the official information about the companies participating in the research.

Additionally, the archival records should be used within the framework of the study. Research diary as a method of recording for findings, ideas, and opinions can be beneficial for the research work and it will allow keeping detailed history of the research. Self-memos enable to record and collect the ideas that emerge during the working process.

In the case study it is essential to use multiple sources of evidence (Yin, 1994). It allows to examine the issue in an integrated manner, from different perspectives and considering various points of view. Figure 1 illustrates the means which may help to disclose the answer for the research question.

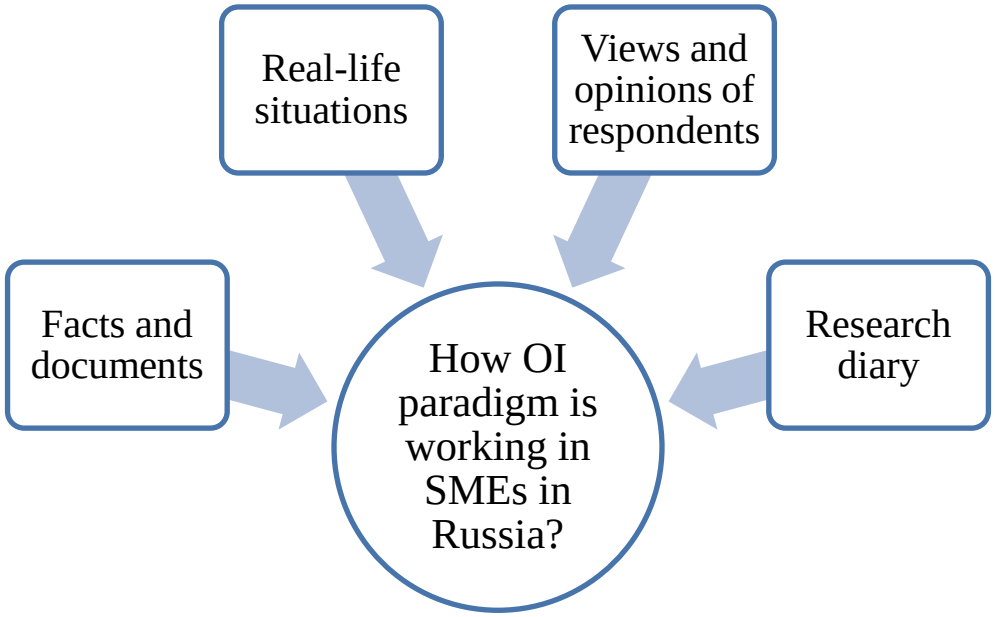

Figure 1. Means of evidence for the research

1.4 Structure of the study

After short overview of the topic, described in the Introduction part, there is a Theoretical Background part. In this chapter basic terms and concepts related to innovation are covered. In Chapter 3 the Closed and Open Innovation paradigms are described. Erosion factors, which destroy the old paradigm and strengthen the new one, are covered. Opportunities and limitations of using OI by SME are presented

Chapter 4 gives information on innovation activity in Russia. Historical background and current situation in innovation sphere are covered. This part also presents

information about infrastructure, existing capabilities and limitations for SMEs operating in Russia.

Chapter 5 gives information on case companies, their work, the application of the open principles and difficulties they face. After that chapter the analysis of results and conclusions are presented. The structure of the study is presented in Figure 2 in the form of input-output scheme.

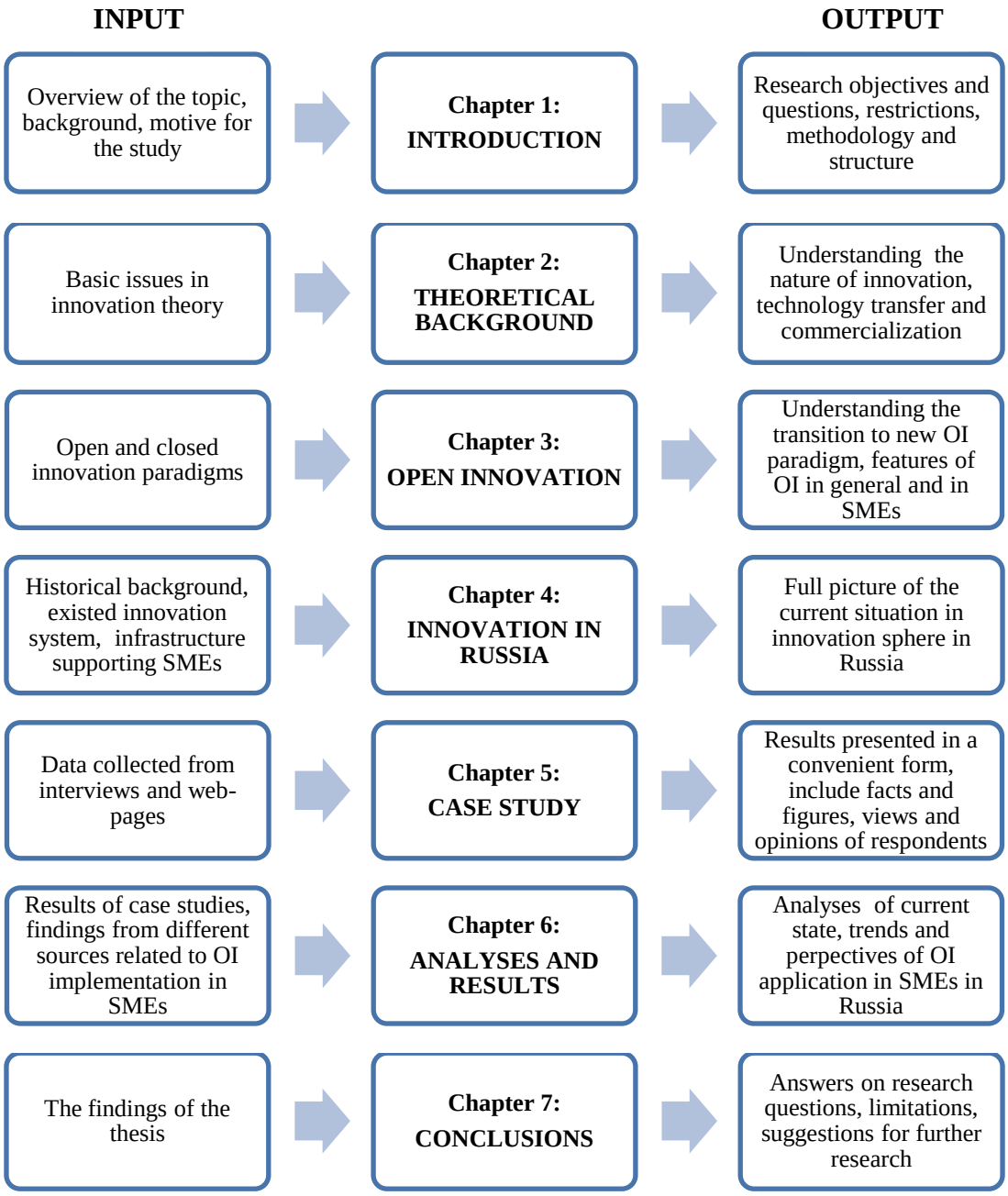

Figure 2. Structure of the study

2 THEORETICAL BACKGROUND

2.1 Innovation

The word “Innovation” derives from 1540s Latin word *innovationem*. Noun of action from *innovatus*, past principle of word *innovare* which means “to renew or change” formed from *in-* "into" and *novus* "new" (Online Etymology Dictionary, 2011). The notion of innovation is very often and widely used in business, literature and media. However, the term is not always appropriate. First of all, it is crucial to understand what is meant by the term "Innovation". There are quite a lot of definitions of it.

Peter Drucker defines innovation as “a change that creates a new dimension of performance” (Narayanan and O'Connor, 2010, p. 89). Department of Trade and Industry, UK, give the following definition: “Innovation is the successful exploitation of new ideas” (Tidd et al., 2005, p.66). Paap and Katz (2004, p.17) give the following sufficient broad definition: “Innovation is the use of an old or new technology to meet a new or old need for improving the performance of a process, product or service that is sufficiently valued by potential users that they will adopt it.”

Figure 3 shows Model of innovation, where innovation begins with the coupling between a need and the technology which address that need. This combination forms an idea, which in turn is screened, tested, developed, scaled up, and then used and diffused.

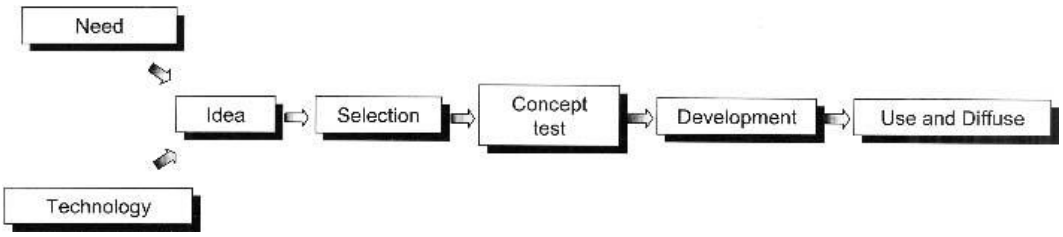

Figure 3. Model of Innovation adapted from Meyers and Maruis Successful Industrial Innovation (Paap, Katz, 2004, p.16)

From the perspective of network theory there is a definition given by Regis Cabral (1998, p.814): ”Innovation is a new element introduced in the network which changes, even if momentarily, the costs of transactions between at least two actors, elements or nodes, in the network.”

2.2 The Types of Innovation

There are also various typologies of innovation. Tidd et al. (2005) give the 4P’s of innovation of innovations, which have become paradigmatic:

- Product innovation – changes in the product or service of a company
- Process innovation – changes in the ways that something is produced
- Position innovation – changes in the context, the customer’s perception of a product or service
- Paradigm innovation – changes in the underlying mental model of a company by rethinking of principles and attitudes.

This division into types is very simple and makes it easy to correlate a particular innovation to one and sometimes more than one type of innovation. Evaluating this or that organization, such typology can be applied.

Another difference between innovations is degree of novelty. (Tidd et al., 2005) Any innovation can be placed on the continuum ranging from radical, discontinuous innovation to incremental changes. (Mohr et al., 2010)

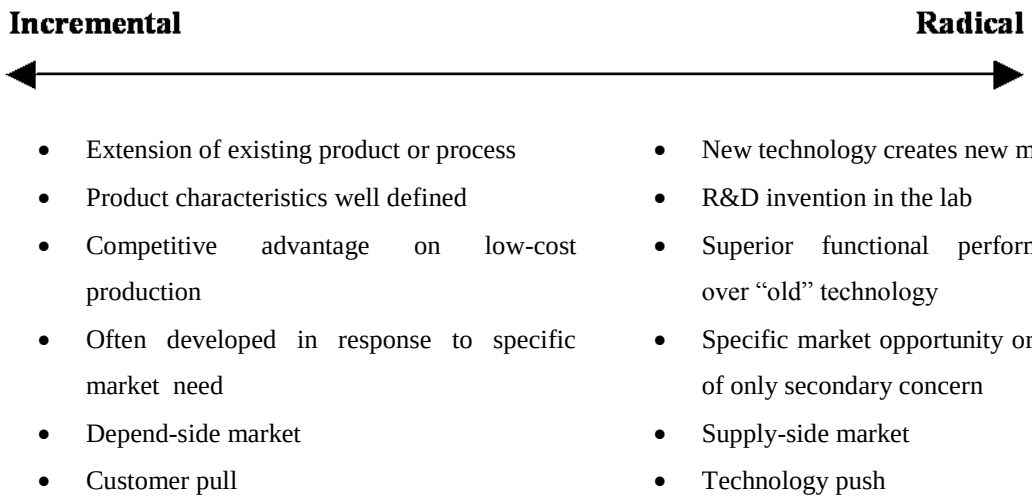

Figure 4. Continuum of Innovation (Mohr et al., 2010, p.19)

Incremental innovations walk along the evolutionary path of development. They are extension of existing products or services. Incremental innovations are used where product characteristics are well defined and consumers of a product understand their needs. (Mohr et al., 2010)

Radical innovations cannot be compared to existing practices or perceptions. Radical innovations provide superior functional performance over old technology. They create new market and change the rules of the game. (Mohr et al., 2010)

The strategies for the market launch of the product should be developed differently depending on the type of innovation. Accordingly, various types of market research should be applied. For incremental innovation it could be such traditional techniques as survey research, concept testing conjoint studies. In the midrange it could be customer visits, empathic design, lead users, quality function deployment, prototype

testing. As for totally radical, breakthrough innovations, we must rely on market intuition. Leaping ahead, this terminology can be compared to the terminology used by Chesbrough (2003). The development of the emerging technologies for the new markets differs from the improvement of the technologies, which are implemented on the existing markets. It can be stated that dealing with incremental innovations is similar to playing chess: it is necessary to plan the actions for several steps forward, to predict the logic of the opponent, and collate it with the current situation on the field (which is the situation on the market in this case). Further steps are to take well-judged actions towards the victory, and as a result, to checkmate the opponent (the competitor). In case of radical innovations the person should be ready to play poker: to bluff, not knowing the capabilities of the opponent, to find courage to make high stakes, and make the opponent to be mistaken. The major aim of these actions is to hold the best cards at the end of the game and take the bank (that is the market in this case).

Tidd et al. (2005) also gives the dependence of the type of innovation on the state of core innovation concepts and links between knowledge elements. Figure 5 illustrates this dependence.

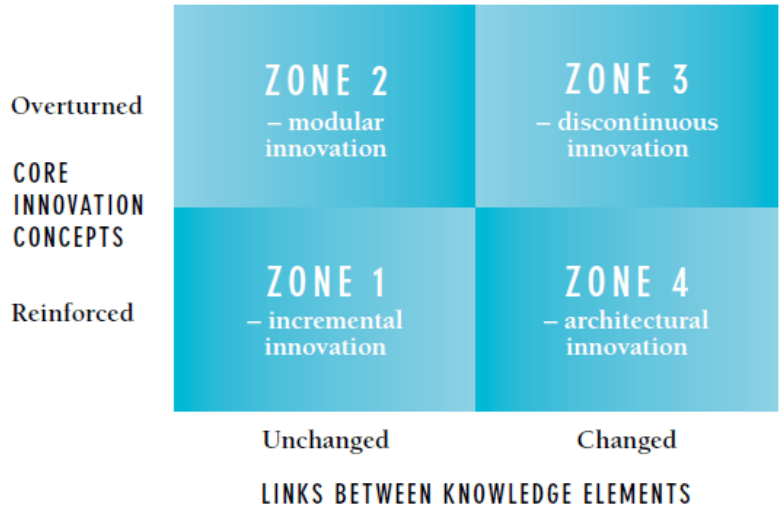

Figure 5. Component and architectural innovation (Tidd et al., 2005, p.17)

In Zone 1 there is incremental innovation - steady-state improvement to product and process. The rules of the game are already known. In Zone 2 there is significant change in one element. It is modular innovation. The overall architecture remains the same. New knowledge is needed yet within an existed framework of sources and users. In Zone 3, discontinuous (radical) innovation, the whole set of rules of the game changes. And in Zone 4 there is architectural innovation which destroys linkages between the components, without changing the components themselves. As a result new combinations – architectures – emerge. The challenge is to reconfigure the knowledge sources and configurations. (Tidd et al., 2005)

Depending on the type of innovation, the strategy of the company should be created, as well as the way of its implementation, the organization of marketing research, and allocation of resources and knowledge. Another important issue is that in order to be successful, the company should be involved to some extent in the activities related to both types of innovations – incremental and radical. Balanced allocation of the resources and funds on both types of innovations enable the company to be competitive on the market and develop both improved products and completely new ones.

2.3 Innovation as a Process

Innovation is a process of growing the ideas into practical use (Tidd et al., 2005). According to Leonard and Sensiper (1998, p.116), “The process of innovation is a rhythm of search and selection, exploration and synthesis, cycles of divergent thinking followed by convergence”.

We need to understand how this process occurs, how the idea grows into products or services, many of which at first boggle our imagination, and then become common everyday things. From the point of view of an organization, innovation can be seen as a generic activity associated with survival and growth (Tidd et al., 2005). From this

perspective, the innovation process can be considered common to all firms. Traditionally, the process of innovation, according to Tidd et al. (2005) can be considered as consecutive steps in time, each of which is accompanied by learning. Figure 6 shows that process.

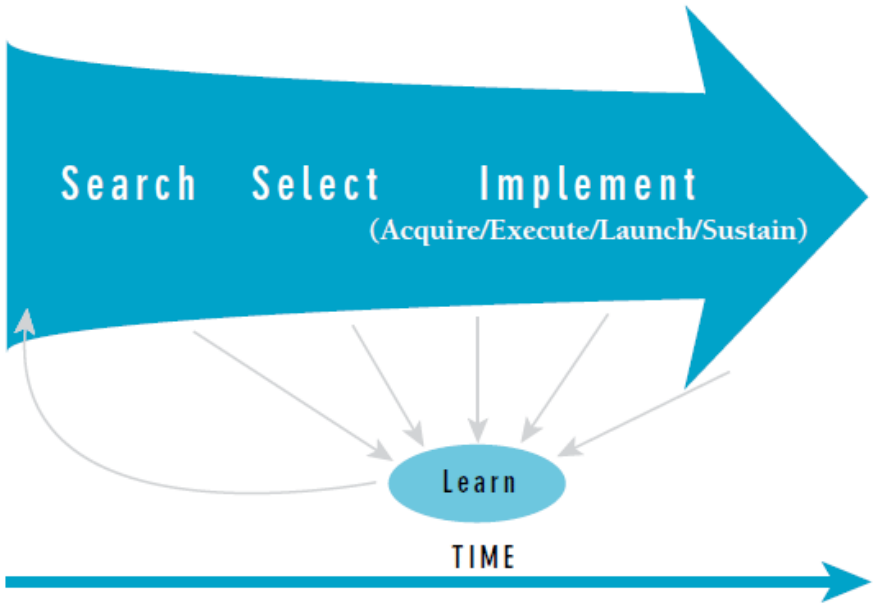

Figure 6. Innovation process model (Tidd et al., 2005, p.89)

The process is starting with searching – detecting the signals in the internal and external environment about potential change. It could be new technological or market opportunities; changing requirements or legislation; actions of customers or competitors. (Tidd et al., 2005)

The second phase is selection phase, when a company has to decide on which signals it has to respond. Subsequent process of project output to the market usually requires significant resources and expenses. On the one hand the choice should be weighed and proved and on the other hand, it is important not to pass by the idea, which may subsequently bear good results. (Tidd et al., 2005) The successful solution of this

issue, as in this case, you can catch two rabbits at once, followed in Chapter 3, devoted to Open Innovation concept.

Then implementing comes. It is a process of translating the potential ideas, which have been selected, into something real (new product or service, changes in process or position or business model, etc.) and launching it on a market. It consists of:

- Acquiring the knowledge resources by combining new and existing knowledge.
- Executing the project with high uncertainty and a lot of problem-solving situations.
- Launching the innovation preceded by market preparation.
- Sustaining adoption and use in the long term or rehash the original idea and re-innovate it. (Tidd et al., 2005)

Learning is a continuous process that accompanies all these steps in the innovation process (Tidd et al., 2005). It creates knowledge base which allows us to take another look at ordinary things and finally improves the process. Tidd et al. (2005) mention that now, with the rise of networking, the emergence of small firm clusters, the open innovation implementation, etc. we have to think beyond existing boundaries

Another view of the innovation process is the model presented in Figure 7. It is a complete cycle of several consecutive stages.

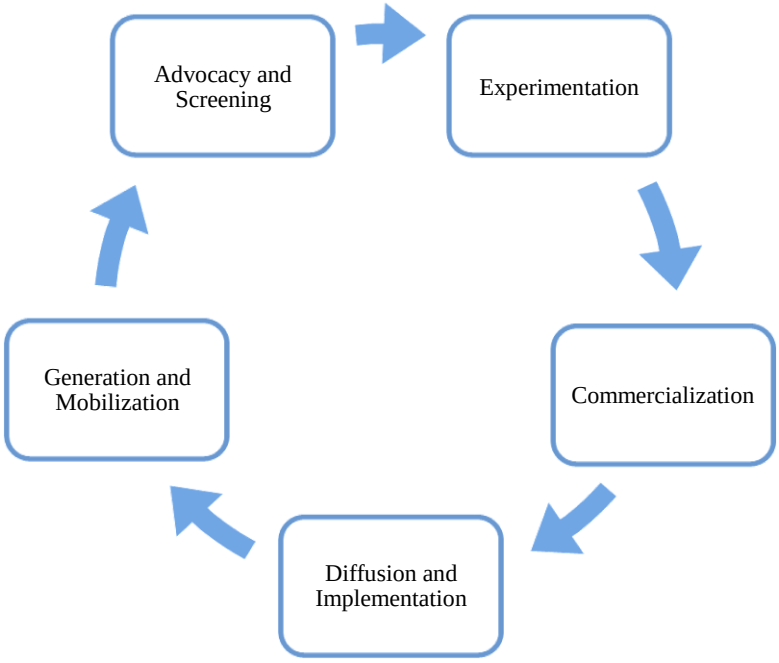

Figure 7. The innovation process (Desouzaet et al., 2009, p.10)

On this model there are five most common stages of the innovation process: generation and mobilization of idea, advocacy and screening of ideas, experimentation, commercialization, and finally, diffusion and implementation (Desouza et al, 2009). The advantage of this innovation process model is that it assumes that the organization can perform each step by itself, outsource it, or in collaboration with customer or business partner.

2.4 Technology Transfer

Technology acquisition by combination of new and existing knowledge can be done within or outside the organization. This process includes the technological and market research and technology transfer that can occur between internal or external sources. (Tidd, 2005) There are many definitions of term technology transfer and one of the most common, but accurate is “active interaction between two or more social entitles, during which the sum of technological knowledge remains stable or increases through

the transfer of one or more components of technology" (Laaminen and Autio, 1993, p.16)

It is a communication two-way exchange process. (Rogers, 1995) Along with the development of telecommunications, Internet, accessible and fast way to transfer information and knowledge, technology transfer is becoming increasingly important and necessary process for organizations.

In order to implement an effective acquisition of technology, there are various mechanisms. It could be mobilizing tacit knowledge, in-house R&D, contract R&D, licensing, joint-venture and even such illegal as covert acquisition. One of the most important among them from the point of view of open innovation is technology transfer. (Tidd et al., 2005)

Firms can maintain and develop their activities even without ability to generate technology inside the firm. But in order to operate such wise they need effective external network of external sources and ability to put acquired technology in efficient utilization. Moreover, the company should exhibit an effective way of operation on all the stages, starting from searching of technology up to technology transfer. Technology acquisition can be considered as a complex task, requiring alternatives assessment and discussions with the client, which leads to successful technology utilization. (Tidd et al., 2005)

2.5 Commercialization of Technology

According to Everett M. Rogers (1995, 143) "commercialization is the production, manufacturing, packaging, marketing, and distribution of a product that embodies an innovation. It is conversion of an idea from research into a product or service for sale in the marketplace."

After acquiring or developing the desired technology, firm have to make commercialization decision. A company must decide how far to proceed in the development process and what can be the best way to commercialize a particular technology. (Mohr et al., 2010)

Depending on existing conditions, abilities and situation on the market, a company makes "what-to-sell" decision:

- Sell or license know-how only. It requires the significant additional expenses by the customer to realize the benefit.
- Sell "proof-of-concept". The evidence that demonstrates that idea or know-how is viable. It can be a prototype, pilot version, trial, etc.
- Sell commercial-grade components to OEM's. A company may produce and sell components that are ready to use by another company in its products.
- Sell ready for use "out-of-the-box" products to customers. A customer get final product with all essential components.
- Sell a complete, end-to-end solution. Customers get solution that solves their problem with no need for additional expenditures or involvement of third parties. (Mohr et al., 2010)

Management of a company also should pay heed to the following: "The commercialization of Innovations is something that customers do, rather than inventors or entrepreneurs. It is great clients and organizations that make inventions successful in the marketplace of reality, and not just in the marketplace of ideas". (Corkindile, 2010)

3 OPEN INNOVATION

3.1 Closed Innovation paradigm

Traditionally new product development was an internal process in industrial companies. Most commonly, firms apply "closed" innovation strategy and limit their interactions with external environment (Lichtenthaler, 2011). This situation can be explained from the historical perspective. In the early 20-th century an enormous gap was observed between the university science and its application in business practice. Despite the existent potential, the enterprises could not rely on the knowledge which was created in the universities. Furthermore, the universities did not have sufficient financial resources for the execution of large-scale experiments. (Chesbrough, 2003)

A number of reputable scientific leaders claimed that the scientists' talents should not be applied for solving commercial problems, which led to the separation of the science from the actual production and application. The activities of such scientists as Thomas Edison were perceived patronizingly as if they betrayed fair scientific ideals and agreed to compromise applying science into practice. (Chesbrough, 2003).

In addition, there was no possibility to rely on government support. The industry was a major source of financing for the research, which was initiated for further commercial use of the scientific results, and the main places for the research execution were laboratories of R&D departments. (Chesbrough, 2003).

Thus, taking into account these factors, perhaps the only solution was to make a discovery and commercially develop the scientific knowledge within a company. The creation of centralized research laboratories and independent product development were major factors facilitating the growth of industrial corporation. (Chesbrough, 2003)

The existing strict borders between the companies and scientific organizations determined an innovation system, within which the organizations explored and developed new products and services – the closed innovation paradigm. Figure 8 shows the process of managing R&D within this paradigm.

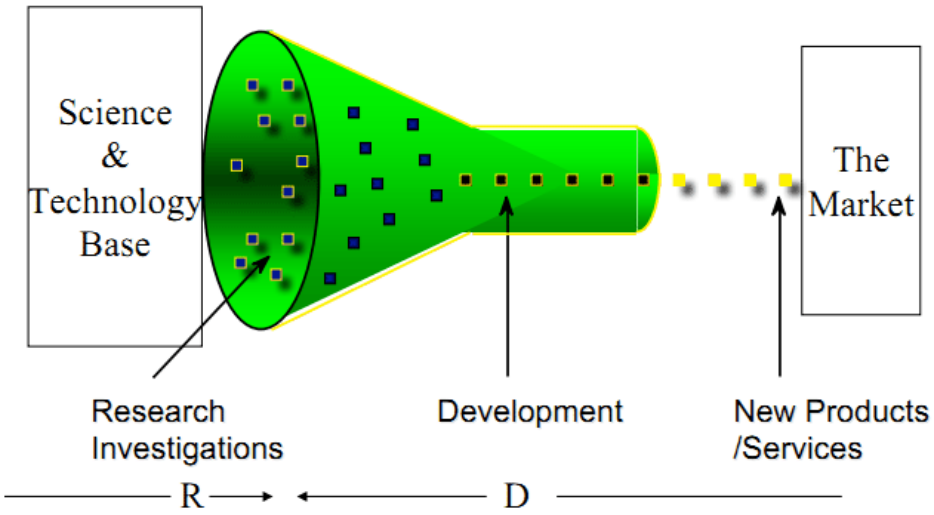

Figure 8. The current paradigm: The Closed Innovation model (Chesbrough et al., 2006b, p.3)

According to this paradigm, successful innovation requires control. Here, new projects are launched from science and technology base, then progress through the process, some of them are stopped and others are selected for the further actions. (Chesbrough, 2006b) A company should generate its own ideas, then develop them, create a product based on them, then head for the market, after that distribute the product and get engaged in financing, service and support. This approach forces companies to rely only on themselves. (Chesbrough, 2003)

Robert Cooper (1990, p.44) argued in favor of the fact that America is in a product war and the key to winning this war is "to drive new products from idea to market faster and with fewer mistakes" but noticed that only one project in four becomes a

winner. He offered Stage-Gate model as a solution where innovation process is divided into stages separated by gates. At each gate management or special committee makes a decision: whether or not to continue further process (Cooper, 1990). With the use this principle a lot of new ideas can be lost.

The logic of Closed Innovation created a sort of virtuous circle. It is shown in the Figure 9. Companies invest in internal R&D due to which they get breakthrough discoveries. These discoveries allow them to bring new products and features to market. Because of this, these companies make more sales, higher margins, which in turn allow them to reinvest more in further internal R&D, and that leads to new discoveries. And so the process goes in circles. (Chesbrough, 2003) The process described above corresponds to the traditional and presumptions about the innovation process.

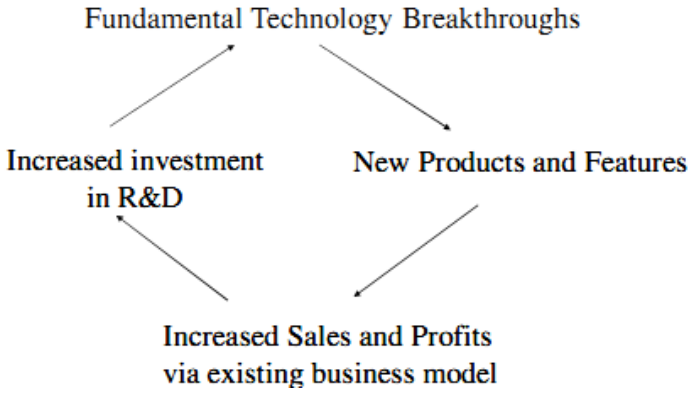

Figure 9. The Virtuous Circle (Chesbrough, 2003, p.xxi)

For the most of the twentieth century this paradigm worked reliably enough. Within the boundaries of this paradigm, a huge number of new products and services were introduced, which opened horizons for future inventions and new markets. (Chesbrough, 2003) Scientists stated that opening up technologies leads to weakening of IP protection and reduces the ability to capture the value for a developer and as a

consequence decrease willingness to invest in new developments (David and Greenstein, 1990).

In those industries with tough intellectual property protection, regulatory restrictions are high, start-ups appear seldom and the role of venture capital relatively small, the Paradigm of Closed Innovation is still working. However, in many other industries the logic of Closed Innovation paradigm has been entirely obsolete. This was facilitated by several factors. (Chesbrough, 2003)

The first factor which led to erosion of Closed Innovation paradigm is increased availability and mobility of skilled workers and specialists from different areas of knowledge worldwide. There are several causes of this factor. Among them is the growing number of graduates and postgraduate students. Another trend is the increased mobility of trained workers, thus is more widespread knowledge that they possess. Such mobility of well-trained staff allows even start-up firms to become pioneers in the commercialization of new promising inventions. (Chesbrough, 2003)

Another factor was the growing presence of private venture capital. After 1980, there was a sharp increase in the volume of venture capital. The large and growing pool of VC created a real danger for companies, staking on internal R&D. Individual professionals have become easier to lure in other companies and start-ups by offering them an attractive compensation package with an interesting balance of risk and reward. (Chesbrough, 2003)

The combination of the first two erosion factors led to the emergence of external options and ways to market for ideas sitting on the shelf. If an internal development organization of the company is not ready to take advantage of new research results, it can no longer count on the fact that the received idea will be on the shelf for a long time. Specialists who are able to obtain financing in the form of venture capital have other ways for commercialization of their ideas. (Chesbrough, 2003)

Due to the combined effect of the above factors, the capability of external suppliers has been dramatically increased. The large companies can be faster and realize greater potential of market opportunities. On the other hand, these external suppliers offer their services to all participants of the market, which increases the pressure on companies that have created large amounts of R&D projects currently sitting on the shelf. (Chesbrough, 2003)

These erosion factors in aggregate impacted an industry, the assumptions and logic, which at one time made Closed Innovation an effective approach, no longer work, at least to the extent conventional in the past. In implementing of fundamental technological breakthroughs, scientists and engineers are now aware of previously inaccessible external opportunities. If a company that financed these discoveries did not realize a breakthrough in time, scientists and engineers can use it independently in a new start-up firm. This start-up may commercialize this breakthrough. Very often, a company fails. But in case of success, such firm might achieve an initial public offering (IPO) or be acquired by another firm on profitable terms. Successful start-ups usually do not invest in the development of new fundamental technology breakthroughs. They try to find external technologies for external structures to pursue their commercialization instead. (Chesbrough, 2003) Figure 10 demonstrates the problem.

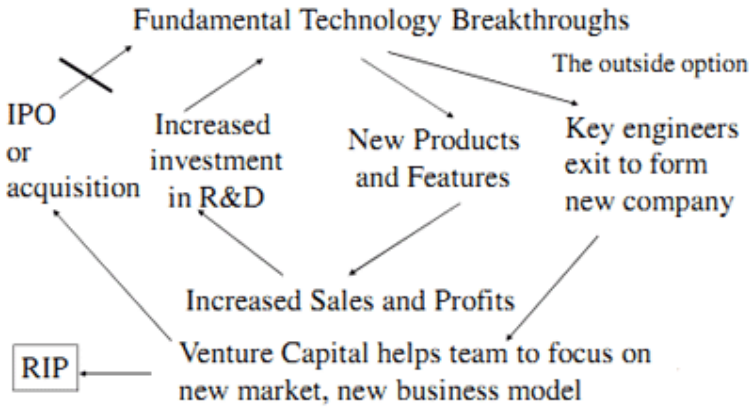

Figure 10. The Virtuous Circle Broken (Chesbrough, 2003, p.xxiii)

The emergence of this new, external path leads to breakage of the virtuous circle. The company, originally funded the breakthrough results, did not make a profit on its investment in research and development. Then the company that did profit from this breakthrough usually did not invest in the next-generation research. This interruption means that the next round of investment in basic research, fueling the subsequent advance will not take place. (Chesbrough, 2003)

In the economics of innovation there are some forces which compel the companies to change their approach to innovation process. These forces include rising costs of technology development, accompanied by reduction of the product lifecycle on a market. Moreover the probability of getting a good return on investment in innovation is decreasing. All these leads to the fact that maintaining the same level of R&D investments in the model of closed innovation is becoming increasingly difficult. (Chesbrough, 2006a)

Figure 11 illustrates changes in revenues and costs ratio in closed innovation model. In this figure, “closed model - before” shows that expected revenues are much higher than the development costs. However, as these costs are rising and as the market life of offerings is decreasing, the situation with net income more and more starts to resemble the “closed model - after”, that is, companies are becoming harder to recoup their innovation investment. (Chesbrough, 2006a)

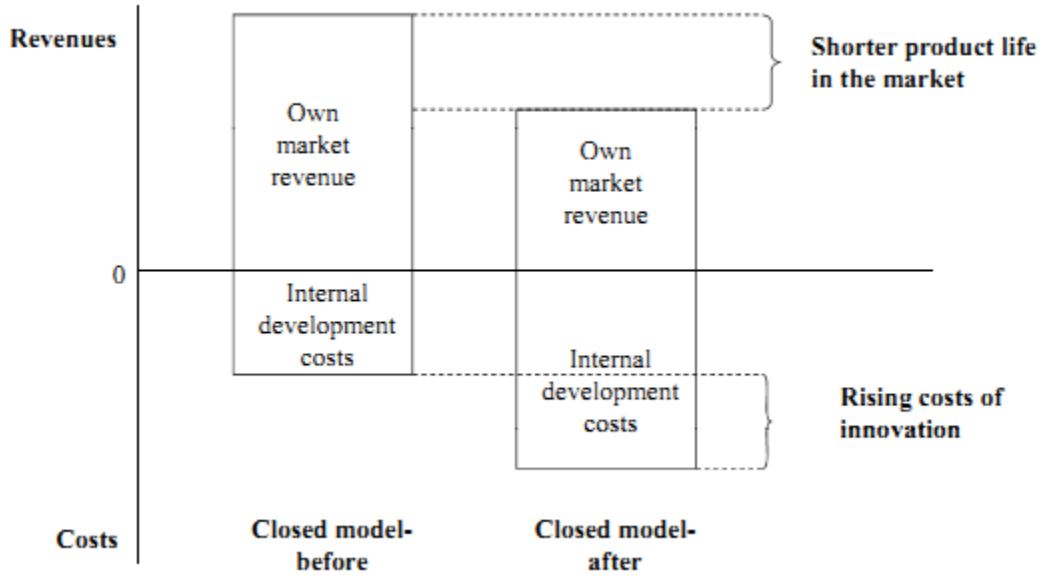

Figure 11. The economic pressures on innovation (Chesbrough et al., 2006a, p.12)

All these factors have weakened the existing links between research and development in the Closed Innovation paradigm. (Chesbrough, 2003) Taking into account the given changes, it is necessary to change the approach to ways of getting knowledge and ideas and their subsequent realization. In situations where there are these erosion factors, Closed Innovation should be replaced by new approach, which is called Open Innovation (Chesbrough, 2003).

3.2 Open Innovation Paradigm

Open innovation is a paradigm, according to which it is assumed that firms can and should use external as well as internal ideas, and apply the internal and external paths to market, as the firms seek to advance their technology. The paradigm combines internal and external ideas into architectures and systems, whose requirements defined by applied business model. This business model uses both external and internal ideas for value creation. Model of open innovation is based on the

assumption that additional value can be generated by bringing internal ideas to market through external channels, outside the current business of the firm. (Chesbrough, 2003) The process of open innovation is shown on Figure 12.

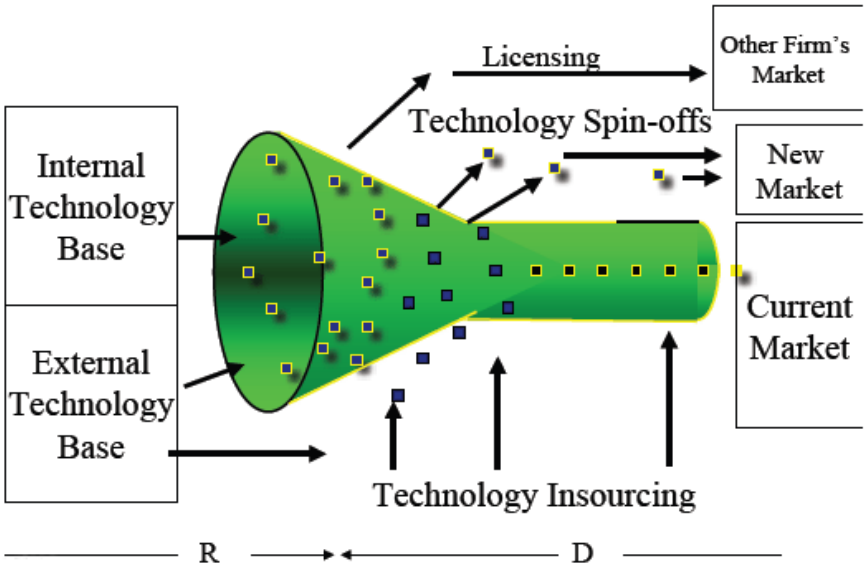

Figure 12. The Open Innovation paradigm (Chesbrough et al., 2006b, p.3)

Projects can be launched from either internal or external technology sources, and new technology can enter into the process either at the stage of research, or later during development. And then projects can reach the market in many ways. It could be out-licensing or a spin-off venture company, or bringing to market through the company's own marketing and sales channels. (Chesbrough et. al, 2006b) Ideas and technologies may emerge during the research process, and then some of these ideas may seep out of the company. The reverse process is also possible, when ideas initially appear outside of the firm's labs, and then move inside. (Chesbrough, 2003, p. xxiv)

At its basic level, the logic of Open Innovation model is based on knowledge surplus, which should be used rapidly for value generation for the company. At the same time

the knowledge that the company received during its research, cannot be limited only by the internal pathways to the market. Similarly, the internal pathways to the market cannot be limited to using only internal knowledge of the company. (Chesbrough, 2003) Table 1 shows some of the principles of this new approach - the Open Innovation paradigm in comparison with the Closed Innovation paradigm.

Table 1. Contrasting principles of Closed and Open Innovation (Chesbrough, 2003, p. xxvi)

Closed innovation principles	Open innovation principles
The smart people in our field work for us.	Not all the smart people in the field work for us. We need to work with smart people inside and outside the company.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to the market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to the market first will win.	Building a better business model is better than getting to the market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our IP, so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our business model

Based on the result of the research, Gassmann and Enkel (2004) identified three core open innovation processes: (1) The outside-in process: when the company enriches the knowledge base through the integration of suppliers, customers and external knowledge sourcing in order to increase company's innovativeness. (2) The inside-out process: profit by bringing ideas to market, selling IP and transferring ideas to the outside environment. (3) The coupled process: couple the outside-in and inside-out processes by working in alliances with complementary partners. Three core open innovation processes presented on the Figure 13.

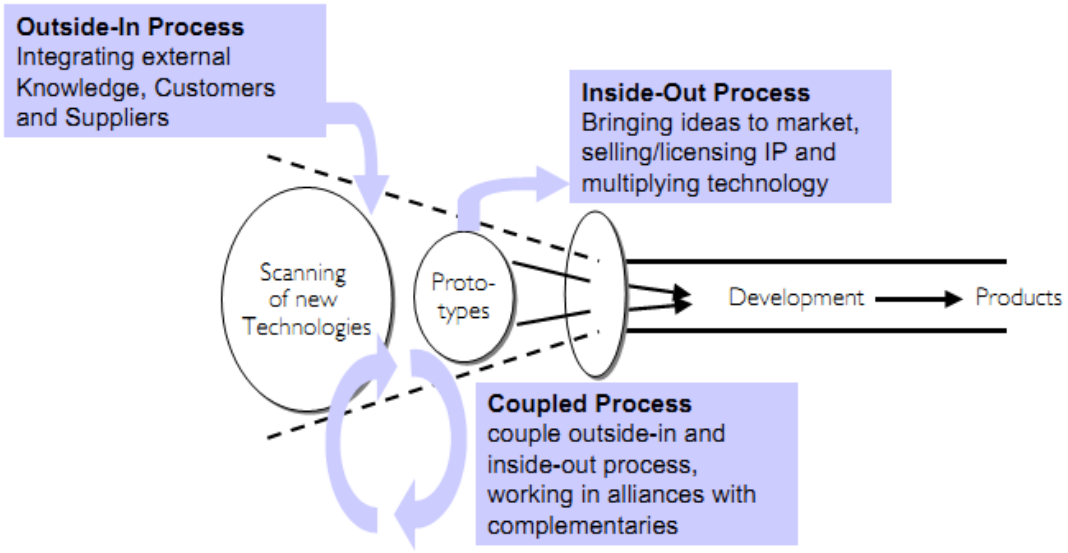

Figure 13. Three archetypes of Open Innovation processes (Gassmann and Enkel, 2004, p.7)

However, Gassmann (2006) pointed out that open innovation is not an imperative for every company or any innovator. He identified a number of developments and trends, and the more an industry corresponds them, the more appropriate the open innovation seems to be. Among them are:

1. Globalization. Open Innovation contribute to global industries to achieve economies of scale more swiftly than in the closed model and to promote powerful standards and dominant designs.
2. Technology intensity. Companies in high-tech sectors are more likely to cooperate, use external sources to support product development in a rapidly changing technology.
3. Technology fusion. The more interdisciplinary cross-border research is required, the more openness and collaboration are essential.
4. New business models. New alliances, external technology sourcing and new business opportunities.

5. Knowledge leveraging. Knowledge became the most important resource for firms. The mobility of knowledge and demand for specialized knowledge has significantly increased.

Gasmann (2006) identified the various perspectives of opening up the innovation process: globalization of innovation, outsourcing of R&D, early supplier integration, user innovation, and external commercialization and application of technology.

In addition to support in the scientific community there is also a criticism of the Open Innovation term. Trott and Hartmann (2009) assumed that "Open Innovation is old wine in new bottles". They consider that Open Innovation paradigm has created a partial perception by describing the limitations of closed innovation principles, which is undoubtedly true, but false in conveying the wrong impression that companies today follow these principles. The authors believe that the Open Innovation principles are the repetition of a long ago implemented practice, and "Open Innovation" is just a name.

Today, successful business is not based only on Open Innovation but on simultaneous investments in closed as well as open innovation activities. Companies have to keep a proper balance of the open innovation approach: use every tool available to create new successful products faster than their competitors and at the same time to foster the building of core competencies and to protect their intellectual property. (Enkel, Gassmann and Chesbrough, 2009)

3.3 Open Business Model

Companies that see the benefits of Open Innovation Paradigm needed to combine internal research with external ideas and then utilize these ideas both within their own business and also through other companies' businesses. The keys to solving this problem is identification of missing pieces that should be internally supplied, as well as integration of internal and external pieces together into systems and architectures.

The business model is a useful framework to connect these technical decisions to desired economic results. (Chesbrough, 2003)

Chesbrough (2003) states the business model has the following functions:

1. To define the value proposition.
2. To define a market segment.
3. To specify the structure of the value chain.
4. To define the mechanisms of revenue generation and evaluate its cost structure and target margins of the offering.
5. To characterize the firm's position within the value network.
6. To establish the competitive strategy.

The most important role of the business model is to create a simplified heuristic cognitive map, from technical domain inputs to the social domain outputs. Figure 14 shows that the business model serves as an intermediate that connects technical and economic domains. (Chesbrough, 2003)

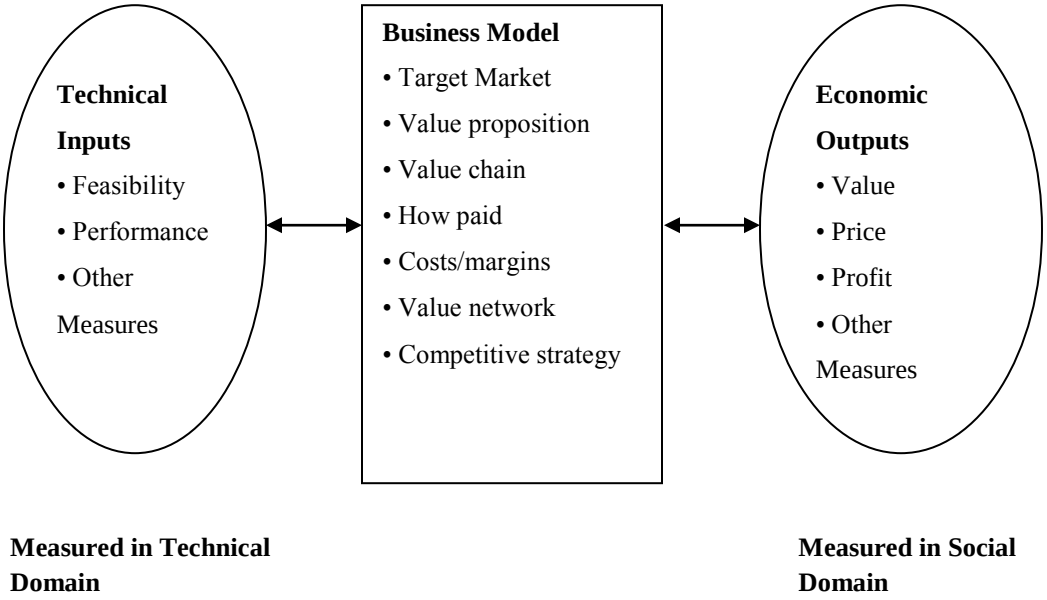

Figure 14. The Business model as a cognitive map across domains (Chesbrough, 2003, p.69)

The firm's realization of economic value that it receives through technology depends on the choice of business model, rather than from some intrinsic characteristics of the technology. And the creation of a business model requires managers to take into account all complexities and contradictions of the system. (Chesbrough, 2003) Yet properly constructed business model in turn provides good economic results for the firm.

The combination of leveraged cost and time saving on the one hand, and new revenue opportunities - on the other in the Open Innovation business model is illustrated by Figure 15. The firm no longer restricts itself to the markets that it serves directly. Now it is involved in various market segments and profit from licensing, joint ventures, spin-offs or variety of other forms of interaction. (Chesbrough, 2006a)

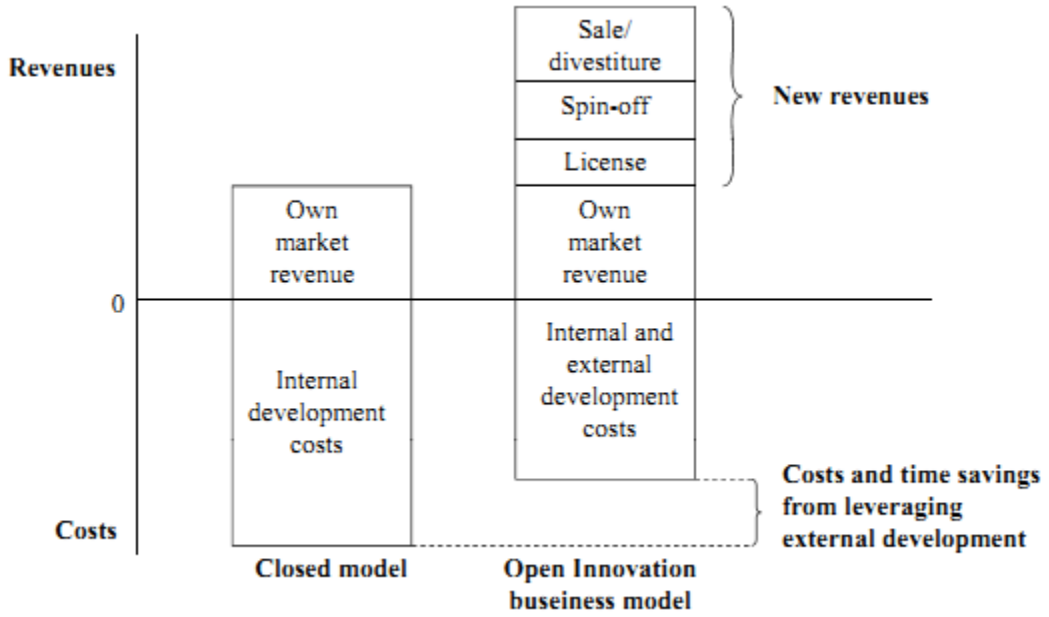

Figure 15. The new business model of Open Innovation (Chesbrough, 2006a, p.17)

These different streams of revenue lead to an increase in the total revenue from innovation. At the same time, through the increased use of external technologies in the firm's R&D process, the development costs of innovation are reduced. This saves time and money. The result of applying such a model is a return to a situation in which innovation is again economically attractive, even with shorter product life cycles. (Chesbrough, 2006a)

Whether it is a large organization or a small one, in any case it is necessary to open up the innovation process. But to do this effectively it is essential to connect a business model to an innovation process. (Chesbrough, 2006a)

3.4 Open Innovation and Intellectual Property Rights

Management of Intellectual Property (IP) is extremely important. It is the essential part of technology strategy and moreover, it can be a major competence of the company (Shane, 2009; Mohr, 2010). And companies have to understand the different legal mechanisms to protect IP, and develop ways to employ those mechanisms to their advantage (Shane, 2009).

The way companies manage their IP, to a great extent depends on whether they operate in the Closed or Open Innovation paradigm. Closed Innovation paradigm comes from the fact that companies have to produce their own ideas and make money from them through their own products. A company manages IP to create a control over its ideas, maintains it and does not allow others to use them. (Chesbrough, 2003) However, the technology can be commercialized by licensing or selling the IP rights, rather than by developing of products (Tidd et al., 2005). The Open Innovation paradigm assumes that there is a huge supply of potentially useful ideas generated outside the firm and that firm should be an active buyer and seller of IP. A company manages IP, not only focusing on its own business, but also profiting from other's use of ideas of the company. (Chesbrough, 2003)

Not all ideas can be protected as IP, and many ideas that might be "protectable" are not protected (Figure 16). Intellectual property refers to a set of ideas that: (a) are novel, (b) are useful, (c) have been put into practice in a material form, (d) have been guided in accordance with existing laws. (Chesbrough, 2003)

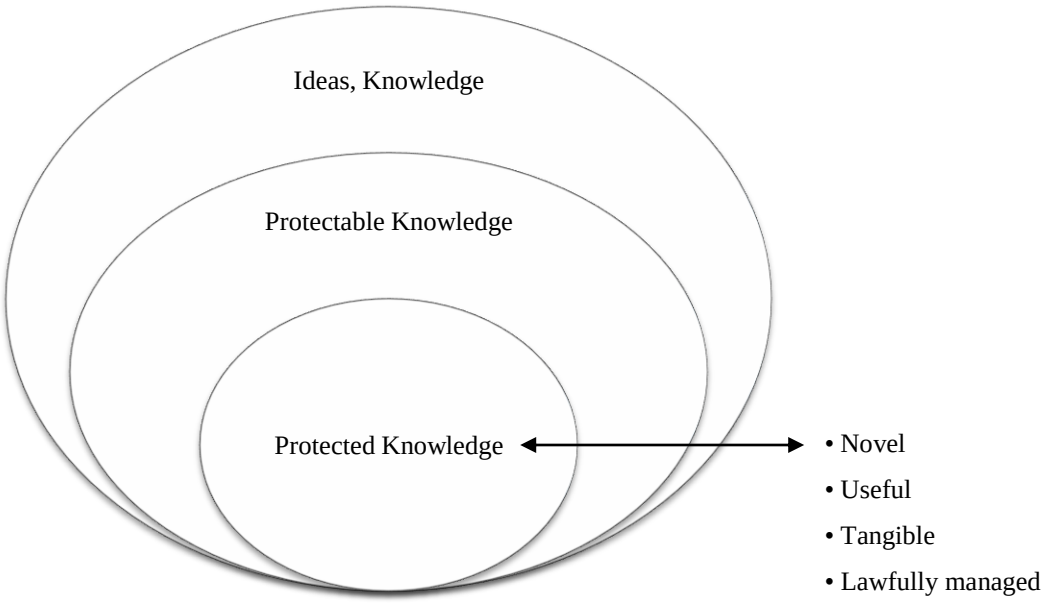

Figure 16. Ideas and Intellectual Property (Chesbrough, 2003, p.157)

There are four ways that companies protect their IP by legal means: through patents, trade secrets, copyrights, and trademarks (Shane, 2009). Patents are the major source of trade in IP. Traditionally, patents were used as a protective measure in business strategy through their legal ability to prevent competitor's use of a company's own proprietary technology. (Chesbrough, 2003, 157) Small and new companies have to spend a significant portion of their revenues and senior management time to enforce their patent rights. Large companies sometimes infringe the patents of small companies, believing that they will not have the funds or energy to defend their rights. (Shane, 2009)

Companies need to manage IP in order to enhance and extend their business models and seek out new business models for discoveries, unsuitable for their current models. (Chesbrough, 2003) Hence, the main factor of success of managing IP, as in the case of realization of economic value through technology, is to create the optimal and effective business model.

3.5 Open Innovation in Small and Medium Enterprises

In large companies, Open Innovation relates to purchase or sale of technologies and relevant to them IP as part of the business model. In small companies, the scope of transactions with IP is usually quite limited. While small companies still can buy or sell IP, Open Innovation for them more often means collaboration or common use of technology and IP with other parties as a part of their business model. (Chesbrough, 2006a) However, understanding the importance and striving for practical implementation of the Open Innovation paradigm, SMEs face a number of challenges.

Small firms are less likely to use outside sources of knowledge rather than larger firms, reflecting their limited capacity to absorb external knowledge (Tidd et al., 2005). SMEs commonly do not have the ability to support respective resources and personnel to create structures for identification of useful external knowledge (Chesbrough, 2010).

Even if external ideas and technologies are initially identified and transferred, SMEs frequently lack the ability to absorb them. Ideas and technologies typically require substantial modification in order to meet customers' needs. Many SMEs do not have specialists with the required scientific background to understand, absorb and exploit the scientific discoveries and technologies that are developed outside the company. (Chesbrough, 2010)

SMEs may be unattractive as a partner. Other companies, universities or scientific labs might prefer to work with larger, well-known, and more prestigious companies or, on the contrary, might prefer to help a new start up company, rather than existing SME. Quite often SMEs also do not have an institutionalized, well-structured innovation process and enough funding for promising academic research that might form the basis for a cooperative innovation project. (Chesbrough, 2010)

SMEs have certain drawbacks in value capture. Typically they do not have enough market power to capture the value of their externally sourced knowledge and innovation, if not protected by IP rights. (Chesbrough, 2010)

Despite the existing difficulties, SMEs have some structural advantages over large companies. Smaller markets would not be attractive for larger firms but due to the size it is attractive to SMEs. This allows SMEs to utilize new trends sooner with lower entry costs. (Chesbrough, 2010)

Focus lets SMEs execute very effectively against large, diversified firms. The sharp focus of SMEs on a particular market, customer type, expertise or technology may create a competitive advantage in those industries where specific knowledge, expertise or service is needed. (Chesbrough, 2010)

SMEs can direct their business more deeply in narrow areas. The role of markets playing in innovative activities is increasing. SMEs can get greater rewards for specialization since they can often sell their capabilities to a wider range of customers and markets. (Chesbrough, 2010)

SMEs attract more entrepreneurial persons. Managers and R&D employees have more freedom to implement their ideas. In SMEs it is much easier to experiment with alternative business models. In many cases, identifying and executing an effective business model is no less important than developing of a new technology. (Chesbrough, 2010)

SMEs can quickly make decisions and realize them more rapidly. Smaller firms can respond more quickly to changes in customer needs or challenges from competitors. They potentially have a competitive advantage in fast changing markets. (Chesbrough, 2010) They are usually less bureaucratic, and they may have greater incentives to be successful than large firms. (Rahman & Ramos, 2010)

Flexibility and specificity of SMEs can be advantages in accelerating innovation but only few of them can effectively manage the whole innovation process by themselves. This encourages them to collaborate with other firms. (Lee et al., 2010)

These advantages give SMEs new opportunities of Open Innovation. Among them Chesbrough (2010) identified the following:

1. Large companies are more interested in advantageous cooperative innovation partnerships. SMEs' expertise can save time and costs for a larger firm's innovation initiative.
2. Large companies build technology platforms and attract SMEs to create products for these platforms.
3. Since SMEs intensively exploit some technologies, they can serve as major developers of improvements for these technologies. As a result, large companies are interested in active participation in open innovation network where SMEs can play the leading roles.
4. SMEs that are successful worldwide have developed a niche strategy as the main factor of competitive advantage. Small firms work in narrow market segments but they have started to operate in many regions globally.
5. Open-source development allows creating new innovative products and services to all firms regardless of size and resources.
6. For SMEs it is easier to specialize than larger firms. This specialization is most useful when markets are more adapted for innovative activities. Open innovation aimed at growing up diversified customers in diversified markets, with diffused costs and risks.

Small companies are facing a serious dilemma: on the one hand, they must protect their ideas and technology as much as they can so that larger companies with greater resources don’t steal their ideas and on the other hand, they need to raise capital, hire employees and attract customers for survival and growth. To achieve this, they have to disclose the most of their ideas, technologies and plans, and only then deal with the

protection of their ideas. And striking the proper balance is very difficult. (Chesbrough, 2006a)

In addition, SMEs need better insertion in knowledge networks. It requires both connections with other parties and capabilities to exploit these connections by absorbing ideas and knowledge. (OECD, 2010) The difficulty lies in the organization of new product development within the network (Rahman & Ramos, 2010).

In the period of the latter development stages and commercialization SMEs have a number of typical problems. In those stages, they face with financial constraints, lack of qualified personnel and low possibility to substitute relevant products in the market and as a consequence, to get sufficient profit. On the other hand, SMEs have a number of advantages that makes them suitable as partner in new product development. (Rahman & Ramos, 2010)

Despite the fact that companies nowadays should aim to openness, it is dangerous to become too open. If a company shares information with the wrong people, it can destroy the company. Small companies make a mistake, if they entirely rely on formal legal protections and support of the court system to enforce their IP rights. Lack of resources of a small company limits the amount of protection that it can receive. While small companies should get as much protection as they can afford, nothing can substitute a good business model to protect IP rights. (Chesbrough, 2006a)

Large companies usually enjoy strong business models. However, they face challenges and risks that small companies do not have to take into account. For large companies that achieve high results with their current business models, it is difficult to shift them to exploit Open Innovation opportunities. In small companies there is typically a lack of strong business model, and resources to exploit advantages of Open Innovation without fear of being copied by a larger rival. In order to be

successful, IP protection should be one of the many tools needed in their business model. (Chesbrough, 2006a)

4 INNOVATION IN RUSSIA

4.1 Historical Background

Russia has centuries-long history of inventive work. History shows that the country developed mostly owing to talented minds, breakthrough ideas, gumption and other abilities of the individual developers and groups over a number of years.

Russia has done its first breakthrough in the sphere of technology at the end of XVII century under Peter the First (1672-1725). From the very beginning of his reign Peter the Great believed that only boosting the level of prosperity based on the full-scale development of “manufactories and industry” can be a steady foundation for all his reforms. (Pilenko, 1902) The Tsar himself studied shipbuilding, military science and other fine sciences in Europe (Venivitinov, 1897). Upon his return to Russia Peter the First initiated a number of reforms facilitating the development of industry and technologies which enabled Russia to expand its territories and increase its global influence. (Munchaev & Ustinov, 1998) In 1724 the Saint Petersburg Academy of Sciences was founded, with the aim to satisfy the scientific and technological demands of the country.

Thanks to the works of Mikhail Lomonosov (1711—1765) Russia has made a significant step forward in the field of theoretical and applied science. He was one of the first globally influential Russian scientists, he designed about one hundred different physical and meteorological instruments, and executed research in the field of electricity, optical phenomena, geology, mineralogy, astronomy and geophysics. (Brokgauz, Efron, 1896)

Famous Russian scientist Ivan Kulibin (1735—1818) was a talented mechanic, engineer and inventor. He became one of the first inventors taking advantage of the government support and help of the Empress Catherine the Second in particular. In seventies of the XVIII century Kulibin designed the first wooden bridge across the

Neva river. The surname of Kulibin has become a common noun and talented self-tough professionals are called so (a Kulibin) in Russia up to now. (Brokgauz, Efron, 1895)

In 1812 the first legal act for the legal protection of inventions was published in Russia: the Emperor Alexander the First signed the manifesto “On the privileges for the various inventories and discoveries in arts and crafts”. (Pilenko, 1902)

The works of Karl Shilder, Pavel Anosov, Alexander Mozhayski, Dmitri Mendeleev, Alexander Stoletov and many other Russian developers of the XIX century enabled active development of industry and the country as a whole. The scientific base developed by then favored further breakthrough discoveries and implementing them into production in the following industries: chemical, textile, construction, oil refining and electrical engineering. (Chernyj, 2005)

At the end of the XIX - beginning of the XX century Nicolay Zhukovsky, Yakov Gakkel, Dmitry Grigorovich, Igor Sikorsky worked on the creation of Russian aircrafts, laying the foundation of Russian aircraft manufacturing. K.I. Konstantinov, N.I. Kibalchich developed the scientific basis for the production and application of rocket technology. (Chernyj, 2005)

Due to the revolutionary events of 1917 many Russian scientists had to emigrate abroad. The model of Soviet science in 1917 - 1930 was focused on the demands of industrialization. So-called “period of patenting” hold a specific place in the history of Soviet inventions development in 1924 - 1931. During this period the whole network of the invention agencies was formed, and large-scale community-based organizations played an important role in the development of invention activities.

By the outbreak of the World War II the Soviet Union was inferior to the enemy on technical level. At that time the defense industry was given a priority, which mostly

defined subsequent scientific and technical development of the country. (Poljak & Markova, 2000)

From the 50's up to the middle of the 80's the country followed the extensive way of development in the sphere of science and technology. In 1954 the first nuclear power station was opened in the Soviet Union. In 1957 the first artificial satellite was launched, and the first in the history flight of the human into outer space happened in 1961. (Chernyj, 2005)

"Perestroika" of the middle of 80's and further events were a big shock for the country and served as a source of the dead season for the scientific sphere in Russia. Nevertheless the potential of talented developers and the existent scientific base is still very significant. Nowadays the government takes measures relegated to the development of innovations in Russia.

4.2 Current Situation in Innovation in Russia

Historically, Russian economy development depended on the key sectors such as aerospace technology, nuclear technology, air craft production. Unfortunately, over the past two decades the country has been on the downward path in the field of technology and innovation. (INSEAD, 2010)

The 1990's crisis brought reduction of government expenditure in science and technology. As a result, a large number of Russian scientists left their country in search of better working conditions. Recently, the Russian authorities have taken certain steps for extension of Russian innovations but still there are serious problems. In terms of R&D-based outputs Russia are inferior to other large OECD and middle-income economies. (INSEAD, 2010)

According to The Global Competitiveness Report 2010–2011, Russia takes the 63 place of 139 countries in the world (Table 2). It is the same position as in the 2009-

2010 Report. It shows that instability in macroeconomic has been balanced by improvements in other areas. (Schwab, 2010)

Table 2. Ranking of Russia according to the Global Competitiveness Report 2010-2011 (Schwab, 2010, p.286)

Indicator	Rank (out of 139)	Score (1-7)
1. Overall Global Competitiveness Index 2011	63	4.24
2. Basic requirements	65	4.52
2.1 Institutions	118	3.22
2.2 Infrastructure	47	4.46
2.3 Macroeconomic environment	79	4.49
2.4 Health and primary education	53	5.92
3. Efficiency enhancers	53	4.19
3.1 Higher education and training	50	4.55
3.2 Goods Market efficiency	123	3.58
3.3 Labor Market efficiency	57	4.51
3.4 Financial Market development	125	3.18
3.5 Technological readiness	69	3.56
3.6 Market size	8	5.74
4. Innovation and sophistication factors	80	3.36
4.1 Business sophistication	101	3.47
4.2 Innovation	57	3.25

The Russian economy is still on efficiency-driven stage of development. At the same time, competitiveness of Russian federation continues to deteriorate in such important factors as goods market efficiency and Financial Market development. Competition is suffered from inefficient anti-monopoly policies and restrictions on trade and foreign ownership. These factors lead to inability to take advantage of its strong suits such as innovation potential and level of higher education. Weak Institutions are great challenge for the country: insufficient protection of property rights, legal framework, and weak corporate governance standards interfere to develop. (Schwab, 2010)

Russia has educated and experienced work force but it lacks knowledge and skills to compete in global markets. In high-tech industries, such as electrical machinery, share of production is substantively lower than in countries like Germany, Poland, India, South Africa and Brazil. (INSEAD, 2010)

According to the Report the most problematic factor of doing business in Russia is corruption. The ranking of the problems is shown on the Figure 17 and it was compiled by answers of respondents, doing business in the country. (Schwab, 2010)

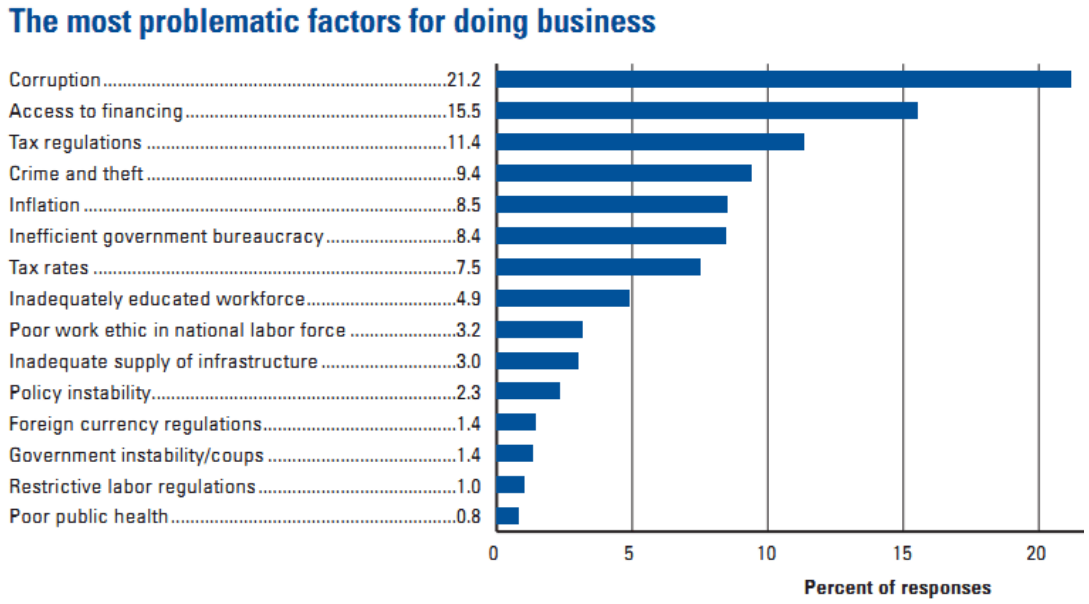

Figure 17. The most problematic factors for doing business in Russia (Schwab, 2010 p.286)

In terms of innovation, Russian Federation has overall rank 57 in the Report. The country has relatively high rates of innovation capacity and utility patents per million but loses in Government procurement of advanced tech products and collaboration in R&D between university and industry (Table 3). (Schwab, 2010)

Table 3. Ranking of Russian Innovation Index in detail according to the Global Competitiveness Report 2010-2011 (Schwab, 2010, p.286)

Indicator	Rank (out of 139)
Overall Innovation Index	57
Capacity for innovation	38
Quality of scientific research institutions	53
Company spending on R&D	50
University-industry collaboration in R&D	61
Government procurement of advanced tech products	82
Availability of scientists and engineers	56
Utility patents per million population	49

Annual surveys show that the level of innovation among Russian companies is low compared to OECD standards (OECD, 2011). About 60% of R&D are financed at the state level. The role of the business sector is insignificant. (Podmetina et al., 2011) In Russia in 2008, only about 10% of the enterprises of the respondents mentioned innovation in technology. In similar studies conducted in other countries, there is significantly higher proportion of innovative enterprises. The general figure is 30-40% but sometimes it is more than 60% (Figure 18). (OECD, 2011)

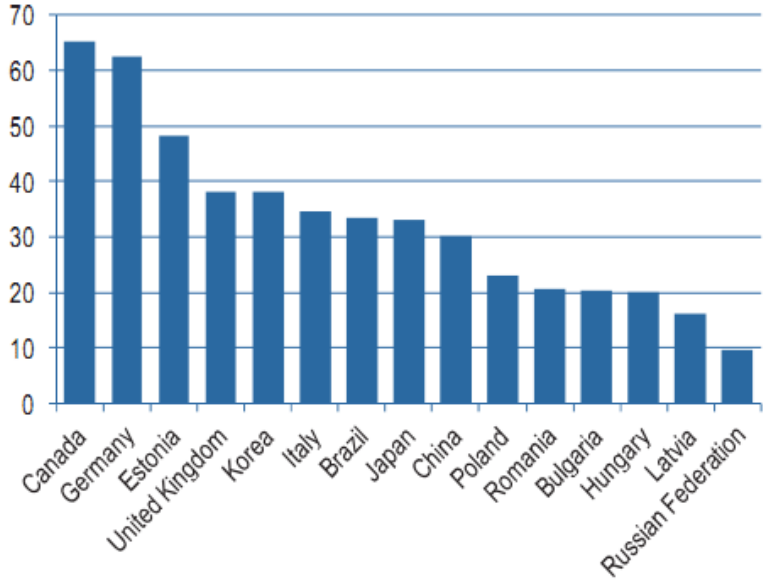

Figure 18. Enterprises engaged in technological innovation as a percentage of all industrial enterprises, by country, 2008 or nearest year (OECD, 2011, p.132)

Other indicators also show lower innovative performance. The share of innovative products in total sales remains low and did not exceed 5% (Figure 19). For comparison, the average of the 27 EU countries is around 10%. (OECD, 2011) There are also difficulties with the realization of ideas and technology abroad.

Russian developers and scientists tend to register only Russian patents, avoiding patenting abroad. (INSEAD, 2010)

Figure 19. Innovative products as a percentage of total sales 2008 (OECD, 2011 p.132)

It is vital for the Russian economy to increase the levels of productivity and competitiveness in industrial sector (INSEAD, 2010). It is impossible without creation of effective innovation system.

4.3 Innovation System in Russia

It is vital for the Russian economy to increase the levels of productivity and competitiveness in industrial sector (Schwab, 2010). In recent years the political leaders have claimed innovation a national priority (OECD, 2011). In 2008, Russia passed the Concept of Long-Term Social and Economic Development of the Russian Federation Until 2020. The main objective for the coming period is transition from the export of raw materials to an innovative model of economic growth, capable of ensuring the growth of competitiveness of Russian products and services in the domestic and world markets (OECD, 2009).

Innovation - is the result of the primary distribution of efforts that the government can take, and which it can influence. Russia has not yet fully overcome the legacy of the

past, when the performance of each strategic task for the society entrusted to any agency in accordance with a strict division of labor. (OECD, 2011)

Innovations are the result of interaction between many of competent market and non-market institutions that are driven by shared motives. In Russia, this process is distorted by the strategies implemented by some influential performers, including those who have inherited this potential, resisting the modernization and redeployment in cases, where it might weaken their institutional positions, as well as those who have built economic and political influence on achievements, based on the rent, but do not need to invest in new innovation competencies. (OECD, 2011)

Innovation systems are set institutions and processes, developing along the evolutionary path. Russia used to reach a significant level of development of scientific and technological capacity, but this potential is poorly adapted to the processes of wealth creation. Nowadays the country faces the task of transition to the innovative model, but there is still unfinished business of the current stage of development associated with the institutional quality and market efficiency. (OECD, 2011)

The current state of the Russian innovation system is shown on Figure 20. It demonstrates that firms located in the central part of the scheme as natural entities of innovation, have to occupy a central role in the innovation system. The contribution to innovation in firms from the public research sector is weak and needs to increase. Design bureaus, joint-stock R&D and engineering companies overlap the position with institutions because they receive the greatest share of public spending on R&D. Infrastructural support to R&D and innovation requires serious attention. But these efforts have largely shifted to the supply side of knowledge and remain largely isolated from demand. Tax incentives to encourage firms to innovate is used relatively little. Their effectiveness depends on the broader framework conditions for innovation, including competition, regulation, legal framework etc. Currently, this is

the weakest link. Public procurement and direct financing of R&D in Russia are conflated to some extent because of the strong support of the branch institutes and design bureaus. At the same time, using public procurement to stimulate innovation in other types of firms, both public and private, is not developed. (OECD, 2011)

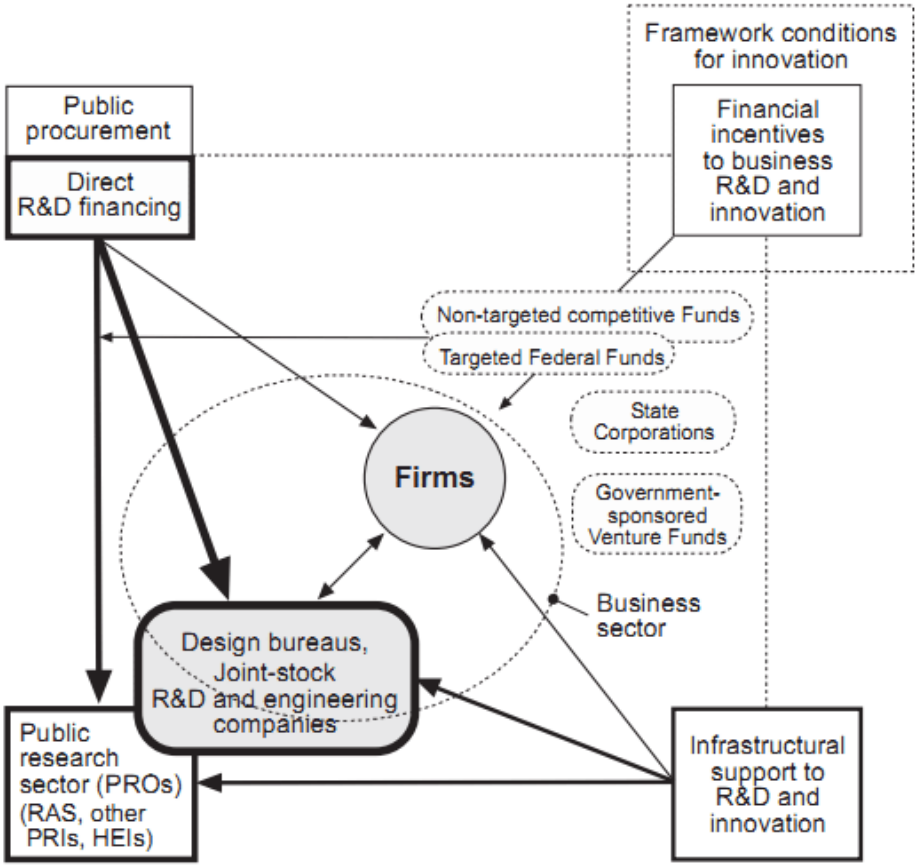

Figure 20. Russia's current innovation policy space (OECD, 2011, p.18)

The Russian innovation system is not yet oriented at the enterprise, despite the high share of the business sector in knowledge-based activities. Most technology-based companies are confined to a limited degree driven by market incentives and are insufficiently motivated to comply with market discipline. (OECD, 2011)

In terms of components of the innovation system Russia currently has a fairly complete portfolio of competent performers (small and large firms, research universities, public research organizations), supporting institutions and policies, although they are not sufficiently coordinated. (OECD, 2011) In Russia there are over 110 technoparks, even more technological innovation centers, over 100 centers of technology transfer, 10 national innovation analytical centers, more than 80 centers of science-engineering, 129 business incubators, 15 centers of innovation consulting and other organizations of the innovation infrastructure. (OECD, 2009)

Russia has got a useful legacy that can serve as the foundation for further development that includes a relatively high educational level and strong positions in certain fields of science and technology. Recent decisions regarding the innovations made at the highest level, created the conditions for renewal and development of new infrastructures, supporting science, technology and innovation within the framework of strategic directions. This led to the decision to target spending in priority areas and to introduce better use of the competitive approach in the resource allocation. (OECD, 2011)

At the same time, the effectiveness of innovation systems is hampered by many specific factors, including inherited from the Soviet system. These include the very low level of R&D and innovation activity in enterprises, weak infrastructures and regulations, and poor framework conditions for innovation, such as lack of competition, low level of trust and high levels of corruption. (OECD, 2011)

4.4 Innovation Infrastructure Supporting SMEs in Russia

Since the mid-1990's, Russian authorities have taken measures to stimulate innovation of SMEs and entrepreneurship in the field of innovation. Currently in Russia there is still no comprehensive policy on development of innovative SME. However, some initiatives have been implemented in this direction.

Commercialization support, venture financing and infrastructure development are among policy initiatives. (OECD 2010)

In Russia the growth in the number of SMEs (Figure 21) is observed. It is difficult to say with certainty what exactly contributes to continued growth. This indicates the development of entrepreneurship and the emergence of new business opportunities in Russia.

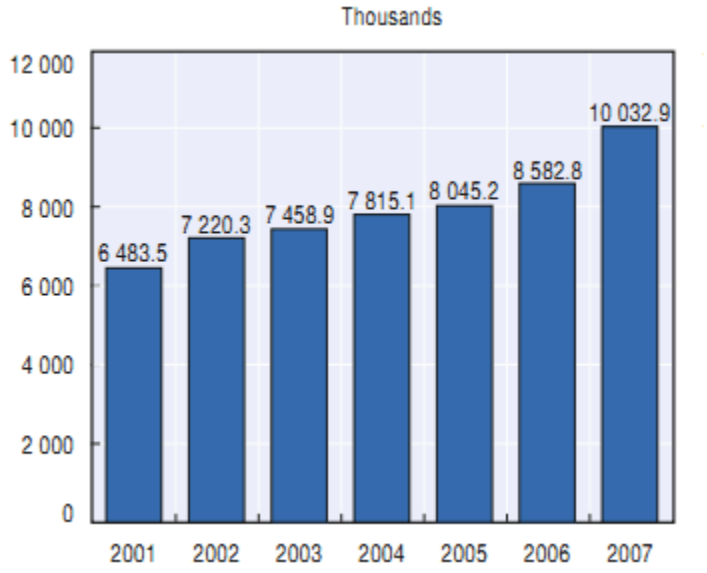

Figure 21. Growth in the number of SMEs, 2001-2007 (OECD, 2010, p.125)

In terms of commercialization support of SMEs, the funds from the state budget are mainly allocated to two organizations: the Foundation for the Assistance to Small Innovation Enterprises and the Russian Corporation of Nanotechnologies (RUSNANO). (OECD 2010)

The Foundation for the Assistance to Small Innovation Enterprises was founded in 1994 by the initiative of Russian Government. Annually, 1.5% of federal budget funds intended for public research are allocated to the foundation. The main activity of the Foundation is to support commercialization through direct financing of small

enterprises in their innovative activities. (OECD 2010) In addition, competitive programs for young scientists and innovators, as well as partnerships programs between universities and companies are conducted by the Foundation (FASIE, 2011). The organization has invited about 4,000 specialists from different fields of science. At the beginning of 2009, 16,500 projects were represented to the Foundation and over 5,500 were accepted. Enterprises that have received the support from it, commercialized around 3500 patented inventions. (OECD, 2010)

Rusnano was created by the Russian government in 2007. The federal budget allocated USD 5.3 billion for their activities. Corporation finance the selected projects in the field of nanotechnology and associated areas of science. (OECD, 2010)

In 2006, the regional venture fund program was initiated by the Ministry for Economic Development. The total capitalization of regional venture funds amounted to USD 300 million. (OECD, 2010) The Russian Venture Company (RVC) was established in 2006 to encourage development of venture capital in the country. (OECD, 2009) For the year 2010 RVC received 44 projects from different Russian companies, including SMEs (Russian Venture Company, 2011). Each project was examined and finally 17 projects were approved. In Seed Fund venture partners presented 130 investment applications, of which the investment committee selected 20 projects. The total investment for the approved projects for the entire period of existence of RVC has exceeded RUB 6 billion. (STRF, 2010) However, further development of venture capital markets in Russia are still hampered by imperfect financial markets (OECD, 2011).

Since 1990, Russia began to form elements of the innovation infrastructure of the market type - science-engineering parks and business incubators. Currently, to support companies in its early stages, around 160 business incubators (MIIRIS, 2011a) have been founded, that provide premises for rent on preferential terms, as well as accounting, consulting and legal services. (OECD, 2009)

Russia has seen rapid growth in the number of organizations registered as technoparks (OECD, 2009). In 2006 there were 55 technoparks (OECD, 2009) and in 2011, the amount has increased to 148. (MIIRIS, 2011b) Some of the Russian technoparks are operating successfully, but unfortunately, their share is not so great. For example, according to the result of accreditation, conducted in 2000-2003, only 25-30% of Russian technoparks met the assessment criteria. (OECD, 2009)

Innovation technology centers (ITC) are conglomerates of many small businesses located in the same area. For their formation substantial financial resources have been allocated at the state level. The main feature of ITC is that it is structural support for support of the already formed small innovative enterprises. They are designed to provide a more stable relationship with industry, small businesses, and therefore created at enterprises or research-production complexes. (OECD, 2009)

Innovation center Skolkovo near Moscow is of particular interest, planned to create scientific-technological complex for the development and commercialization of new technologies (RIA Novosti, 2010b). It was personally initiated by Russian President Dmitry Medvedev. The project aims to promote international cooperation, financing support, and assistance to innovative businesses, including small ones. (I-gorod, 2011) Residents of the Skolkovo will receive unprecedented tax benefits (InterFax, 2010). However, innovative SMEs already face difficulties in applying for Skolkovo. In particular, the barrier for participation in the project is an obligatory presence of the foreign partner or a specialist (Polit-Online, 2010). This fact causes confusion among Russian developers and it is a matter of intense debate (I-skolkovo, 2011).

On the basis of RAS institutes, state research centers and universities centers of technology transfer were established. (OECD, 2009) Russian Technology Transfer Network (RTTN) was established in 2002 and unites more than 70 Russian innovation centers, specializing in technology transfer. The activities of RTTN members aimed at seeking of Russian and foreign partners and establishing of technological cooperation between the parties (buyer and seller of technology) to

implement the further commercialization of technologies. However, it should be noted that the number of technology offers much greater than technology requests. (RTTN.ru, 2011) The project Gate2RuBIN takes a special place in RTTN activities (Luksha et al., 2008). It is new large-scale long-term project of participation of Russian organizations, business and innovation infrastructure in the European Enterprise Network. Gate2RuBIN project aims to promote technological business cooperation of SMEs and research organizations of Russia and the European Union, leading to enhance their competitiveness. (Gate2RuBIN, 2011)

5 CASE STUDY

5.1 BVN Engineering

General information and history

BVN Engineering is a company specialized in sports and special clothing, design and manufacture of equipment for the processing of down-feather raw materials and measuring and control apparatus. The company is located in Novocherkassk, Rostov Region, North Caucasus economic district. It was founded in 1991 by a group of scientists leading by Doctor of Technical Sciences Ivan Yurevich Brink (BVN Engineering, 2011). Now it is the leader of a group of developing companies that are structurally related to each other and represent a technology park. The main customers are large and medium-sized enterprises which require special summer and winter clothing for professional activities.

Leading experts of the company were involved into design of different types of overalls, bedding, and the equipment for the processing of down-feather raw materials even before foundation the company. In 1983 in Shakhtinsky Institute of Technology of Consumer Services (nowadays South-Russian State University of Economics and Service) heat protective clothes laboratory was established under the guidance of Ivan Yurevich Brink. In this laboratory specialists worked over developing downy heat protective clothing for rescue of astronauts. These years two basic branches of activities of the future enterprise have been established: manufacture of clothes and mechanical engineering. (BVN Engineering, 2011)

In the late 80s the production was launched in collaboration with manufacturing enterprises of the region. All this activity was integrated in 1991 under the name "BVN engineering". The company has retained the scientific and technological traditions created in the institute, and has not lost communication with higher education science. Management of the company pays much attention to the marketing

policy. According to opinion of the company this approach, despite the massive decline in production and discontinuity the traditional long-term relations between enterprises, made it possible to expand the product range and increase production volumes. (BVN Engineering, 2011)

State of the art

Nowadays BVN Engineering is the leader of a group of developing companies that are structurally related to each other and represent a technology park. Rich experience in designing and manufacturing of garments, considerable experience in the Russian market allowed the company to become large supplier in its market segment. Its customers include major Russian fuel companies. Large European and American companies place orders. It is also planned to enter the Finnish market with their products. At the same time the company has only about 80 employees. The company operates quality management system ISO 9001-2001.

The company successfully performed public contracts with the Foundation for Assistance to Small Innovative Enterprises. BVN Engineering has a gold medal of the 10th Moscow Salon of Innovations and Investments 2010

R&D activities

Major R&D areas:

- Special and sports clothing
- Equipment for the processing of down-feather raw materials
- Measuring and control equipment

The company is permanently engaged in R&D in its segment and registered 5 patents on products. One was sold to another company. Totally, employees of the company are co-authors in more than 15 patents. Directly in R&D activities 4 specialists are engaged. The company actively cooperates with South-Russian State University of

Economics and Service for a long time. Two licenses were bought from this university. Together with this university the joint-venture has been established.

Government support & challenges

The company does not have any tax benefits. In view of the current legislation, the company pays an additional tax on fuel. A significant portion of the costs is the tax on wages. This is one of the reasons for the joint-venture together with the university. The tax rate is lower there. The company has subsidies from the budget of the region. The amount of subsidies is 7000-8000 Euros per year.

According to the CEO of the company Aleksandr Sirotkin, bureaucratic barriers are only growing. The processes of registration of new firm and forms of reporting have become more complicated. Number of inspections has decreased, but if the inspection is carried out, this process takes a lot of effort.

Open Innovation perspective

BVN Engineering has five spin-off companies. The reason for that is the allocation of non-core activities into separate companies. The company receives no profit from them, but from acting together, synergistic effect is created. All companies are located in the special economic zone – the Industrial Park. The company is based on favorable conditions for the lease. There are totally 15 companies in Industrial Park that actively cooperate with each other.

BVN Engineering is an active member of the nonprofit partnership of innovation and technology center InTeh-Don. The company is involved in several serious collaborative projects. ItTeh-Don is the participant of Gate2Rubin project, the part of Enterprise Europe Network (Intehdon, 2011). The company contributes with RTTN. Aleksandr Sirotkin, evaluates the work of the network as satisfactory.

The company seeks to make the majority of their research projects and developments. The ideas and technologies do not gather dust. The company's management seeks to

implement the ideas inside the company, or allow ideas to develop in new start-ups. As mentioned above, the company has experience both in acquisition and sales of IP. Despite these successful operations, Alexander believes that IP is not protected by Patent Law strong enough. That is to say, there is no market of patents in Russia. Barriers for the sale of patents abroad result in the difficulty of international certification. However, it is quite possible that later on the company will register the new promising technology abroad.

Clients are actively involved in the development process. Given the fact that the company is taking orders for professional clothing, it implements customization of its products. New products for specific tasks are being developed.

As mentioned earlier, the company actively cooperates with the university. The university makes provision for developments and research projects, and, conversely, on its material base, some technological solutions are tested. The company is integrated with the university and commercializes their developments by implementing into production. The joint-venture is the result of combining two types of knowledge – applied from BVN Engineering and theoretical from the university. The result of collaboration was the development of new clothing resolving problems of electrostatics in potentially explosive atmospheres.

The company actively takes students for internship. Some students, usually one or two in the year, stay in the company. Aleksandr emphasizes the problem with the production personnel. Young people do not want to become such specialists. So the company is not fully supplied with the production personnel.

The personnel of the company actively participates in training programs as trainers and as trainees. Alexander Sirotkin teaches venture capital. The founder of the company, Ivan Yurevich Brink is the head of the department “Modeling, engineering and design” in the South-Russian University of Economics and Service. There are also two doctors of science in the company who teach in the university.

Alexander considered counterfeit goods and corruption as the principal handicap for the development and opening-up process of BVN Engineering. Speaking of Open Innovation among Russian companies in general, he believes that mistrust and misunderstanding of the effect that they can finally achieve are the main barriers.

Summary

Considering BVN Engineering in terms of openness, it can be concluded that the company is an excellent example of application of the Open Innovation paradigm in Russia. The management of the company thinks outside the boundaries of the firm, looking for new possibilities and markets. The company actively cooperates with universities, other companies and organizations, makes it possible to develop new spin-offs and successfully collaborates with them. In addition, the company is cooperating with the centers of technology transfer and is a member of Gate2Rubin project.

Table 4. Characteristics of BVN Engineering

Year of foundation	1991
Location	Novocherkassk, Rostov Region, North Caucasus economic district
Industry sector	Special and sports clothing, design and manufacture of equipment for the processing
Target market	Fuel and oil companies
Web-site	http://www.bvn.ru/
Number of employees	~80
Financing	Self-financed
Type of ownership	Limited Liability Company
Distribution channels	Direct sales and through network dealers
Special Economic Zone	BVN Intor
Number of the regular employees occupied with R&D	4
Intensity of the investment in R&D (expenditure/profit ratio)	0.3-0.5% of revenues
External (outsourcing) R&D	+
Joint R&D	With University
Licensing-in	+
Licensing-out	+
Number of patents	5
The number of sold licenses/patents	1
The number of bought licenses/patents	2
Spin-offs	5

5.2 Kamsky Bereg Stankostroy

General information and history

"Kamsky Bereg Stankostroy" is a company dealing with manufacture, sale and service of woodworking equipment. Located in Izhevsk, Udmurt Republic, the Ural economic district. The company was founded in 2000, and now it is a large and high-tech company with many customers in Russia and abroad. The main customers are small business - woodworking companies.

The company Kamsky Bereg Stankostroy began activities in 2005. The founders are Bychkov Dmitry, executive director of the company, once a member of the Udmurt State University, and his wife. The main partner, head of production also works in the company with his son and brother. As noted by Bychkov, the role of "family contract" is very significant.

Promotion is made via Internet. Actually, the business commenced with the fact that Bychkov in 1998 began to organize sales of local companies through the Internet. Gaining this experience, Bychkov has become able to promote the company and Internet sales in Kamsky Bereg Stankostroy. The owned production began in 2004. Initially it was a small "garage factory", and in 2009 a vacant building on one of enterprises was leased and reorganized into a small factory.

State of the Art

With small human, financial and material resources, the company was able to develop and produce a large number of different products with high demand – just like a large factory. On the web-site of the company there is an ordering form, a customer can choose the desired hardware configuration and calculate the approximate costs. Besides, on the official web-site of the company experts give advisory opinions on any matters related to woodworking machines, offer consultations and share experiences (Kamsky Bereg Stankostroy, 2011).The amount of the company is rather small – about 100 employees. The company manages to create a friendly atmosphere

in the team; there is almost no staff turnover. For ten years the company has produced several hundred units of various woodworking equipment. Manufacturing is constantly working with a full load.

R&D activities

Major R&D areas:

- Equipment for a wooden house
- Disk sawing
- Grinding machines

The company is constantly elaborating products, mainly empirically. The process of product development starts from general considerations and in alterations and modifications are brought to a required form. Except Bychkov and the head of production, 5-10 people are permanently involved in development of new products. They are not only professional designers. The company employs people who bear the nominal title of "Kulibin" in Russia (a self-taught master), with their own view, ideas, solutions and inventions.

New ideas and technology are often sought through the Internet. The company rarely needs to invent something completely new. To reduce cost and improve quality, if necessary, R&D and production often involve external companies and experts from specialized areas. For example, the company has an employee who is engaged in electronics – he is occasionally connected to the project and he helps to resolve issues on electronic components and constituents. The total R&D expenditures constitute about 30% of profit.

Government support & challenges

The company does not receive any kind of financial support from the state. Bychkov does not count on such endorsement and prefers to keep away from public authorities – "the farther from the officials, the better", he says. He sees the problem in that although much is said about innovation support on a government level, it is too far

from real cases. Money does not reach innovative companies. The company is financed by its own resources.

Open Innovation perspective

The company does not use strategic alliances and other similar forms of cooperation, explaining that such forms are effective in specific situations, but not on the system level. Purchasing of patents also has not been carried out yet.

In the R&D process lots of ideas and solutions have emerged that can serve the basis for a separate business, but the company has no experience of “Spin-off’s” or licensing. Ideas and inventions which do not run in production, as a rule, are not used, “waiting in the wings”. As noted by Bychkov, the idea can also be a product, but it is much more interesting to create a whole chain and get a final product as a result.

The company actively involves its customers in the development process, receives new ideas, the requirements for a new product from them. Customers - small woodworkers often receive new equipment without the full payment; the company maintains long-term business contacts with them. Clients are actively involved in launching and commissioning of new products.

There is almost no collaboration with universities or other research organizations, Bychkov explains that a university is far from the real business problems: the difference between university science and the real things is enormous.

Assessing the company's activities in terms of openness, Bychkov said: "The Company is open to the utmost”. And it does not depend on the willingness, but on the real situation. For the Company that means – “get maximum results from a minimum of cash". "We are a small business. We are very flexible and fast. And without the "openness" it is just impossible", he says.

Summary

Kamsky Bereg Stankostroy is a company that attempts to get the maximum with the minimum of resources. The company has a large number of clients and actively involves them in the development process. It invests significantly in the internal R&D, seeks to create competitive diversified products. The company has lots of ideas and projects, but it does not use the opportunity to benefit from the external use of its ideas and technologies.

Table 5. Characteristics of Kamsky Bereg Stankostroy

Year of foundation	2000
Location	Izhevsk, Udmurt Republic, the Ural economic district
Industry sector	Woodworking machinery (manufacture, sale and service)
Target market	Small woodworking companies
Web-site	http://www.kbstanok.ru/
Number of employees	~100
Financing	Self-financed
Type of ownership	Limited liability company
Distribution channels	Direct sales and through dealers (3 in Russia and 1 in Belarus)
Special Economic Zone	-
Number of the regular employees occupied with R&D	5-10
Intensity of the investment in R&D (expenditure/profit ratio)	30%
External (outsourcing) R&D	-
Joint R&D	With customers
Licensing-in	-
Licensing-out	-
Number of patents	1
The number of sold licenses/patents	0
The number of bought licenses/patents	0
Spin-offs	0

5.3 Prikladnaya Electronica

General information and history

Prikladnaya Electronica (the translated name – Applied Electronics) is a company engaged in the development and production of modern power supplies for vacuum technology. The company is located in Tomsk, Tomsk Region, West Siberian economic district. It was founded by employees of the Institute of High Current Electronics (IHCE), Siberian Branch of Russian Academy of Sciences in 2004 for commercialization of development of the institute in the field of vacuum ion-plasma coating technologies (Pronika, 2011a). The company is headed by one of the leading specialists of the Institute - Nicholay Sochugov. Experience and knowledge allow specialists to create high-precision instruments, world-class quality. The company is one of the recognized leaders in the industry. (Pronika, 2011b) The main customers are Russian and foreign research laboratories that develop technologies of surface modification.

Specialists of the company were engaged in the development of power supplies for vacuum technology long before the foundation of the company. The company's activity is the result of years of teamwork in the laboratories of IHCE. The Prikladnaya Electronica itself can be regarded as a spin-off of this research center. And now laboratory and the company are integrated. Nicholay Sochugov double-jobs two executive positions: the CEO of Prikladnaya Electronica and Head of Laboratory in IHCE.

State of the art

Over time, the company managed to achieve significant results in the field. The company has 10 employees. Among customers there are influential Russian universities, research centers and laboratories. Technologies are also presented abroad. The company and the laboratory are located on the territory of special economic zone. The company has passed the requirements of ISO 9001- 2000.

R&D activities

Major R&D areas:

- Power supplies for vacuum technology
- Vacuum ion-plasma coating technologies

Specialists of Prikladnaya Electronica and the laboratory are a sole team. The center of the team has been and remains the laboratory of the Institute of Sciences. Prikladnaya Electronica as a spin-off has its own way of development but management has a desire to maintain the unity of command. The laboratory employs 15 people and they are all involved in the process of development. 6 of 10 specialists in the company are involved in this process. The transition of the intellectual property from the laboratory to the firm is performed at the level of knowledge of specialists. The laboratory has registered 5 patents, the company - 1 patent. Not every technology is patented. Plenty of ideas are sitting on the shelf.

Government support & challenges

The company regularly receives financial support from the assistance fund and from the regional fund. As a resident of the SEZ, the company has a lower tax regime. But according to Nikolay Sochugov, taxes are still unreasonably high. The company attempts to obtain venture investing. However, excessive requirements for the project make it difficult, so it is more than likely that the company will refuse the venture company.

Open Innovation perspective

The Company sells its technology directly. While the sales volume and production level do not allow to lose direct contact with the buyer.

Attempts to create strategic alliances have been made, but so far have not yielded practical results.

The company collaborates with the Foundation Assistance to Small Innovative Enterprises. On the initial stage Prikladnaya Electronica started with a victory in the contest “Start – 2004”.

The company is a resident of Tomsk special economic zone. However, management of the company believes that it does not give the desired effect. The received tax privileges leave on payment of expensive rent.

In addition IHCE cooperation is carried out with other research institutes. Usually the company cooperates with two or three of them simultaneously.

Speaking of the potential of open innovation in Russia, Nikolay Sochugov believes that the problem is the lack of demand and supply. ”Now, unfortunately, those companies that should make innovations, only pretend that they do that”, he says. Speaking about the company, Sochugov says that now they face challenges that cannot be resolved alone and they have to apply some of Open Innovation principles.

The company constantly cooperates with universities. R&D in universities is associated with the implementation of joint projects. This is often related to financial issues. The possibility of funding brings to work.

Some employees of the company are lecturers in the university. Nikolay Sochugov is teaching at the Tomsk Polytechnic University. Graduates are employed in the laboratory and in the company. The company also provides seminar works and tasks for students.

Summary

Prikladnaya Electronica is a small enterprise that successfully collaborates with R&D laboratory of IHCE, other research centers and universities. Achieved synergistic effect allows them to commercialize world-class technologies. In this case, it is

important to pay attention to the position of CEO, which sees the laboratory and the company staff as one team, which has the same goals.

Table 6. Characteristics of Prikladnaya Electronica

Year of foundation	2004
Location	Tomsk, Tomsk Region, West Siberian economic district
Industry sector	Power supplies for vacuum technology
Target market	Research laboratories that develop technologies of surface modification
Web-site	http://www.pronika.ru/
Number of employees	10
Financing	Self-financed
Type of ownership	Limited liability company
Distribution channels	Direct sales
Special Economic Zone	Tomsk special economic zone
Number of the regular employees occupied with R&D	6 (15 in the laboratory)
Intensity of the investment in R&D (expenditure/profit ratio)	30%
External (outsourcing) R&D	+
Joint R&D	With research institute
Licensing-in	-
Licensing-out	+
Number of patents	1 (5 in the research institute)
The number of sold licenses/patents	1
The number of bought licenses/patents	0
Spin-offs	0

5.4 Nanopowder Technology

General information and history

Scientific and Production Company Nanopowder Technology deals with the variety of services, solutions and equipment based on nano-materials. It is located in Novosibirsk, Novosibirsk Region, West Siberian economic district. The company was founded in 2007 in Novosibirsk as a science campus (Nanopowder Technology, 2011). The company is headed by Dmitry Zyryanov. The company has a large baggage of ideas, developments and projects. The main customers are those enterprises that need equipment and technologies for complex fly ash recycle. They are located in the Western part of Russia mostly.

The foundation of the company was encouraged by great research potential, accumulated over several decades, combined in diversity of global, infrastructure, innovation projects. The father of the head of the company is a well-known scientist, and he was involved in the development of these technologies from student years. The company was established to commercialize the results of R&D activities. The unique developments available to the company existed since the Soviet period.

State of the art

The company is now expanding its range of products and services. The highest level of staff skills, vast experience and ability to work with any size powders offer advantages over competitors. The company has a unique technological methods and technological solutions which significantly exceed competitors in terms of grinding various materials. The company has only five employees.

R&D activities

Major R&D areas:

- Fly ash reduction and recycling
- Hydrogen power engineering

- Membranes and ceramics technology
- Composite materials
- Constructing of technologies for low-rise building

Only one specialist inside the company is constantly engaged in R&D activity. However, scientific staff is involved in external research centers, laboratories, research institutes, possessing expensive analytical equipment that operates tasks associated with research of materials. Outsourcing is a steady practice.

Company has only one registered patent. Totally they have more than 50 developments, but they have not yet registered them as finished products and currently they have no concrete customers for those developments. So those ideas and technologies are sitting on the shelf.

Government support & challenges

The company does not receive government support and subsidies. Most R&Ds in Russia are initiated by the state. Money normally comes from the state, but where they go and under what pretext is unknown. In recent years, work has become more complicated. The company needs tax benefits. On the contrary, tax burden and rent has been increased. Since late-2000's financial crisis all the costs are minimized.

The company wants to be located in the SEZ, but existing technology park in Novosibirsk does not offer reliable conditions. Dmitry says that companies are leaving from there. Conditions that are offered were not initially competitive. It is simply more profitable to rent floor space in a common business center.

The company is submitting an application in Skolkovo. It requires a lot of documents and participation of foreign partners is needed. Skolkovo still expresses rather negative attitude towards the management of the company.

Open Innovation perspective

The company has no positive experience of strategic alliance. There were two attempts to crate joint-venture with potentially promising companies, but there was no successful realization. Partners proved were unreliable. The company carries the entire cycle from idea to final implementation and works directly with customers.

According to Dmitry, it is impossible to buy and sell technologies in Russia. The potential for ideas is strong but technology waits in the wings, as it was already mentioned. Registration of the patent is worth the money. Any patents relate to the disclosure of information. Therefore, the company has no specific goal to patent technologies. Dmitry points out that one of the problems of innovative evolution in Russia is that the companies are not ready to pay for intellectual work.

The knowledge of the company is gathered in a heap and arranged in the form of two projects, that require investments. Product line will be for different purposes. According to Dmitry, they must be out of competition. If he finds funds, the projects will be launched, no other way. In case of success, new spin-offs may evolve. The company actively seeks investments for these innovative projects. RVC considers these projects. However, so far there is no definite action. According to Dmitry, venture capital companies working in Russia are not efficient enough.

Nanopowder Technology has not received any offers from other Russian companies to buy their technology. According to Dmitry it is difficult to sell a patent on favorable terms and foreign companies are not inclined to cooperate. They are no longer taken seriously as the existing Russian developments. All existing achievements are mainly from the Soviet period.

The Company offers cooperation to many foreign well-known companies, but the results cannot be reached. Dmitry says: “The foreign companies do not want to work with Russian companies because they believe that it is very bureaucratic, unreliable, too far away, and that "the bears are still walking on the streets". For his company it

is difficult to establish contacts with potential foreign partners, and if this stage passed, further attempts to a concrete contract fail. At some stage of the process foreign companies are stopped.

RTTN is not interesting for the company. For some points, management's views diverge from those that offer RTTN.

None of the staff is engaged in teaching activity. Dmitry says that the State allocates the money for universities, but they do not reach real science sector. There is a certain imbalance. Universities have the instrument base but professors are far from actual practice. Currently students are not involved in the development process. When the company finds itself confident enough, they will attract young specialists.

Summary

Nanopowder Technology is a young promising company that has superior skills and technology in the field of nano-material. The company successfully uses the accumulated knowledge and cooperates with research centers. Also the management attempts to use existing opportunities for new projects: venture capital, Skolkovo, access to foreign partners. These attempts have not brought significant results yet. The company faces serious difficulties, but the company does not stand still and continues to evolve, developing new products and services. They are open for the Russian market, while “the market is not ready yet”.

Table 7. Characteristics of Nanopowder Technology

Year of foundation	2007
Location	Novosibirsk, Novosibirsk Region, West Siberian economic district
Industry sector	Services, solutions and equipment based on nanomaterials
Target market	Enterprises which need equipment and technologies for complex fly ash recycle
Web-site	http://www.nanopowder-technology.com/en/
Number of employees	5
Financing	Self-financed
Type of ownership	Limited Liability Company
Distribution channels	Direct sales
Special Economic Zone	-
Number of the regular employees occupied with R&D	1
Intensity of the investment in R&D (expenditure/profit ratio)	50%
External (outsourcing) R&D	+
Joint R&D	-
Licensing-in	-
Licensing-out	-
Number of patents	1
The number of sold licenses/patents	0
The number of bought licenses/patents	0
Spin-offs	0

5.5 SonarSource S.A.

General information and history

SonarSource S.A. is an IT-company engaged in the open source quality management platform called Sonar. The headquarter of the company is located in Plan les Ouates, Geneva, Switzerland and R&D office in La Roche sur Foron, France (SonarSource, 2011b). Also the company has a specialist in Saint-Petersburg, Russia, where it is planned to open representative office. The company was established in 2008 and now it is a small but promising company with large customer base, partners and open source community. Olivier Gaudin is now the CEO of SonarSource S.A. The experience of the company interested in terms of attracting Russian specialists, as well as Open Source project. The main customers are banks and companies that service them.

Freddy Mallet, Olivier Gaudin and Simon Brandhof, employees of large IT-company had their own internal project – the open source quality management platform. It could not be a part of main business of the company so they founded SonarSource S.A. in 2008 as a spin-off. The large company has invested in new start-up and owns part of it. From the date of foundation, Sonar, as an open source platform has developed all the time.

The company is actively involved the third-party programmers to develop products based on the platform. One of such specialists, Evgeny Mandrikov, a graduate of Saint Petersburg University of IT, Mechanics and Optics, joined the company in the beginning of 2010. Before that he worked in a Russian IT-company and had experience with the Sonar-based products. He found something that he didn't like in it and decided to improve the product. As a hobby, he developed an improved version of the product and made it accessible to all. Then story repeated itself with another SonarSource S.A. product. As Open Source technologies became more and more interesting, Evgeny began to communicate with developers all over the world, including SonarSouce SA.

The company from Switzerland, became interested in Evgeny, he contributed a lot to the project. After some time, they invited him to work at the company and develop Sonar together in team. Now Evgeny works mainly in Russia and develops non-commercial Plugins for the Sonar platform.

State of the art

SonarSource S.A. uses Open Source features to the maximum. Knowledge, experience and openness allow the team to have well-known companies as customers worldwide. Among them are Cisco, Bank of America, Michelin, Nokia Siemens networks, etc. (SonarSource, 2011a) SonarSource S.A. has no special advertising. It advances through free of charge platform and communication. Most often a company starts to use Sonar platform due to the interest of an ordinary employee, who sees the benefits of the platform and contacts the management with a proposal to use it.

The company employs just 7 people but due to the active cooperation and own talented developers it achieves significant results. The Sonar platform is free of charge for companies and developers. The source code is open. SonarSource S.A. profits from support and creation of specified Plugins.

R&D activities

Major R&D areas:

- Open source quality management platform.
- Developing commercial and non-commercial Plugins for the platform.

The development of the platform and programming of its products is the continuous process in the company. 5 specialists are directly engaged in programming. However, the open code is able to attract developers from all around the world. Collaboration with specialists is usually carried out on a gratuitous basis. Specialists want to take part in the development of the platform, to communicate and discuss its features, and

improve the product for their needs. The company's management, in turn, strongly supports such participation in the project. The company strives to make the most of their ideas. There are some ideas sitting on the shelf, but usually they are eventually realized.

Government support & challenges

Headquarter is located in a business incubator in Switzerland. It gives a definite advantage. Incubator provides tax benefits, as well as a reduced rent. Bookkeeper for document management is free of charge for the company.

Open Innovation perspective

Open Source allows anyone to use the platform. The company receives feedback from users. This provides the opportunity of free testing. The company has no special testers. The users of the platform serve as testers. Besides, normally it is possible to find a person in community who can help with development of a product.

SonarSource S.A. successfully implemented a partnership with other companies

For example a company provides ready-made components, instead of obtaining of the finished product, or companies develop a particular program together.

There is no direct cooperation with the universities. But there was experience, when the company accepted the student to practice. SonarSource S.A. also participates in various student competitions, submitting technological challenges. Also, many students apply directly to companies participating in the development of products for the platform. Employees of the company participate in training as teachers and as students. Evgeny himself conducted several lectures related to Open Source at the University.

Summary

SonarSource S.A. is a good example of Open Source practice and a company based on open principles. Approach of the company’s management, which aims to bring all

possible participants to the process of development - users, individual programmers and groups of them, students, internet communities, etc. has a positive effect and allows a small team to achieve significant results. In this case, openness is the willingness to share knowledge and communicate with all interested parties and develop the better technologies together. Experience in the recruitment of young professional from Russia is a confirmation that foreign companies can find and successfully work with Russian experts.

Table 8. Characteristics of SonarSource S.A.

Year of foundation	2008
Location	Ruelle du P'tit Gris, Plan les Ouates, Switzerland
Industry sector	Open Source quality management IT-platform
Target market	Banks and companies that service them
Web-site	http://www.sonarsource.com
Number of employees	7
Financing	Self-financed
Type of ownership	Privately Held
Distribution channels	Direct sales
Special Economic Zone	Business Incubator
Number of the regular employees occupied with R&D	5
Intensity of the investment in R&D (expenditure/profit ratio)	No exact information
External (outsourcing) R&D	+, as Open Source platform
Joint R&D	+
Licensing-in	+, as Open Source platform
Licensing-out	+, as Open Source platform
Number of patents	0
The number of sold licenses/patents	0
The number of bought licenses/patents	0
Spin-offs	0

5.6 Engineering-chemical laboratory of the Udmurt State University

General information and history

Engineering-chemical laboratory is a self-supporting structural unit of the Udmurt State University (UdSU). It specializes in issues related to scaling and corrosion in thermal power equipment, heating and hot water systems. The laboratory is located in Izhevsk, Udmurt Republic, Ural economic district. The laboratory was established by the initiative of Rector of the University Zhuravlev Vitaly in 2003. Since its foundation the laboratory is headed by Fedor Chausov. Before the opening of the laboratory he worked at the university for 3 years. Over the years, the laboratory was able to achieve significant results. The main customers are fuel and energy enterprises, industrial, housing and municipal services that are interested in reducing costs and new energy-effective technologies.

Fedor Chausov is the author of more than 100 basic and applied research papers on crystallography, physical chemistry, kinetics of phase transitions, chemical technology, scaling and corrosion inhibition. He is the inventor, author of more than 20 inventions and utility models, 9 of which are embedded in the national economy at more than 200 objects of chemical, energy and food industries. (Labudgup, 2011) And also, judging by the results, Chausov is a successful manager and entrepreneur.

State of the art

During its existence, the lab was able to achieve meaningful results. Among the customers there are major Russian and foreign companies. The University is a reputable organization. Under this flag the laboratory has higher consumer confidence.

There are only 2 staff members in laboratory - Fedor Chausov and a leading expert. Other employees are engaged on part-time basis. Over 50 people from other departments of the University, Academy of Sciences and other organizations perform

the main part of the development in the lab. And then production is placed on sub-contract conditions at enterprises of Izhevsk and other Russian cities.

R&D activities

Major R&D areas:

- Pipeline transport technologies
- Transmission of heat technologies
- Protection against corrosion, salt deposits
- Removal of impurities

As mentioned above, the laboratory based on the free scheme. It is not ponderous, and enables Fedor Chausov to monitor the evolving needs and resolve new technological challenges. For each new challenge the new team and approaches are applied. Instrumentation available at the university and at other organizations is involved. In such a way the team and instruments are formed for each specific challenge. The laboratory may adapt to a new formulation of the problem and responds promptly. And it is the competitive advantage.

Laboratory staff has registered more than 20 patents. Now 9 patents are supported, many new technologies replaced the old ones.

Government support & challenges

The state does not provide any special support for the laboratory. The laboratory has not received any grants or allocations from the budget. Chausov says: “When the state intervenes, you will see everything falling apart. It is like a bull in a porcelain shop”. University as a research organization has certain benefits. These benefits are not essential for the laboratory. In general, particular support from the state is not perceived. In recent years the situation has not changed either for better or for worse.

According to Chausov Russia has underdeveloped system of IP protection. There is no centralized authority that would deal with it. In this case the problem is not legislation but lack of its implementation. This is a flaw that disturbs actual work. During its existence laboratory has faced with many infringements of intellectual property rights. Not all of the trespassers were successfully prosecuted.

Chausov also speaks of the complex antitrust legislation. Each purchase of equipment requires unreasonable documenting, regardless of the sum of purchase.

There are some problems with production infrastructure. In Izhevsk city large enterprises do not always agree to fulfill small orders of the laboratory. Many small businesses were forced to cease operations during the crisis. Thus sometimes it is quite difficult to make small-scale orders. The company also faces lack of available modern instruments and equipment.

Open Innovation perspective

The laboratory aims to find profitable partnerships. For example, it has strategic partnership with company EkoEnergia. The company has chemical reagents and the laboratory has technology to utilize these reagents.

There are also longstanding relationships with major Russian companies. From them new technological challenges are received. Customers are directly involved in the development process as well as in the process of commissioning and debugging.

The laboratory has no explicit cooperation with competitors, but sometimes they give their orders when they find out that they cannot cope with them. And if for some reason the laboratory cannot fulfill an order, it redirects customers to competitors.

The laboratory cooperates with other companies as extensively as it is required. There is an optimal measure of cooperation and as Chausov says: “The own work should be also done”.

The laboratory has not purchased any patents. But there is experience of cross-licensing agreement. As previously mentioned, knowledge is usually transferred at the level of specialists. And the laboratory has not sold their patents. According to Chausov, there is no market of patents in Russia. There are not so many innovative companies and the price of a patent is likely to be lower than the income that the laboratory can get commercializing the technology on their own. The laboratory has not tried to sell the patents abroad due to the fact that it is difficult to monitor that technology will not be stolen. Chausov jokes: "Russia is a huge country and it is difficult to control IP rights. If we add Europe, then our laboratory will turn into the police. We will monitor violations, rather than pursue science".

The laboratory is ready to work with the centers of technology transfer, but at the moment it is out of practice. They have no experience with venture capital as well. There is no lack of working assets. The laboratory develops gradually.
Chausov has positive experience with FASIE program Start. It was even before the formation of the laboratory.

Chausov teaches at the UdSU, participates in exhibitions, conferences. He invites students of the university to take part in R&D activity.

Chausov believes that the Open Innovation paradigm is natural in the modern world and he originally followed it, with no idea how it was called. In his view, innovation nowadays can be implemented only according to this paradigm, when the result of R&D activity enters the market in a free co-operation with each other.
“It is impossible to create innovations in another way. In one company the whole cycle is almost impossible today. We initially revolved around this path.”, he says.

Summary
Engineering-chemical laboratory of the UdSU is a positive example of how entrepreneurial spirit and willingness can advance, it is a network of external linkages

that allows the laboratory to be confined to two full-time specialists only and to create innovations for resolving of complex technological problems. The head of the laboratory followed the Open Innovation strategy and using quite modest internal resources, was able to create optimal business model capable to solve versatile problems, to develop steadily and to go far ahead.

Table 9. Characteristics of Engineering-chemical laboratory of the Udmurt State University

Year of foundation	2003
Location	Izhevsk, Udmurt Republic, Ural economic district
Industry sector	Pipeline transport and heat transmission technologies, special protection
Target market	Fuel and energy enterprises, industrial, housing and municipal services
Web-site	http://www.labudgup.ru /
Number of employees	2 (50 – part-time job)
Financing	Self-financed
Type of ownership	Self-supporting structural unit
Distribution channels	Direct sales and through intermediaries
Special Economic Zone	University (UdSU)
Number of the regular employees occupied with R&D	2 (50 – part-time job)
Intensity of the investment in R&D (expenditure/profit ratio)	20%
External (outsourcing) R&D	+
Joint R&D	+
Licensing-in	Cross-licensing
Licensing-out	Cross-licensing
Number of patents	9
The number of sold licenses/patents	0
The number of bought licenses/patents	0
Spin-offs	0

6 ANALYSES AND RESULTS

The number of SMEs in Russia is gradually increasing and their influence is becoming evident. In return, the government is implementing specific measures to improve the innovation environment within which the companies can operate. Open Innovation is a quite new paradigm and understanding of both internal and external processes in a company is needed for its large-scale objectification. The national innovation system in Russia endeavors to become similar to the systems applied in developed countries. Along with emergence of new opportunities, however, the barriers remain to be dramatic. Regarding the current situation, we see that the majority of business rules, which work in developed countries, do not work properly in Russia.

Theoretical contribution

The following part contemplates the factors leading to the destruction of the old Closed Innovation paradigm and reinforcement of the new one. Firstly, availability and mobility of workforce have risen in Russia recently. For instance, there is a great variety of talented scientists and developers in the country, and the quantity of university graduates has boosted. However, the specialists might be not in demand, and many of them are not able to find a job according to their specialization or under worthy conditions. Due to these reasons, many of such specialists had to move abroad, which led to the outflow of the human capital. In this case, the erosion factor works unfavorably not only for specific companies, but against the whole country.

The second erosion factor is the market of venture capital, and some definite initiatives were undertaken in this direction in Russia. Thus, a centralized system of venture capital investments was created, which is subordinated to the state company RVC and comprised of regional funds. The government expended substantial funds for the support of the venture capital market. However, it should be noted, that despite the existence of some projects realized within this program, the number of such projects is insignificant in comparison with other countries. Moreover, many

Russian companies executing R&D, including the case companies of the given study, have encountered with difficulties in obtaining investments for specific projects. Hence, this factor is not fulfilled.

The third factor, new external options for ideas from the shelf, derives from the previous two ones. Russian innovative SMEs do have worthy ideas, the information in mass media, as well as the given study, may serve as an evidence for the fact. Russian inventors hold new promising developments within their laboratories, but nevertheless, only a minor part of them can be implemented. Occasionally it is hard to realize new start-ups due to the complexity of financial questions, as far as sales and purchases of intellectual property remain irregular practice. Consequently, as a result of such attitude, many ideas still rest within the Russian companies, as they rested before.

The fourth factor presents itself increasing capability of external suppliers. Russian companies can find a wide range of suppliers, it is typical for companies dealing with equipment for the raw materials sector, in particular. At the same time, SMEs often encounter the problem of inability to place small orders. Industrial companies are ready to take only large orders, and generally are not interested in the orders from the SMEs. The work with foreign suppliers is restricted by high taxes and existent administrative barriers, which extend delivery time.

Thus, the erosion factors destroying the Closed Innovation paradigm are fulfilled in Russia only partially, and they have both negative and positive impact on the operation of the current innovation system. Due to the specific character of the Russian environment, these factors work either to a certain degree or in some cases do not work at all. This leads to the complexity of the transfer from closed to open innovations.

Interpretation of case study

Despite the existing difficulties, there are successful examples of application of the open innovation principles in SME in Russia. This happened due to some definite factors, which are typical for national operation in the sphere of science and technology.

Comparison of the parameters pertaining to the Open Innovation implementation and factors related to innovation activities in general in Russia are demonstrated in Table 10. The table compares indicators of openness of studied SMEs.

Table 10. Comparison of case companies in terms of OI

Company name	BVN Engi-neering	Kamsky Bereg Stanko-stroy	Priklad-naya Electronica	Nano-powder Tech-nology	Sonar-Source S.A.	Engi-neering-chemical laboratory of UdSU
External (outsourcing) R&D	+	-	+	+	+**	+
Joint R&D	+	+	+	-	+**	+
Licensing-in	+	-	-	-	+**	+***
Licensing-out	+	-	+	-	+**	+***
Selling patents (IP surpluses)	+	-	-	-	-	-
State support	+	-	+	-	-	+****
Venture capital	+*	-	-	-	-	-
Spin-offs	+	-	-	-	-	-
Patenting abroad	-	-	-	-	-	-
Special Economic Zone / Technopark	+	-	+	-	+	+****
Collabo-ration with CTT / Inter-mediaries	+	-	-	-	-	-

* - The company won the venture contest, but due to the crisis 2008 did not received the funds

** - As open-source

*** - Cross-licensing

**** - As a part of university

On Figure 22 the place of case companies in open-closed, exploitation-exploration dimension is demonstrated. X-axis shows whether a firm focuses on its current business with existing competencies and activities or aims to find, acquire and

develop advanced competencies and new business opportunities. Y-axis reflects the degree of openness herein.

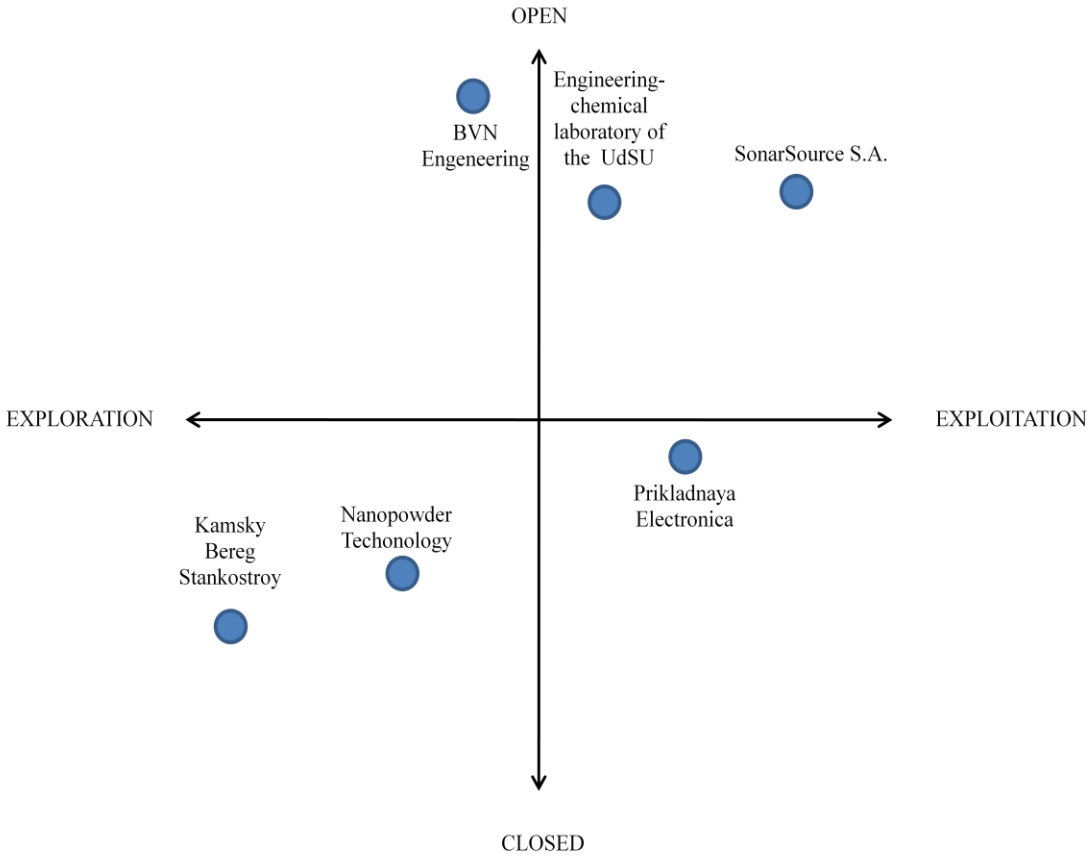

Figure 22. The case companies on open-closed, exploration-exploitation space

It is worth to mention that all the respondents from case companies acquainted with the principles of Open Innovation. All respondents except one agreed to the correctness and relevance of these principles.

The research demonstrates that most commonly case companies are acquiring knowledge through collaboration with universities, research centers and institutes. As rule, the company's work in the field of R&D is directly integrated with the activities of these organizations. Such kind of permanent collaboration is commonly their core

competence. There are quite many talented scientists and developers work in this research centers, and they are able to handle ambitious findings. The works, performed in research centers, are commercialized by the SMEs. The innovative SMEs actively use external sources for the acquisition of knowledge. But mostly, the transfer of knowledge is noticed on the level of specialists. Respondents explained this by saying that it's easier and cheaper. There is no need to sign additional contracts. Most often case companies do not have experience of knowledge acquisition in the form of patents or licenses. New developments obtained on the basis of partnerships with other commercial organizations are not a regular practice as well. Thus in studied SMEs OI implementation in terms of technology in-sourcing is realized through close cooperation with research centers. It is also important to note that a great part of developments in case companies was inherited from the Soviet period, but they are still up to date.

In case companies the sale of knowledge surplus is not a common practice as well. As a rule, the technologies are patented only in case they are directly connected with a manufacturing company. The studied SMEs avoid patenting and further sale of IP for the following reasons:

(1) weak protection of the IP rights on the level of control for the execution of the current laws
(2) high costs for registration and patent sustaining, taking into account existing financial capabilities
(3) lack of demand for technologies in Russia
(4) mistrust, high cost of patenting abroad, reluctance of foreign colleagues to work with Russian the companies
(5) lack of technology market in Russia

Despite such barriers, few studied companies have the experience of selling their IP. But these were isolated occurrences, not permanent practice. Thus, ideas and technologies in case SMEs are either applying practically inside organization or just sitting on the shelf.

Turning to government support and the measures taken, it can be concluded that the businessmen agree with the opinion that the best thing the government can do is not to intervene. Over the last years it has become easier to work in some cases, and more difficult in others, but by and large, the situation has not changed considerably. The Skolkovo project also remains unavailable for many Russian SMEs. The conditions which should be fulfilled do not correspond to reality.

It should be noted that not all technoparks meet asserted claims. The case study indicated that some of them offer proper conditions, all necessary services and reduced rental rates, whereas others only produce pretence: the discounts are compensated by higher rental rates.

As for venture capital investment, the case companies encounter difficulties in obtaining such financing. The prerequisites for the projects are high, and the process of receiving the investment is full of bureaucracy obstacles. As mentioned before, there are only a few projects, which were put into effect. The respondents from the case companies appeal that there are a lot of difficulties in the acquisition of venture capital.

The realization of new ideas and technologies via spin-offs is an irregular practice in Russia. Such experience has only one case company. This kind of projects realization is typical for the large companies mostly.

The collaboration with RTTN does not show any considerable results as well: only one case company had positive experience in this field. Other companies either have no idea about this network, or they are not interested in the cooperation.

Comparing new advantages of the open innovation paradigm for the SMEs, which are presented by Chesbrough (2010), it can be noted that these possibilities are limited in Russia.

(1) In the scale of the country, there are not so many innovation products, which are manufactured within the country. Although large companies attract SMEs in their innovation projects, the demand is not that high
(2) Russian SMEs can develop enhancements for new technologies. SMEs in Russia often have good relations with large companies and help them to improve their products.
(3) There are quite many product platforms in Russia, therefore this advantage is considerable.
(4) Niche strategy works in Russia: SMEs involved in innovative activities offer products for narrow market. Companies outlined in the Case study do not supply products for the mass market, but are able to find their customers. The problem is that the demand for advanced technologies in Russia remains low, and foreign companies are wary of Russian ones.
(5) Open Source is developed in Russia insufficiently; however, it does not mean that there are no talented developers, willing to work in Open Source projects. The given example demonstrates aspiration and readiness of Russian specialists to work in this direction.
(6) SMEs engaged in innovative activities can offer specialized, high-quality products for the market. Performers in various fields of science and technology can be found to resolve specific problems. The challenge here again lies in lack of demand for new solutions.

Table 11 briefly represents OI implementation in studied SME. It provides short information about OI perspective, type of existed OI approach.

Table 11. OI implementation in case companies

Company name	OI perspective
BVN Engineering	Successful application of OI principles; permanent utilization of collaboration, alliances; complete understanding of benefits of Openness; inbound OI (occasionally outbound OI);
Kamsky Bereg Stankostroy	Successful innovation activities and extensive growth without direct application of OI
Prikladnaya Electronica	Effective integration with research centers and universities; inbound OI
Nanopowder Technology	Collaboration with large number research centers and universities; attempts to find ways to new market, but with no result due to existed barriers; inbound OI
SonarSource S.A.	Effective use of Open Source standard; willingness to acquire and share knowledge; inbound and outbound OI
Engineering-chemical laboratory of UdSU	Large number of external linkages; Open approach to business; inbound OI

Generalizing the results, it can be said that Russian SMEs engaged in innovative activity only partially follow OI principles and implement OI paradigm. They actively use external ideas, understanding, that not all smart people work within the organization, create value through external R&D. On the other hand, they do not put into effect the existed ideas and technologies outside the organization and do not use external path to the market. Commonly, they do not have ability to profit from others' use of their IP. This is largely connected with the features of doing business for SMEs, and the problems with IPR protection and VC investments in Russia. Thus, basically, studied SMEs apply inbound way of OI adoption in a company. The outbound innovation processes are isolated occurrences. Usually studied SMEs do not utilize external ways to the market.

7 CONCLUSIONS

Irrespective of existence of scientific base and a large number of research institutes, universities, laboratories and talented individual designers, the innovative activity of enterprises in Russia remains relatively low. The country's top leadership endeavors to take steps for improvement of existing innovation system and emergence of new opportunities for innovative SMEs. The country aspires after the innovative model of economic growth. It is essential to commit such transition with understanding that innovation in developed countries and companies is constructed according to the Open Innovation paradigm. It is crucial to create conditions for greater inter-organizational cooperation in the field of knowledge and technology, for acquisition and their subsequent realization.

The goal of this work was to explore the utilization of OI Paradigm in SMEs in Russia, current trends, opportunities and challenges they faced. The study revealed features of OI implementation by SMEs in Russia. The following possibilities and limitations in of applying the OI paradigm by SMEs in can be distinguished.

Possibilities:

- Highly qualified personnel and availability of equipment in Russian research centers, laboratories, institutions and universities
- A large number of talented independent developers and entrepreneurs
- Access to the rich heritage of knowledge of basic and applied sciences inherited from the Soviet era
- State interest in innovative companies in recent years. To some extent, the allocated funds are reaching SMEs
- Availability of international projects for Russian innovative SMEs
- Availability of technoparks, business incubators, special economic zones

Limitations:

- Lack of venture capital market
- Lack of control over implementation of patent law
- Absence of market of technologies
- Lack of effective government support
- Lack of demand for new technologies in Russia
- Reluctance of foreign companies to work with Russian companies
- Lack of knowledge in operation within international markets
- High level of corruption and bureaucracy
- Tendencies to keep the confidential information inherited from the Soviet era

R&D activities are frequently arranged in direct integration with research centers and laboratories. Collaboration is often facilitated by personal relationships. Buying or selling patents and licenses by SMEs in Russia is likely to be an isolated case. The process of getting ideas and technology in SMEs in Russia primarily occurs at the level of specialist's knowledge. In that case no additional contracts, licenses and IP buying or selling are required.

Most commonly, SMEs carry out further commercialization of technologies by themselves. Such problem occurs from difficulties in patenting and IP protection, lack of market of technologies. Creation of spin-off is a probable option but this process is often interrupted in consequence of lack of available financing.

It can be concluded that SMEs in Russia basically utilize inbound type of OI. Availability of research centers, talented developers and groups of them contribute to the successful use of external ideas and technologies. On the contrary, outbound OI are not used by them practically. This situation derives from the nature of SMEs and listed limitations. Lack of VC, weak IPR protection, absence of market of technologies constrains new ideas and technologies inside the organization.

However, despite the substantive difficulties, successful implementation of OI paradigm was approved by some Russian SMEs. These companies are not limited to their own research projects and find alternative ways aiming to reach new markets. The key to success lies in creation of optimal business models that take into account all outstanding characteristics of Russian economy and the opportunities that exist in the scientific field, for new ideas and inventions, and their commercialization within current and new markets.

The conducted research has certain limitations originating from the nature of the study. First of all, limited number of Russian SMEs was selected, and that illustrates rather specific examples. Selection criteria were based on description of different approaches to innovation and miscellaneous attitudes to Open Innovation principles in order to achieve the variety of evidences and figure out the overall picture. Second, the study includes five Russian and one Swiss company (with a Russian developer as a full-time employee) and does not reflect the situation worldwide. Third, the study is limited by the Open Innovation theory. This theory was selected by virtue of that on one level it is promoted by a lot of studies and scientific communities, and on the other, it is a quite new concept.

The given research can be useful for any kind of organization which intends to cooperate with SMEs in Russia and needs to understand the innovation climate there. The studied SMEs denote Russian objective reality of making business in general and innovation processes in particular. A detailed description of each industry sector or region, or type of market orientation, can be a topic for a further research.

REFERENCES

Brokgauz, F.A., Efron, I.A. 1895. *Enciklopedicheskij slovar' Brokgauza i Efrona. Tom 32*. Izdatel'skoe obshestvo F. A. Brokgauz - I. A. Efron. Available at: <http://www.vehi.net/brokgauz/index.html > [Accessed 30 June 2011].

Brokgauz, F.A., Efron, I.A. 1896. *Enciklopedicheskij slovar' Brokgauza i Efrona. Tom 34*. Izdatel'skoe obshestvo F. A. Brokgauz - I. A. Efron. Available at: <http://www.vehi.net/brokgauz/index.html > [Accessed 30 June 2011].

BVN Engineering, 2011. *BVN Engineering - Istorija*. [online] Available at: <http://bvn.ru/about.php?page=2> [Accessed 30 June 2011].

Cabral, R. 1998. Refining the Cabral-Dahab Science Park Management Paradigm, *International Journal of Technology Management*, 16 (8), pp. 813-818.

Chernyj, A. A. 2005. *Istorija Tehniki*. Penza State University.

Chesbrough, H. W. 2003. *Open Innovation: the New Imperative for Creating and Profiting from Technology*. Boston, Massachusetts: Harvard Business School Press.

Chesbrough, H. 2006a. *Open Business Models: How to Thrive in the New Innovation Landscape.* Boston, Massachusetts: Harvard Business School Press.

Chesbrough, H. W., Vanhaverbeke, W. and West, J. (eds.). 2006b. *Open Innovation: Researching a New Paradigm*. Oxford: Oxford University Press.

Chesbrough, H. 2010. How Smaller Companies Can Benefit from Open Innovation. *Economy, Culture & History Japan Spotlight*, 29 (1), pp. 13-15.

Cooper, R.G. 1990. Stage-Gate Systems: A New Tool for Managing New Products. *Business Horizons*, 33(3), pp. 44-54.

Corkondile, D. 2010. Towards a business model for commercializing innovative new technology. *International Journal of Innovation and Technology Management*, 7(1), pp. 37–51.

David, P. and Greenstein, S. 1990. The economics of compatibility standards: An introduction to recent research. *Economics of Innovation and New Technology*, 1, pp. 3–41.

Desouza, K.C., Dombrowski, C., Awazu, Y., Baloh, P., Papagari, S., Jha, S. and Kim, J.Y. 2009. Crafting Organizational Innovation Processes. *Innovation: Management, Policy & Practice*, 11 (1), pp.6-33.

FASIE, 2011. *Srednesrochnaja programma dejatel'nosti Fonda na 2011 - 2013 gody*. Available at: < http://www.fasie.ru/documents/about/strategy.aspx> [Accessed 30 June 2011].

Edelmann, J. and Volchek, D. 2010. Open innovation in cross borders - advantages or disadvantages? Strategic options analysis. In Torkkeli, M. (ed.) *Frontiers of Open Innovation*, Lappeenranta: LUT, Publication of Industrial Engineering and Management Department, Research report 225.

Enkel, E., Gassmann, O. and Chesbrough, H. 2009. Open R&D and open innovation: exploring the phenomenon. *R&D Management*, 39(4), pp. 311–316.

Gate2RuBIN, 2011. *Project Gate to RuBIN*. [online] Available at: <http://www.gate2rubin.ru/> [Accessed 30 June 2011].

Gassmann, O. 2006. Opening up the innovation process: towards an agenda, *R&DManagement*, 36 (3), pp. 223-228.

Gassmann, O. and Enkel, E. 2004. Towards a theory of Open Innovation: three core process archetypes. R&D Management Conference, 6 July, Lisabon, Portugal.

I-gorod, 2011. *I-GOROD.com — Oficial'nyj sajt Fonda «Skolkovo» | Istorija.* [online] Available at: <http://i-gorod.ru/about/history/> [Accessed 30 June 2011].

I-skolkovo, 2011. Status uchastnika: pro inostrannogo specialist. *The official blog of the Skolkovo fund*, [blog] 8 April. Available at: <http://i-skolkovo.livejournal.com/7830.html> [Accessed 30 June 2011].

INSEAD 2010. *Global Innovation Index 2009/10*. INSEAD.

InTeh-Don, 2011. *NP ITC InTeh-Don | O NAS.* [online] Available at: < http://intehdon.ru/> [Accessed 30 June 2011].

InterFax, 2010. Superl'goty dlja Skolkovo. *Interfax – Economica*, [online] 30 April. Available at: < http://www.interfax.ru/business/txt.asp?id=134921> [Accessed 30 June 2011].

Kamsky Bereg Stankostroy, 2011. *Konsul'tacii*. [online] Available at: <http://www.kbstanok.ru/konsultatsii> [Accessed 30 June 2011].

Laamanen, T. and Autio, E. 1993. *Technology transfer between research laboratories and industry : measurement and evaluation.* Espoo: Technical Research Center of Finland.

Labudgup, 2011. *Chausov Fjodor Fjodorovich.* [online] Available at: <http://www.labudgup.ru/chausov.html > [Accessed 30 June 2011].

Lee, S., Park, G., Yoon, B. and Park, J. 2010. Open innovation in SMEs—An intermediated network model. *Research Policy*, 39, pp. 290–300.

Leonard, D. and Sensiper, S. 1998. The role of tacit knowledge in group innovation. *California Management Review*, 40 (3), pp. 112-132.

Lichtenthaler, U. 2011. Open Innovation: Past Research, Current Debates, and Future Directions. *Academy of Management Perspectives*, 25(1), pp. 75-93.

Luksha O.P., Pilnov G.B., Rygalin D.B. and Yanovskij A.E. 2008. Innovacionnaja Rossija. Set' sodejstvija. Innovacii, 121 (11), pp. 25-33.

Marschan-Piekkari, R. and Welch, C. 2004. *Handbook of qualitative research methods for international business.* Edward Elgar Publishing.

MIIRIS, 2011a. *Nacional'nyj centr po monitoringu innovacionnoj infrastruktury nauchno-tehnicheskoj dejatel'nosti i regional'nyh innovacionnyh system. Kolichestvo biznes-inkubatorov*. [online] Available at: <http://miiris.ru/infrastruct/view_organizations.php?cbt19=9&action=sendk> [Accessed 30 June 2011].

MIIRIS, 2011b. *Nacional'nyj centr po monitoringu innovacionnoj infrastruktury nauchno-tehnicheskoj dejatel'nosti i regional'nyh innovacionnyh system. Kolichestvo tehcnoparkov*. [online] Available at: <http://miiris.ru/infrastruct/view_organizations.php?cbt12=2&action=send> [Accessed 30 June 2011].

Mohr, J., Sengupta, S. and Slater, S. 2010. *Marketing of High technology Products and Innovations*, 3rd ed. Upper Saddle River, Pearson Prentice Hall.

Munchaev, S. M. and Ustinov V. M. 1998. *Istorija Rossii: uchebnik dlja vuzov*. Izdatel'skaja gruppa INFRA-M – Norma.

Nanopowder Technology, 2011. *Nauchno-proizvodstvennaja firma Nanoporoshkovye tehnologii - O kompanii*. [online] Available at: <http://nanopowder-technology.com/ru/?page=12> [Accessed 30 June 2011].

Narayanan, V. K. & O'Connor G., 2010. *Encyclopedia of Technology and Innovation Management.* John Wiley and Sons.

OECD, 2009. *National Innovation System and State Innovation Policy of the Russian Federation. Background Report to the OECD Country Review of the Russian Innovation Policy,* OECD Publishing.

OECD, 2010. *SMEs, Entrepreneurship and Innovation*. OECD Publishing.

OECD, 2011. *OECD Reviews of Innovation Policy: Russian Federation 2011*, OECD Publishing. Available at: <http://dx.doi.org/10.1787/9789264113138-en> [Accessed 30 June 2011].

Online Etymology Dictionary, 2011. *Etymology of word "Innovation".* Available at: < http://www.etymonline.com/index.php?term=innovation> [Accessed 30 June 2011].

Paap, J. and Katz, R. 2004. Anticipating Disruptive Innovation. *Research Technology Management*, 47(5), pp. 13-22.

Pilenko, A. 1902. *Pravo izobretatelja (privilegii na izobretenija i ih zawita v russkom i mezhdunarodnom prave). Istoriko-dogmaticheskoe issledovanie*. Tipografija M.M. Stasjulevicha.

Podmetina, D. 2011. *Innovation and internationalization in Russian companies: challenges and opportunities for open innovation and cooperation*. Ph. D. Lappeenranta University of Technology.

Podmetina D., Väätänen J., Torkkeli M. and Smirnova M. 2011. Open innovation in Russian firms: an empirical investigation of technology commercialization and acquisition. *Int. J. Business Innovation and Research*, 5(3), pp. 298-317.

Polit-Online, 2010. Veksel'berg ozvuchil trebovanija vhozhdenija v centr Skolkovo. *Novosti - Polit-Online,* [online] 29 September. Available at: <http://www.politonline.ru/news/5136.html> [Accessed 30 June 2011].

Poljak G.B. and Markova A.N. 2000. *Vsemirnaja istorija: uchebnik dlja vuzov.* Kul'tura i sport, JUNITI.

Pronika, 2011a. *Novosti OOO Prikladnaya Electronica.* [online] Available at: <http://pronika.ru/news.htm > [Accessed 30 June 2011].

Pronika, 2011b. *O kompanii*. [online] Available at: <http://pronika.ru/about_ru.htm> [Accessed 30 June 2011].

Rahman, H. and Ramos, I. 2010. Open Innovation in SMEs: from Closed Boundaries to Networked Paradigm. *Issues in Informing Science and Information Technology*, 7, pp. 471-487.

Rbcdaily, 2011. Innovacii v Rossii interesujut vsego 30 regionov iz 83. *RosBusinessConsulting*. [online] 26 May. Available at: <http://www.rbcdaily.ru/2011/05/26/focus/562949980312477> [Accessed 9 August 2011].

RIA Novosti, 2010a. Pomogut li Skolkovo nalogovye l'goty? *RIA Novosti*. [online] 4 May. Available at: <http://ria.ru/analytics/20100504/230346099.html> [Accessed 9 August 2011].

RIA Novosti, 2010b. Rossijskaja "Kremnievaja dolina" budet postroena v Skolkovo – Medvedev. *RIA Novosti*. [online] 18 March. Available at: <http://www.rian.ru/science/20100318/215146918.html> [Accessed 30 June 2011].

Rogers, E.M. 1995. *Diffusion of innovations*, 4th ed. New York: Free Press.

Russian Venture Company, 2011. *Innovacionnye proekty.* Available at: <http://www.rusventure.ru/ru/investments/innovative_projects> [Accessed 30 June 2011].

RTTN.ru, 2011. *Russian Innovation Network.* [online] Available at: < http://rttn.ru/> [Accessed 30 June 2011].

Savitskaya, I. 2009. *Towards Open Innovation in Regional innovation System: Case St. Petersburg*, Lappeenranta: LUT, Publication of Industrial Engineering and Management Department, Research report 214.

Schwab, K. 2010. *The Global Competitiveness Report 2010–2011*. The World Economic Forum

Shane, S.A. 2008. *Technology strategy for managers and entrepreneurs.* Prentice Hall.

SonarSource, 2011a. *SonarSource - Our customers*. [online] Available at: <http://www.sonarsource.com/about/our-clients> [Accessed 30 June 2011].

SonarSource, 2011b. *SonarSource - The company*. [online] Available at: <http://www.sonarsource.com/about/company/> [Accessed 30 June 2011].

STRF, 2010. OAO «Rossijskaja venchurnaja kompanija» podvela itogi goda. *Nauka i tehnologii Rossii - STRF.ru,* [online] 30 December. Available at: <http://www.strf.ru/material.aspx?CatalogId=223&d_no=36147> [Accessed 30 June 2011].

STRF, 2011. Tehnoparkam i osobym ekonomicheskim zonam uvelichat l'goty. *Nauka i tehnologii Rossii - STRF.ru,* [online] 15 March. Available at: <http://strf.ru/material.aspx?CatalogId=223&d_no=37840> [Accessed 9 August 2011].

Tidd, J., Bessant, J. and Pavitt, K. 2005. *Managing Innovaiton: Integrating technological, market and organisational change*, 3rd ed. USA: John Willey & Sons, Ltd.

Torkkeli, M., Kock, K. and Savitskaya, I., 2009. Innovation management in Russia and the concept of «Open Innovation»: initial research findings. *Innovacii*, 133 (11), pp. 89-95.

Trott, P. and Hartmann, D. 2009, Why Open Innovation is old wine in new bottles. *International Journal of Innovation Management*, 13(4), pp. 715–736.

Vanhaverbeke, W., Torkkeli M. and Trifilova A., 2010. Open Innovation: Scio Me Nihil Scire. *Innovacii*, 141 (7), pp. 3-5.

Venevitinov, M. A. 1897. Russkie *v Gollandii: Velikoe posol'stvo 1697-1698 g.* Tipografija O.O. Gerbeka.

Yin, R.K. 1994. *Case Study Research – Design and Method,* 2nd edition. Thousand Oaks (CA), SAGE Publications.

Interviews

Anisimov Aleksandr, Energoresurs, CEO, 08.04.2011.

Bychkov Dmitry, Kasky Bereg Stankostroy, CEO, 25.3.2011.

Chausov Fedor, Engineering-chemical laboratory of the Udmurt State University, Head of laboratory, 24.6.2011.

Mandrikov Evgeny, SonarSource S.A., Programmer, 23.6.2011.

Sirotkin Aleksandr, BVN Engineering, CEO, 4.4.2011.

Sochugov Nikolay, Prikladnaya Electronica, CEO, 21.4.2011.

Zyryanov Dmitry, Nanopowder Technology, CEO, 19.4.2011.

APPENDICES

Appendix 1. Interview questions

General information:

1. Date of foundation, management, structure, headquarters and offices, number of employees.
2. What are main customers of the company, target market?
3. Do you have foreign customers or partners?
4. History of the company and activities before the foundation.
5. State of the art and achievements.

R&D activities:

6. Major R&D areas.
7. Number of employees occupied in R&D.
8. Number of patents.
9. What are the main sources of ideas, knowledge and skills?
10. Does your company have any kind of shortage of resources for R&D activities?
11. Have you ever used external sources of inventions and technologies for realization of the projects?
12. What became the reason for such practice? When it was used for the first time?
13. What kinds of collaborations, alliances with partners in the R&D field are existed in the company?
14. How do you organize the transition of intellectual property to your company?
15. Number of bought patents and licenses.
16. Whether it happens to your company to acquire the inventions which were not useful further?
17. Does the company have ideas and technologies sitting on the shelf?
18. What do you do with technology surpluses?
19. What kind of external channels do you use to market the new technology? (licensing-out, patents, spin-off, joint venture)
20. Do you have patents registered abroad? Why, if not?

21. Have you ever tried to sell the technology to a foreign company?
22. Number of sold patents and licenses and created spin-offs or joint ventures.

Government support, financing & challenges:

23. As innovative company do you receive any kind of state support? (tax benefits, subsidies, grants, etc.)
24. How do you evaluate changes in doing business in past few years?
25. Do you feel that the situation in the field of science, technology and innovation in Russia is improving?
26. Have you taken part in Foundation for Assistance to Small Innovative Enterprises programs?
27. Have you applied to Skolkovo project? How do you evaluate it?
28. What are the sources of financing?
29. Do you have experience with venture capital?
30. What are the main challenges for doing business in Russia?
31. Do you have problems with IP rights protection?

Infrastructure:

32. Whether your company is located on the territory of technopark, special economic zone, business incubator? Does it help in doing innovative business?
33. Do you have experience with RTTN or other centers of technology transfer?
34. Do you collaborate with universities? Do you provide coursework or internships in a company for students?
35. Do you have anyone in your company engaged in teaching activities?
36. Does the company's staff participated in educational programs and training?

Attitude toward open innovation:

37. How much effective and competitive you consider the Open Innovation paradigm? Why? Where do you see its main advantages and disadvantages?
38. To what extent Open Innovation approach fits Russian realities?
39. What are the main barriers for Open Innovation implementation in your company and in the whole country?
40. To what extent your company is “Open”?