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Technology foresight in Russia in historical evolutionary perspective☆

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ABSTRACT

The paper aims to analyse the evolution of forward-looking activities in Russia vis-à-vis science, technology and innovation policy challenges and its development over the last century, with a particular focus on the period of transition to a market economy. With the development of more complex and elaborate policy instruments, demand for a better grounded long-term vision of social and economic trends has been growing both among policy makers and the S&T community. The study illustrates the emergence of technology foresight in Russia and its evolution along relevant stages of economic development, from an information source for S&T and innovation policy towards a fully-fledged anticipatory policy instrument.

1. Introduction

Forward-looking activities and technology foresight[1] in particular emerged initially as an attempt to identify future developments of science and technology (S&T). The first large-scale national S&T foresight studies conducted in Japan, and 15–20 years later in the US, Germany, and UK, were intended to better inform design and implementation of national S&T policies. Later, as S&T and innovation came to play a greater role in social and economic development, S&T policy became more complex and systemic. An upsurge of studies of national innovation systems (NIS)[2] have created a solid foundation for designing more elaborate policy tools, which require more substantial information not only about an existing situation but also future trends in the field of S&T. Traditional statistical, bibliometric and patent indicators reflecting the existing state-of-the-art had to be complemented with evidence-based insights concerning future challenges and opportunities.

When analysing the emergence and development of forward-looking activities in a particular country, it is important to take into account the relevant institutional settings (evolved over time) related to economic development, knowledge production, and distribution. This is because historical transformation of a NIS covers production structure, technology and institutions (Lundvall, 2005).

During the last few decades, foresight and S&T policies have been developing in tandem. The evolution of foresight can be considered as a process of institutional learning. Whereas at the initial stage it was driven mainly by the internal dynamics of technology (the first generation of foresight, see Georghiou et al., 2008, p. 15), over time it has been paying more attention to markets and the social dimension. The policy mix concept (OECD, 2010) aimed at a better coordination between different government agencies also influenced foresight programmes, which are more frequently coordinated by several sponsor agencies and more deeply integrated with strategic decision making. The structure, focus and design of national technology foresight studies vary significantly from one country to another. They are related both to the local context and, on the other hand, to the country's position on the "learning curve" with respect to S&T policy and foresight capacities. Different nations have to learn from each other, both in terms of policy design and allied foresight methodologies. "The learning economy is neither a pure market economy nor a pure planned economy; it is a mixed economy, in the fundamental sense of the term" (Lundvall and Johnson, 1994, p. 33). Therefore a comparison of knowledge production processes, modes of government intervention, and relevant anticipatory activities related to priority setting both in the free market and in the centrally planned economy might help to better understand the evolution of foresight activities.

During the last century, the theoretical approaches to technology-related forward-looking activities and practices of long-term strategic

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[1] In this paper, we will consider technology foresight as: *"the process involved in systematically attempting to look into the longer term future of science, technology, the economy, and society with the aim of identifying areas of strategic research and the emerging new technologies likely to yield the greatest economic and social benefits"* (Martin, 1995).

[2] The concept of NIS first appeared in the 1980s and then widely diffused (see Freeman, 1987; Lundvall, 1992; Nelson, 1993). It focuses on the role of innovation activities (of different types) and learning processes in economic progress and takes into account organisational, social and political factors developing over time. Institutions are considered as a key component of the NIS; institutional learning is seen as a driver of knowledge production and distribution (Edquist, 2006).

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planning in Russia passed through several stages, which largely depended on the macroeconomic environment and institutional framework. The paper covers the period of 1921–2009, which we subdivide into the following historical phases related to particular features of national development:

- Catching up (1920s–1930s);
- Threat thinking (1940s–1960s);
- Stagnation and the crisis of the Soviet system (1970s–1980s);
- Strategic reforms and opportunity-thinking: towards innovation development (1990s–2000s).

Such a subdivision is related to the major economic and political problems facing the country and to the global evolution of knowledge production modes. According to Jamison (2003), knowledge production modes globally can be described as follows: "Little Science" (before World War II) dealing mostly with disciplinary type of knowledge (such as physics or chemistry) produced by academic research groups; "Big Science" (1940s–1960s) addressing wider multidisciplinary fields (like nuclear energy or space research) and based at large research institutions with much more engagement of national bureaucratic authorities in priority setting; and "Technoscience" (1970s–nowadays) with much more transdisciplinary studies aimed at commercial and entrepreneurial-driven applications and performed within both research labs and ad-hoc research networks.

The paper presents a brief overview of the emergence and evolution of forward-looking activities along with S&T development in the Soviet Union. The period of transition to a market economy during 1991–2009 is addressed with an in-depth analysis of the longer-term strategies based on solid expertise, using foresight as one of the instruments to enable this process. National foresight exercises are reviewed here relating to their contribution to building a more elaborate forward-looking S&T policy at the national level. Their outcomes and impact on major stakeholders of the NIS are also discussed.

The year 2009 was purposefully selected a boundary of our analysis given that the 2008–2009 economic crisis stipulated demand for a new widespread wave of foresight activities. We briefly mention some examples of post-2009 foresight at the end of the paper, but they require another detailed critical overview.

Foresight related activities in the Soviet Union and in the newly independent Russian Federation are not well known in the English-language literature. Only a handful of papers have analysed the Soviet forecasting programmes and extensive experience accumulated in this area in centrally planned economies. Most of them focused on criticism of the planned economy and were very sceptical, whereas in fact the Soviet experience contained many interesting ideas of value for the current day. Such "myopia" does not help to analyse objectively the aliens' experience.[3] In this respect, the paper could also help those interested in technology foresight studies to better understand the drivers and barriers of their evolution.

The paper is organised as follows. The first part contains a historical overview of the emergence of forward-looking activities and S&T foresight in Russia. Second, the more recent technology foresight activities in 1991–2009 are described in more detail with particular attention paid to the first large-scale national S&T foresight exercise. In the third section, new applications for forward-looking activities in Russia are discussed. Finally, the paper addresses the role of foresight under conditions of a global economic crisis.

[3] Erickson (1977) contains an example of such blinkers, where the author expressed his scepticism on the assessment of the role of "bionisation" and the use of automation and cybernetics, leading to the deliberate manipulation of "physical-chemical and biological phenomena" by Soviet futurist Grigoriy Gudozhnik. The progress of ICT and fast development of synthetic biology clearly shows who was right.

2. Long-term planning under the Soviet system

2.1. Catching-up (1920s–1930s)

It is difficult to imagine serious discussions about the future during the devastating World War I (1914–1918), October revolution (1917), and subsequent Civil War in Russia (1918–1921). Nevertheless, even in those hard times, the key role of science in industrial development was clearly understood by both researchers and the national leadership. In 1915, the famous Russian geologist Vladimir Vernadsky initiated the creation of the Commission for Study of Natural Productive Forces at the Russian Academy of Sciences, which was transformed in 1920 into the State Commission on Electrification of Russia. In 1918, Vladimir Lenin in his "Sketch of a Plan for Scientific and Technological Works" instructed the formation of expert commissions for quick development of an industrial reorganisation and economic growth plan. Lenin's idea incorporated rational territorial development and concentration of industrial enterprises with respect to the available natural resources and minimisation of losses within value added chains, electrification of industry, and transport (Lenin, 1974).

After the Civil War, Russian authorities attempted to introduce elements of the market economy to the centralised administrative policy of war communism. They were limited to fixed taxes for peasant farms, the introduction of gold-based currency, and the development of private small and medium size businesses in trade and manufacturing. In contrast, large enterprises continued to be under state ownership.

During the wars, the country faced economic decline, financial destabilisation, and disintegration of the political regime, which all had a profound negative impact on Russian science. To provide a basis for defence and accelerated industrial development, the government initiated a large-scale programme of building a network of academic and applied research institutes. In 1918–1927, some 800 such institutes were established, whereas in 1913 their number was 298 (Gokhberg, 2003).

This period was marked by the first attempts to establish a longer-term planning system with particular attention paid to technologies as one of the key elements of economic development. Nikolay Kondratiev devoted great efforts to the study of economic conjuncture cycles based on the analysis of large statistical datasets. He developed the theory of long waves in economic dynamics (Kondratieff, 1984).[4] Later, in 1926–1927, Kondratiev developed the theory of planning in a market economy, although policy makers rejected it in the years following the New Economic Policy (NEP). He mentioned that "plans without any foresight are nothing" and they should be based on foreseeing trends and take account of their potential impacts (Kondratiev, 1993, p. 118).

The abovementioned State Commission on Electrification of Russia proposed the first state plan on the electrification of Russia (GOELRO), which had a horizon of 10 to 15 years and became the first large-scale strategic initiative in the Soviet economy. It envisaged accelerated development of the energy sector, construction of modern enterprises to create new industrial regions (such as the Kuznetsk coal basin), and building of a new transport infrastructures (railways, Volga-Don Canal, etc.). Construction of >30 new power plants meant that the production of electric energy increased seven-fold by 1931 compared to 1913 (Simchera, 2006). Technological modernisation of all sectors of the economy based on electricity was one of the plan's key elements.

The plans were so ambitious that even H.G. Wells, the British author who spoke about the necessity of "a professor of foresight" (Wells, 1932), was very sceptical about them after his discussions with Lenin on the future 10–15 years of Russia during his 1921 visit to Moscow (Wells, 1921).

In 1924, the Central Statistical Department launched a project to try to balance the national economy. It was reflected in Wassily Leontieff's

[4] Indeed, at the end of the 1990s, these ideas were further developed to include the concept of techno-economic shifts (see Perez, 2002, p. 23).