Chapter 27
The Methodology of National Innovation System Analysis

Oleg Golichenko
National Research University Higher School of Economics, Russia

ABSTRACT

Many efforts have been made in developing the National Innovation System (NIS) concept. However, there are the limitations, which do not make it operable and effective in practice. This investigation attempts to eliminate some limitations of the approach. The NIS is presented as three interrelated macro blocs: business environment, environment producing new knowledge, and knowledge transfer mechanism. The principles of performance and efficiency measuring of NIS are proposed. The system structure-object and functional approaches to NIS performance and efficiency are applied. The former is used for decomposition of NIS objects of high aggregation level. The latter is available for analysis of NIS efficiency and its factors. The methods allow the estimation of the NIS component by component and identification of the cause-effect chains of factor impacts on its elements. The key policy tools tailored to liquidate and mitigate market failure and NIS dysfunctions are proposed.

INTRODUCTION

The conception of national innovation system (NIS) has arisen at the edge of 80th years of the last century. The founders of the new branch were Freeman (1997), Lundvall (1992) and Nelson (1993). For many researchers and experts the birth of the new conception was bound up with the demand for new approaches to finding ways of the effective economic development driven by innovations. There was also a need for "operable" approach focused directly on the design of public policy aimed at innovative development.

In the meantime, one cannot fail to recall Schumpeter who pointed out in his "Theory of Economic Development" that the principal function of an entrepreneur is a search of resource combination to obtain "new uses" or "new combination," i.e. "innovation." For long decades (until the beginning of the 1980s), the works of Schumpeter were outside of the mainstream of economics. To adopt the systemic perspective on innovative development, it became necessary to rely on a comparative historical analysis, on the one hand, and studies on institution governing of innovation actors' interactions on the other (Soete

DOI: 10.4018/978-1-4666-8358-7.ch027

et al; 2010). That is why the NIS conception has consolidated scholars of evolutionary theories (e.g., Metcalfe, 1988; Nelson and Winter, 1982) and economists in institutional traditions of innovation studies (e.g., Freeman, 1987; Lundvall, 1992).

The conception of NIS has been widely diffused between both academicians and decision makers at regional and national levels and became a framework for innovation studies in international organizations such as the OECD, the European Union, UNCTAD and UNIDO (Godin, 2009). OECD has published the whole series of the manuals of Frascati family. In this series, on the one hand, there is an attempt to harmonize the system of definitions of many NIS elements and processes. On the other hand, this set of manuals proposes the guidelines to construct the corresponding statistics database. Many of these recommendations are accepted in various countries of the world including Russia.

In the concept, a national innovation system is considered as a set of private and public organizations and nonlinear mechanisms of their interaction (Lundvall 1992; Nelson 1993). Within the framework of the system new knowledge and technologies creation, storage and distribution take place. The behavior of organizations is shaped under the influence of institutions (North, 1991) including laws, rules, norms, routines and established practices. While neoclassical economics uses methods based on the concept of an individual rational behavior in the market, institutional economics suggest that institutions interfere in the functioning of markets. The institutions regulate the relations, interactions, learning between individuals, groups and organizations. They make a basis for incentives and obstacles for innovation (Lundvall, 2007; Edquist 2006). According to Lundvall et al. (2002), the features of the institutional environment that enterprises are sunk determine to a considerable degree distinctions of technological results. The joint efforts of the state, enterprises and scientific environment build the NIS. The state creates framework conditions of the system, generates in many respects a motivation basis of system elements activity, develops the resources and institutions and acts as a catalyst of NIS processes and a partner reducing innovation risks.

Many efforts have been done in developing the NIS concept. However, they are not sufficient to provide the basis of the methodology of the NIS investigation. Particularly, there is an understanding of a need in "method to study national systems of innovation that moves from micro to macro – and back again to micro" (Lundvall, 2007, p.102) but the operable scheme of this method is lacking. Hekkert *et al*. (2007, p.414) pointed out that the innovation system approach focuses on a macro level institutions and less on actions of entrepreneurs. In other words, the ability to bridge the macro economic patterns and the behaviour of firms and other economic agents, which was demonstrated before by mainstream economic studies, has been lost in the NIS approach.

Edquist also notices a vagueness and diffuseness of the approach in some cases (Edquist, 2006, p. 186). The innovation system is often considered as an entity without its division into real subprocesses and its actors. Fagenberg (2006, p.20) noted, "our understanding of how knowledge–and innovation–operates on organizational level remains fragmentary and further conceptual and applied research is needed." Miettinen (2013, p.35) concludes that the NIS approach "is poorly connected to general or dynamic systems thinking."

At the same time, there are many valuable publications of various authors deal with the bottlenecks or imperfections of real systems. Among the authors of these publication are Carlsson and Jacobsson (1997), Edquist et al. (1998), Johnson & Gregersen (1994), (Malerba & Orsenigo, 1997), Smith (2000). In the publications, one can find a description and analysis of infrastructural, institutional failures. Some papers try to identify functions served by innovation systems (Edquist,