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The role of corporate foresight and technology roadmapping in companies' innovation development: The case of Russian state-owned enterprises

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ABSTRACT

In recent decades, the attention of researchers and policymakers has turned to state-owned enterprises (SOEs), in particular the role they play in science, technology and innovation and the methods they use to implement innovation strategies. In this paper, we look at Russian state-owned companies and their development plans, as well as the management tools they employ to forecast and prioritize technologies. Although most Russian SOEs rarely implement corporate foresight and technology roadmapping, certain successful cases are presented and discussed in the paper. Based on these case studies, we suggest a common structure of a technology roadmap that is suitable for SOEs.

1. Introduction

In today's rapidly changing world, innovation is one of the major factors determining national competitiveness (OECD, 2015a). In developed economies, the business enterprise sector is a catalyst of innovation, and a major source of research and development (R&D) funding.[1] While the importance of small firms in innovating, creating jobs, and contributing to national economic growth is indisputable (Audretsch, 2009; OECD, 2012; Siegel et al., 2003), large-scale implementation of technological innovations can hardly occur without diverse efforts of large corporations. The total amount of R&D investments of 2500 of the world's largest companies constitutes more than 90% of the total expenditure on R&D financed by the business sector worldwide (Hernández et al., 2014). Furthermore, this sector definitively leads patent activity: in 2010, it accounted for about 83% of all patent applications (WIPO, 2011).

Considering how important large enterprises are for long-term national competitiveness, such entities inevitably draw governments' attention in a variety of forms. Thus, even in developed economies where corporations are largely private, the latter still consult and maintain dialogue with the state regarding issues such as corporate social responsibility, ecological development, and energy consumption. In the developing world (including Russia) large companies are often state-owned and make up a substantial proportion of GDP, employment, and market capitalization (OECD, 2014). While state ownership often 'naturally' exists in such sectors as utilities and infrastructure (e.g. transport and telecommunications or energy), it may also dominate in high-tech areas, such as aerospace, shipbuilding, and automotive industries, particularly if they make up some of a military–industrial complex. Many SOEs become either monopolies in their respective fields or diversified industrial groups, whose activities (including R&D and innovation) are totally or partially funded and controlled by the government (World Bank, 2010).

Although the management and innovation literatures have shed little light on innovation in SOEs, in recent decades the role of the state and SOEs in taking on high-risk innovative projects has been reconsidered (Mazzucato, 2013; Tõnurist, 2015). This may be attributed to the rapid and innovative growth of SOEs in China (Nolan and Xiaoqiang, 1999; Girma et al., 2009) and, to a lesser degree, in other countries (Baliga and Santalainen, 2006), including some European economies (i.e. Antonelli et al., 2014).

Innovation in the Russian Federation has been stagnating in the last decade. The proportion of enterprises engaged in technological innovation has not increased beyond 10% since 2000, while the share of innovative products in industrial turnover remained between 4 and 6% in 2000–2011 (HSE, 2015).

Due to this, for the last several years the Russian Government has been trying to improve this situation (Gokhberg and Kuznetsova, 2011). In 2011, Russia adopted its national level Strategy of Innovative Development, which included many mechanisms and tools to stimulate

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[1] The sector accounts for about 60% of R&D spending in OECD countries on average, and remains the largest source of R&D financing in major STI-driven economies such as USA, Japan, Germany, France, and UK. For more information, see (OECD, 2015b).

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innovation at federal and regional levels. Within a short time, high-level strategic documents in science, technology, and innovation (STI) were developed including a Fundamentals of Science and Technology (S&T) Policy, a Federal Law on Strategic Planning in the Russian Federation, and S&T Foresight 2030. The government established key elements of STI infrastructure, such as engineering, prototyping, industrial design centres, and centres for technology transfer, as well as a system of development institutions to provide financial support to companies at all stages of the innovation cycle. The newer government initiatives include both the creation of 35 technology platforms (Proskuryakova et al., 2014) and the establishment of 25 innovative regional clusters (Kutsenko, 2015). Moreover, a set of technology roadmaps was designed to support new industrial sectors including biotech, composite materials, photonics, engineering, and industrial design. These various initiatives encourage stronger interaction among different actors of the national innovation system.

One of the recent government STI policy tools is innovation development programmes (IDPs) of SOEs. According to the President's instruction, 47 largest Russian SOEs have been obliged to develop IDPs since 2011. In 2012, their number increased to 60. The share of SOEs implementing IDPs in Russian GDP is about 20% (Gershman, 2013). Among this group of companies are such giants as Gazprom, Rosatom, Rosneft, Rostech, Russian Railways, and United Aviation Corporation, many of whom already possess a large S&T base inherited from Soviet times.

The innovation strategies were developed in accordance with official governmental recommendations. Most of them are focused on the following strategic areas: new product development, modernization of equipment, commercialization of technologies, cooperation with universities, R&D institutions and SMEs, participation in Russian technology platforms, and international collaboration. SOEs from the approved list prepare annual progress reports on the implementation of innovation strategies for the government review.

Russia's Strategy of Innovative Development adopted by the government in 2011 stipulated that the IDPs of the largest SOEs should become a major trigger for technology and innovation development of the country. Their plans should be linked to high-level strategic documents defining the country's overall STI development including the above-mentioned sectoral technology roadmaps and S&T Foresight 2030. This might be achieved by implementing foresight and technology roadmapping techniques at a corporate level. Thus, it is interesting to look more closely at SOEs' innovation plans, specifically with regard to their strategic planning tools. Do these huge companies really use them to develop and implement innovation strategies? Are there any successful cases which could serve as an example for other countries faced with similar problems?

The structure of the paper is as follows. After reviewing the relevant literature and outlining our methodology, we analyse how the surveyed group of Russian SOEs that are implementing IDPs deal with corporate foresight and technology roadmapping. We provide several case studies showing best practice. Next, we suggest a structure of technology roadmaps that contains all the necessary pillars for successfully developing and implementing an IDP. Finally, we discuss the further evolution of government requirements that attempt to strengthen SOEs' strategic S&T planning competencies.

2. Literature review

In general, corporate foresight involves research undertaken by companies to study emerging markets and trends, identify weak signals, and formulate corporate strategies and innovation policies to prepare for an uncertain future (Horton, 1999; Becker, 2002; Müller, 2008). This type of future-oriented study indicates a dynamic capability to make structural and cultural changes in the organization to re-adapt to imminent needs (Rohrbeck, 2011). With the help of corporate foresight, private companies and SOEs understand those complex forces that drive changes in the decision-making process and strategy development, and encourage research for innovation in a company (von der Gracht et al., 2010; Battistella, 2014). Rapid social and economic changes often result in problems of capacity building for corporations. Therefore, future orientation paired with strong foresight that is based on flexible and adaptable systems, is the key to success (Hines, 2003; Ratcliffe, 2006).

Large companies use foresight for various purposes. Becker (2002) defines two types of drivers for corporate foresight activities: those that are essential to a company's' business operation and inherently demand a long-term orientation (i.e. in industries with long product cycles or high development costs); and, those that act as preventive measures to better deal with uncertainties in the business environment. Further, foresight activities can be categorized in terms of their intermediate functions and impacts: anticipatory intelligence (informing and warning), priority-setting (establishing guidelines for the corporate strategy), determining priorities (identifying the most desirable R&D areas), strategy formulation, and innovation catalysing (stimulating and supporting innovation processes). The companies studied by Becker mostly used foresight for one of the purposes mentioned. However, a few of them – namely Decathlon, Volvo, and IBM – employed foresight tools for a broad range of tasks, from intelligence gathering to strategy development (Becker, 2002). In a more recent study of 44 large European companies, Müller (2008) asserts that corporate foresight can achieve 'hard' objectives: it can support strategic decision making, improve long-term planning, enable an early warning system as an engine for issue management, refine the innovation process, and enhance the speed of reaction to environmental change. Within the foresight process, more than half the companies regularly implemented such measures to generate medium/long-term future perspectives (92.5%), identify and analyse environmental trends and issues (75%), anticipate future application contexts of products/services (72.5%), interpret trends, issues, and future perspectives (62.5%), and communicate/transfer the foresight results and insights (55%) (Müller, 2008). Rohrbeck and Gemünden (2011) analyse 19 case studies and 107 interviews and identify three generic roles of corporate foresight, namely strategist, initiator, and opponent roles. In the first role, corporate foresight guides innovation activities by developing a vision, providing strategic direction, combining opinions, assessing and repositioning innovation portfolios, and identifying new business models of competitors. In the initiator role, corporate foresight fosters innovation initiatives by defining new customer needs, technologies, and product concepts of competitors. Finally, in the opponent role, corporate foresight encourages the innovators to create better and more successful innovations by challenging basic assumptions, creating state-of-the-art current R&D projects, and scanning for disruptions that could endanger current and future innovations (Rohrbeck and Gemünden, 2011).

Corporate foresight enables us to use a wide range of approaches and methods (for example, about 50 different foresight methods have been identified: see Popper, 2012). It may be also combined with other techniques sometimes considered as alternatives — competitive intelligence (Muller, 2005), benchmarking, and business analytics (Calof et al., 2015). Corporate foresight tools and techniques, applicable for both private and state-owned companies, can be classified in different ways. Essentially, the methods employed are quantitative (e.g. cross-impact analysis, correlation analysis), qualitative (e.g. brainstorming, scenarios), and synthetic (e.g. bibliometrics, roadmapping) (Becker, 2002; Popper, 2008). Phillips et al. (2005) distinguish nine families of foresight methods: expert opinions, scenarios, modelling and simulations, monitoring and prospecting, trend analysis, statistical methods, creativity, descriptive and matrix methods, and evaluation methods. In turn, Rohrbeck and Gemünden (2006) delimit the methods of strategic (corporate) foresight according to areas in which these methods are applied. Researchers have identified market-oriented, technology-oriented, and integrated methods. The latter are considered a powerful tool that overcomes the barriers between both the fields of market and technology, and among strategic, tactical, and operational planning (Rohrbeck and Gemünden, 2006). The most popular integrated methods are roadmaps and scenarios (Rohrbeck et al., 2007).