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Smart development of innovation ecosystem

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Abstract

In this article, the approach of complexity theory to the development of innovation ecosystem is presented. Innovation ecosystem is understood as a smart system that is explained by the characteristics of complex adaptive systems. Thus its development is based on the mechanisms of management of complex adaptive systems and integrates both top-down and bottom-up approaches towards the development of innovation ecosystems. Smart development of innovation ecosystems relies on pattern formation, sense making, definition of simple rules, change of attractors, tagging, chunking and maintaining disequilibrium, as well as the mobilization of niches.

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1. Introduction

The literature on 'systems of innovation' has been largely dominated by the institutional list approaches with emphasis on the structural aspects of the innovation systems (e.g. "triple helix" of government-academia-industry, infrastructure, policy and political environment). Such actor-focused approach laid out by the advocates of regional (RIS) or national innovation systems (NIS) has for long been attractive to the policy makers that seek the clearly defined and, in most cases, linear solutions to the development of innovation system. However, it is of limited value for achieving a truly functioning innovation system because it fails to take into account its complex social dynamics. A gradual switch away from "innovation system" towards the "innovation ecosystem" can be observed in the academic discourse. The key properties of any biological or social ecosystem, such as diversity of actors and their

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network ties, co-evolution, self-organization and disequilibrium are increasingly used for describing the innovation "ecosystems". However, the theory of complex adaptive systems is still largely used for the interpretive purposes, but provide little advice (compared to the systems theory underlying much of the research on "systems of innovation") on the development of the innovation ecosystems.

Thus, the aim of this paper is to provide insights into the possible applications of complex adaptive systems theory for the development of innovation ecosystems. The paper rests on an assumption that the development of innovation ecosystems calls for new approach, whereas the institutional and system theories are too static. The complex adaptive systems (CAS) approach may offer some valuable perspectives; however, the studies of management and development of CASs are still in their infancy. The concept of smart development takes into account the complex dynamic nature of the system and is based on promoting the productive self-organization rather than imposing the top-bottom linear solutions.

In the first part, the traditional approaches to the innovation systems, their limitations and the need for complexity-based approach are discussed. Systems theory is contrasted with the complex adaptive systems theory.

In the second part, the main theoretical insights into the development of complex adaptive systems are presented. Finally, in the third part their implications for the development of innovation ecosystems are discussed.

2. Method

In order to define an approach towards smart development of innovation ecosystem, the analysis of scientific literature about complex adaptive systems, their characteristics and management and transition mechanisms was performed.

3. Results

Development of innovation (eco) systems: systems theory vs. complexity theory. Systems theory and system thinking are concerned with defining the ideal future state of the system and trying to close the gap. Such are the conceptual grounds for many of the acclaimed management theories and instruments (e.g. Six Sigma, Balanced Scorecard), including the innovation systems approach. If often relies on a rather simplistic and linear attitude: mixing the right ingredients (inputs) will produce predictable results (outputs). Thus, the innovation systems are often treated as complicated systems (i.e. with diverse actors, yet predictable interactions and equilibrium state) rather than complex systems (i.e. with diverse actors, but with multiple unpredictable interactions and potential for disequilibrium).

Complexity theory has no ambition of predicting the future or defining the "ideal" state of the system - it is more about describing the present and seeing what can be changed. "Get the inputs right and the desired outputs will follow" attitude does not necessarily work (in most cases, it does not) when developing the systems that are complex by their very nature, such as the innovation ecosystems.

It is an ongoing debate to what extent the innovation ecosystems should be regarded as different or rather as supplementary to the traditional "systems of innovation". The system of innovation approach traditionally builds upon the perspective of institutional economics and its system-related research, e.g. business systems, social systems of production, industrial districts or clusters. The innovation ecosystem approach, on the other hand, looks into the very nature of successful innovation systems and emphasizes that system is much more than a sum of its parts. There are too many innovation systems with apparently all the right elements, yet they still fall short of expected outcome. The innovation ecology only partly depends on presence of elements (i.e. talent, firms, institutions, capital), but even more so on their identities, meaning, networking capabilities, culture of trust and pragmatic cooperation. Thus, in this respect, the innovation ecosystem approach is supplementary rather than contradictory to the approach of "systems of innovation" because conventional logics suggests that the elements have to be established before one can talk about their linkages. On the other hand, from the perspective of management, building and developing the institutional "system of innovation" and nurturing the "innovation ecosystem" are two very distinct processes. To use a metaphor, creating a park is very different from raising a rainforest. Planting trees and creating ecology are two different tasks that cannot be successfully achieved with the same mental model. It even brings into question our previous assumption that one can plant the trees before creating the ecological system