Connecting Urban and Regional Innovation Ecosystems to Enhance Competitiveness

Chapter title:
Connecting Urban and Regional Innovation Eco-systems to enhance Competitiveness

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Definition:

This paper explores why an increasing number of European regions and cities in close cooperation with quadruple helix partners, such as clusters, firms, universities, non-governmental organizations and member states combine place-based innovation strategies with cross-border networks of innovation. Such collaborations may result in a rich variety of organizational solutions and approaches, which allow actors and stakeholders to overcome different barriers and concerns of innovation. The chapter outlines a conceptual framework of how cooperation between urban and regional innovation eco-systems may strengthen regional place-based development strategies and improve regional innovation capabilities. Key analytical concepts are proximity, knowledge complexity, entrepreneurial discovery processes, and stakeholder analysis.

Introduction

Linking interregional innovation eco-systems may improve regional innovation capabilities and drive institutional change. It may even contribute to entrepreneurial discovery processes (EDP). Combining spatial / geographic proximity inside regions with complimentary forms of trans-national proximity, such as cognitive, temporal, and organizational proximity, enables transnational synergies across different regions with related knowledge domains. These synergies may create knowledge complexity, new knowledge combinations, which open up for new locus of innovation, where different forms of proximity are combined in different phases of the entrepreneurial discovery process. This process results in new emerging clusters. Micro-level cluster emergence may have the power to remove institutional barriers of innovation and improve place-based innovation capabilities of regions.

Regions and cities with shared research and innovation priorities collaborate to exploit complementing research and innovation capabilities, while building up necessary capacities and overcoming interregional fragmentation and lack of critical mass across urban and regional eco-systems of innovation. Furthermore, such collaborations lead to improved business environment by identification of barriers to innovation, new investment or skills.

Main text:

Conceptual framework for connected urban and regional innovation eco-systems

The concept of 'open regions' refers to proactive policy measures aiming at '*redesigning the dialectic interplay between territorial openness and closure'* (Schmidt et al, pp. 187). In parallel, opening up and connecting urban and regional innovation eco-systems has been identified as a challenge as regards to smart vertical regional strategies (Mariussen et al. 2016), that shape opportunities for innovation within the sphere of influence of policy makers (Schmidt et al. pp. 193).

The motivation to link innovation eco-systems is influenced by structural and institutional factors. As Rutten puts it, geographical distance is more a dynamic trade-off between effort, preference and dependency (Rutten 2018, pp. 159-177). Such preferences and dependencies facilitate the creation of cross-border / transregional networks resulting in diverse forms of proximity.

Distance and proximity

While spatial and temporary proximities refer to interactions within a place and interactions in social gatherings that connect people from different places, organizational and cognitive proximities are such that result in organized networks connecting hubs and specialists of shared of knowledge and expertise of different places (Boschma 2005). These proximities can be linked to connecting urban and regional eco-systems of innovation, presented on **Error! Reference source not found.**.

Distance and proximity_Connecting urban and regional eco-systems of innovation by typologies of proximities_table1

Typology of proximities		***Urban and regional eco-systems of innovation***
Spatial	Interaction within a place	Urban or regional development strategy; a strategy aiming to develop a space
Temporary	Interaction in conferences, workshops, meetings, or other ways of connecting people from different places	Regular meetings and exchanges between regions, clusters and other stakeholders
Organizational	Interaction within an organization or an organized network located in several places.	Set up governance mechanisms for the partnerships, ensuring regular dialogue

Cognitive	Interaction between specialists, who share the same knowledge.	Learn and connect regions within shared domains of innovation with the objective of developing complementary strength and capacities of innovation and realizing joint investment projects

Source: own adaptation based on Boschma 2005, pp. 61-74

As presented on **Error! Reference source not found.**, connecting innovation eco-ecosystems builds on urban and regional development strategies relating to spatial proximity. Such strategies open for the discovery of shared domains that lead to cognitive proximities. Shared domains are built on complementary competences, expertise and skills within innovation eco-systems that require an organization set up that is based on agreed methods and principles guided by shared vision towards common objectives. Collaboration across borders require tailor made governance structures that allow urban and regional spaces to work towards their shared objectives, while temporary proximities are created by regular interaction between stakeholders. Consequently, connecting innovation eco-systems across urban and regional borders require combinations of different forms of proximity combining forms of proximity that lead to access – among others - to new knowledge.

New knowledge is to be transformed and translated through diverse processes from search through problem solving to industrial upscaling. Diverse forms of knowledge, such as tacit, codified, industrial engineering and science-based knowledge have to be combined, which is often based on trial and error and on continuous dialogue among actors, who decide to share trust and cooperate for sustained periods of time (Maurissen and Hegyi 2020). While connecting innovation eco-systems, a combination of several sources of knowledge can enhance the innovation capacity of place-based development strategies, leading to a 'living knowledge'.

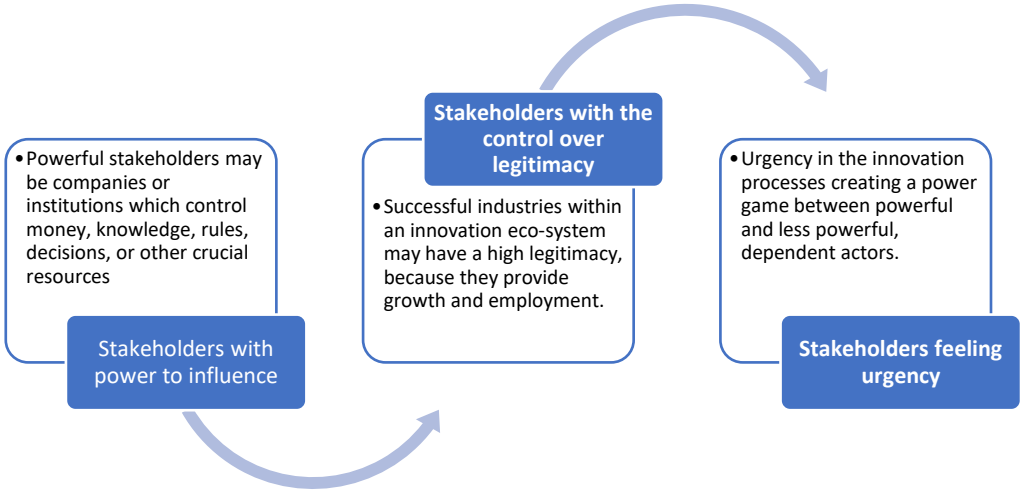
Living knowledge refers to practical knowledge that is shared and communicated resulting in the development of an eco-system of innovation leading to entrepreneurial discoveries of new (business) opportunities. Complexity theory relates to knowledge, innovation and biological eco-systems when sharing some of the same properties (Byrne and Callaghan 2014, pp. 17-38). There is a crucial difference between complicated and complex systems.

Complex systems in nature are not designed top down, but they are the result of self-organization by many autonomous interrelated components. Complex system theory emphasize that sophisticated entrepreneurial ecosystems have *emergent properties* in the sense that they have the capacity to combine different forms of knowledge and create new products, value chains and clusters. Complex systems, such as entrepreneurial ecosystems are able to create something new by increasing the system scale. These systems start a process, which may go at different pace, but then as they grow and develop, they are able to attract more and more human or financial resources, making complex systems inherently unstable. At the same time, in order to be able to mobilize more stakeholders, dynamic ecosystems should be open without rigid borders. While openness is an essential feature of complex systems, these systems also tend to be dissipative how they interact with their environments as they are likely to experience

a continual inflow and outflow of resources including information. By opening the borders between the knowledge domains of urban and regional territories, connecting urban and regional eco-systems of innovation increases knowledge complexity, by involving different stakeholders (Mariussen and Hegyi 2020). The advantages of complex knowledge domains, as compared to more simple, non-complex structures may be illustrated with the discussion of the advantages of scale (critical mass) and scope in corporate organization. It is well known that large companies with a wide variety of knowledge domains have an ability to diversify and adapt to changes better than small, narrowly specialized companies.

The theory of stakeholder involvement can be applied to connecting innovation eco-systems (Mitchell et al. 1997, pp. 853-86) viewing the role of stakeholders along the following dimensions:

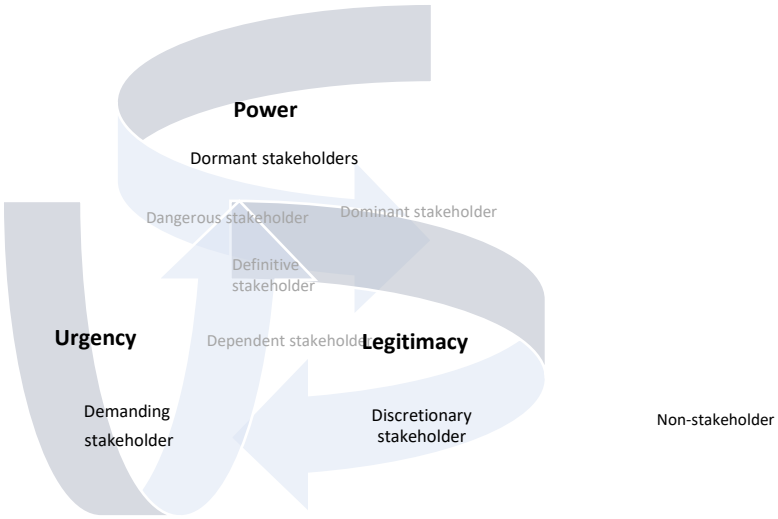
Distance and proximity_Stakeholder analysis in connecting eco-systems of innovation_fig1



Source: own adaptation based on based on Mitchell et al. 1997, pp. 853-86

Stakeholders with power indicate a type of relationship among social actor that influence one's actions, while legitimacy can be understood as a "a generalized perception that the actions of an entity are desirable, proper, or appropriate within the socially constructed system of norms, values, beliefs and definitions" (Mitchell et al, 1997, pp. 866). In case of cross border innovation actions urgency can be caused by challenging / shocks of a value chain dynamic. Diverse stakeholders of the same value chain are exploring new common opportunities that impact the dynamics of their relations. Through such exploration, actors grow unique forms of knowledge and create shared domains that are more competitive together. They may be able to grow more power and diversify their markets. These three main dimensions make it possible to define seven types of stakeholders as shown on **Error! Reference source not found.**.

Distance and proximity_Stakeholder analysis classification model_fig2



Source: Mitchell et al 1997

The dormant, discretionary and demanding stakeholders are latent stakeholders with low salience. Dominant, dangerous and dependent stakeholders are expectant stakeholders representing two attributes according to the classification and might show a high level of engagement. Definite stakeholders are the ones with all three attributes, representing high salience, therefore there is an immediate priority of involving them (Mitchell et al. 2007). Definitive stakeholders are the initiators and leaders of the cross-border collaborations of different institutions, such as regional authorities, universities, or clusters. The composition of stakeholders, their engagement and their agility vary considerably. According to Morgan, barriers to interregional collaboration lead to lack of access to knowledge, lack of political support and / or lack of synergies between policy sectors (Morgan 2018).

Correspondingly, motivations of regions differ depending on their level of innovativeness. For example, moderate innovator regions may be more motivated to actively participate in cross-border collaboration to get access to existing technologies and knowledge, which may be exploited in a shorter-term perspective.

Building new European value chains and clusters, and to close the gap between innovation leaders and followers allow urban and regional eco-systems of innovation to become more competitive. When looking at European regions, the competitive forces are the United States and China, which may or may not be able to get access to European research and take advantage of growth possibilities of industrial upscaling. In this respect, the European Commission is applying a long-term perspective in order to overcome market failures, critical mass or parallel investments across regional borders, which furthermore enables growth and regional convergence between innovation leaders and lagging regions.

Cluster emergence transforming regions

In a static comparison, it might seem obvious that differences between innovation leader regions and innovation followers are both structural and institutional. If we shift perspective and look at how successful clusters develop, we can see how successful innovation and cluster development co-evolves and drives institutional change. As a successful growth experiences, this may help shaping regional institutions.

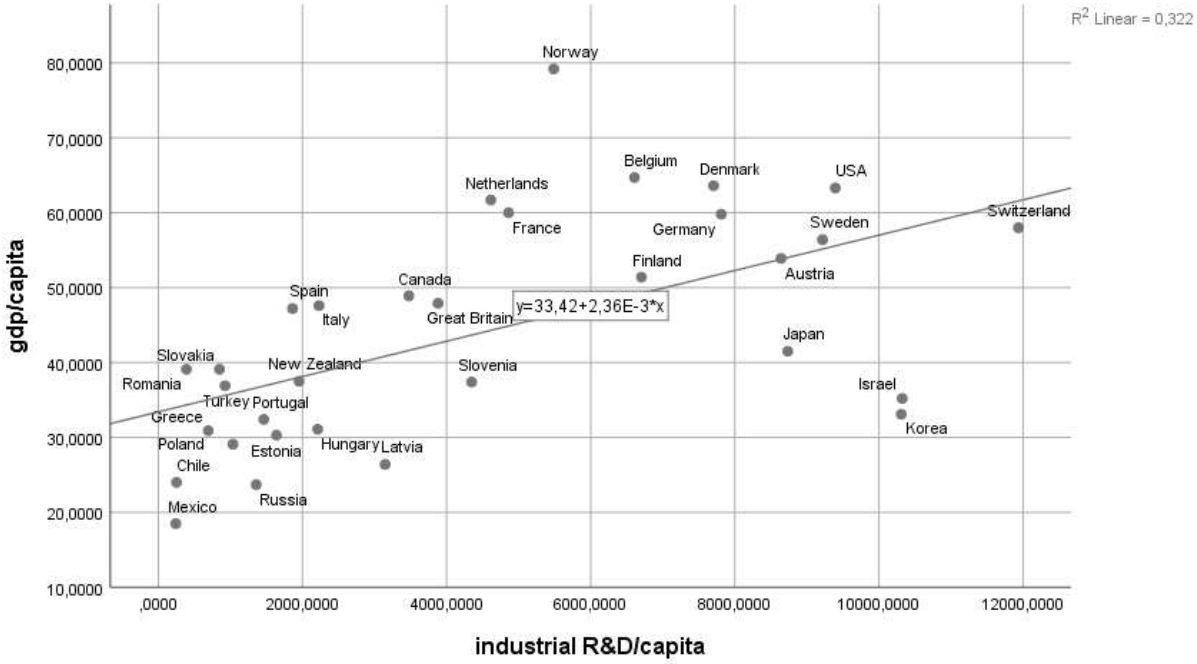
The cluster life cycle literature explains how clusters are emerging from small micro level entrepreneurial discoveries and start to grow and get bigger (Menzel and Fornahl 2010 and Isaksen 2011 and Fornahl and Hassink 2017). At a certain point in the process of growth, the small firm and the embryonic network of a new value chain is to be noticed at the macro level of the region as a new export sector and as an addition to the regional labor market. This growing cluster may require spatial planning, regulations and improved educational frameworks. The new sector will be copied by followers, whether they will collaborate or compete. An emerging cluster will ask for – and sometimes even get – more innovation-friendly regional institution, which signals the co-evolution between economic change and institutional transformation (Virkkala and Mariussen 2019).

On a longer term, something deeper might happen inside the region. The new institutional arrangements initiated by the cluster may become generalized at regional level. The experience of new path creation may be repeated, which is likely to provide a new framework for other stakeholders with novel ideas. What started as a movement from the bottom and up and has created a more innovative region, becomes a process, which goes from the top to the bottom. The stimulation of further innovation creates a self-reinforcing process of co-evolution of economic growth of the new clusters driving institutional modernization and transformation, which in turn creates new clusters in the region.

Combining industrial and science-based innovation to create new paths of development

Less innovative regions in Europe are often squeezed by markets pushing for lower costs and higher productivity, combined with a weak regional and / or national support from science. These regions face competition from low cost producers in Asia, Latin America and increasingly also in Africa. This lock-in effect significantly restricts growth. The impact of such lock-in is illustrated in **Error! Reference source not found.**, which shows GDP per capita in OECD countries, seen in relation to private industrial investments in R&D per capita.

Combining industrial and science-based innovation to create new paths of development_GDP / capita and industrial investments in R&D / capita in OECD countries_fig3



Source: own compilation, based on OECD data

As **Error! Reference source not found.** suggests, in European countries, lower level of private investments on science-based innovation is associated with the lower levels of GDP/capita. The upshot is that firms, which are not investing in R&D tend to focus on low cost competition, and the parts of value chains, where value creation is somewhat lower. Some countries are richer than they "should have been", given their level of R&D investments. On the other hand, countries with income from natural resource extraction, like Norway has a higher GDP/capita than we should expect, given the private investments in R&D. Some countries with relatively low GDP/capita, such as Israel and South Korea, has high private investments in R&D. South Korea has a strong domestic industry with large corporate actors that invest heavily in R&D, while Israel has a national labor market, which is attractive to large ICT companies from the United States. Consequently, a combination of industrial innovation and science-based innovation in regions and countries provides a mix that is promoting innovation, industrialization and creation of new paths of development leading to competitiveness and economic growth. The innovation ecologies of these regions reach a higher level of complexity with a mix of science-based knowledge and industrial skills and knowledge.

This combination of science-based knowledge and industrial knowledge depends on the degree of spatial proximity, that indicates a place-based dynamic within a region combined with '*global pipelines*' providing knowledge from abroad. The absorption and application of science-based knowledge are rarely straightforward. Examples of how this is achieved through pro-active policy interventions can be found in China. The Chinese strategy of enabling growth in additive manufacturing value chains (Xu et al.

2017) provides a definition of complex innovation ecosystems consisting of *three sub-systems*:

- Business eco-systems, making up value networks,
- Science eco-systems consisting of universities and research institutions,
- Technological eco-systems, which include firms, government agencies, industrial players, universities and research institutions.

This poses the question of whether economic complexity might be enough and if European regions really need science and technology to create growth?

The complexity model of Hausmann also shows expected annual growth, which relies on complexity inside the economy (Hausmann et al. 2013 and The Growth Lab at Harvard University 2019). The winners with fairly high economic complexity have positions in the global economy having had moved up on the value chain. Moving away from complete dependence on raw material extraction, there are still possibilities for improvement on the positioning of the value chain, where innovation through related varieties without R&D inputs are efficient (Nguyen and Mariussen 2019). Table 2 shows countries with high growth expectancies based on economic complexity worldwide and in Europe.

Combining industrial and science-based innovation to create new paths of development_Estimated annual growth among economic complexity winners_table2

Worldwide		**Europe**	
India	+7.89	Ukraine	+5.05
Uganda	+7.48	Serbia	+4.88

Source, Atlas of Economic Complexity 2018

Based on the same method, the European countries with the highest growth expectation are Ukraine and Serbia, which have fairly complex industries that can easily be diversified into production of products with low costs, which are not new for the world, but new for them. Some losers have a low economic complexity, because they are locked into resource dependencies (Qatar, Venezuela or Norway). Other countries have exhausted their potential for growth through related varieties based on economic complexity (Germany). Table 3 shows the annual growth of countries with low growth expectations.

Combining industrial and science-based innovation to create new paths of development_ Estimated annual growth among economic complexity losers_table3

Worldwide		**Europe**	
Qatar	+1.55	Germany	+2.38
Venezuela	+1.88	Norway	+2.54

Source, Atlas of Economic Complexity 2018

The implication of this is that countries with a high level of economic complexity should realize that their potential for growth based on relatedness is restricted (Xiao et al. 2018), also confirmed by other methods:

> *We find that relatedness is a more important driver of diversification in regions with a weaker innovation capacity. The effect of relatedness appears to decrease monotonically as the innovation capacity of a regional economy increases. This is consistent with the argument that high innovation capacity allows an economy to break from its past and to develop, for the economy, truly new industry specializations. We infer from this that innovation capacity is a critical factor for economic resilience and diversification. (*Jing et al. 2016)

Some European countries have fairly high levels of economic complexity, but low levels of firm investments in research driven innovations, which shows a challenging market failure. In the race to innovate without R&D investments, they are competing on costs with several successful countries in Africa and Asia. Some of these challenges are related to institutional and system failures.

Institutional challenges and their solutions

As extensively discussed by Foray, there are market failures resulting in firms investing in new business areas related to their existing strengths, which in addition are often copied or imitated by followers (Foray 2015). In many European regions, dominating firms may be sleeping giants. These firms might have foreign owners and they mainly compete by increasing productivity and decreasing their operational costs. In such situations, these firms might have no incentives or only weak or short-term incentives to develop new products or explore new business opportunities, effectively resulting in a significant underinvestment in innovation. To achieve change, it would require a pro-active regional governance strategy identifying new and challenging priorities and directions (Mäenpää and Lundström 2018).

Regional planning is generally expected to satisfy many different considerations for diverse consumer groups, furthermore regional planning needs to respond grand challenges that requires the ‘reinvention of established economic, social and political conventions (Hegyi 2020). This move signals a shift from a supply driven to a demand driven approach in planning and implementation, also serving to set – besides others – economic, sustainability and environmental goals that incentivizes innovation activities (and mind set) of firms (Hegyi 2007). Along the instructional factors, the impact of leadership has been recognized as an important factor in achieving growth and development at regional or local levels (OECD, 2010) and effective leadership contributing to the success of places (Beer and Clower 2014 and Hegyi 2020). As regards to industrial development, there are different sectors with different interests and

potentially powerful stakeholder organizations protecting vested interests, presenting a demanding problem to public sector planners. According to Mäenpää and Lundström regional planning may reach a state of paralysis called wicked problems. Wicked problems are problems with no good solutions (Mäenpää and Lundström 2018).

In several regions, it proved hard to make what was assumed to be potential enabler in a regional triple helix model. According to Blažek and Morgan *"cooperation among business, researchers and the public sector have to start literally from scratch, underlining the fact that the triple helix model of regional development is a triumph of rhetoric over reality in the vast majority of less developed regions"* (Blažek and Morgan 2018). A core problem seems to be the gap between universities, regional planners and the industry (Mieszkowski et al. 2015). Research is carried out at universities and institutes, not inside firms, resulting in a shift of focus on copying best practices (Muscio et al. 2015). Therefore, real synergies need to be achieved between existing industrial skills and capacities found in industrial eco-systems and science-based knowledge. These are coming from across borders that may start with dialogues and developments of common platforms of shared knowledge resources, expertise and methods, and continue through learning and through joint investments of diverse resources in pilots.

A pilot is an experimental approach to create a new economic activity, which may require combinations of different forms of knowledge. Some of this knowledge may be available locally, as industrial skills, and some may come from outside, such as industrial applications of scientific knowledge. Building on place-based development and opening up to transnational learning, innovation eco-systems may become more dynamic and may be able to move in new directions. If a region wants to build a complex open knowledge space, where actors from different places, sectors and helices cooperate, it is crucial to follow and nurture some of the best ideas, innovations, and projects in the direction of success. Successes should be made visible and used as building blocks for new and even more advanced projects, which could become the foundation of new and institutionalized ways of cooperation that generate self-reinforcing loops. Thus, it is important to look for preconditions for initiating a process of exploration that leads to discovery that may result in growth. An important starting point of such a process is a network with many potential partners. The process of exploration needs linking to other innovation eco-systems, networks, which may result in successful pilots. To explore, to discover and to initiate pilots, scale and complexity are important. Scale means to increase the number of potential relations and innovation ideas, which can be used to discover and initiate pilots. Accordingly, an important precondition for successful processes of exploration is the formation of complex knowledge spaces. A knowledge space is defined by a context, where knowledge is shared, which may be an innovation platform that defines concepts of a technological paradigm, or a combination of scientific disciplines, or skills in understanding the dynamics of markets. Knowledge spaces may be separated, like in epistemic communities and communities of expertise protecting their skills from others, or they may be overlapping, as cross sector and cross disciplinary forms of knowledge.

Conclusion

This publication looks at how connection urban and regional innovation eco-systems strengthen place-based development and improve regional innovation capabilities by combining spatial proximity within regions with complementary forms of trans-national proximity, including cognitive, temporal and organizational. Doing so, regional innovation ecosystems allow cross border synergies with shared domains of knowledge and expertise. The process leads to a strengthened and more dynamic knowledge base of the regional innovation eco-system leading to new competitive advantages within regions and to improved positioning of regional actors in global value chains.

Accordingly, through aligning innovation agendas across regions and borders, cities and regions can combine complementary strengths in research and innovation, can exploit research and innovation competencies and may acquire necessary research capacities while overcoming lack of critical mass and fragmentation. Furthermore, learning via the institutionalized network of knowledge and expertise regions overcome challenges of transnational collaboration. Innovative process has been showing a shift from in-house policy development to networked learning efforts involving peers along structured frameworks (Hegyi and Rakhmatullin *2020*). Peer learning can boost advancement, which then contributes to enhanced eco-system dynamics at regional and urban levels. Supported by literature on network analysis, networks provide access to information, resources and markets that offer gains in terms of learning, effectiveness, innovation, legitimacy or internationalization (Human and Provan 2000 and Provan and Sydow 2008 and Porter and Powell 2006).

The stakeholder analysis helps to understand the motivating factors of diverse stakeholders brings to the table, and how synergies may be found through multi-level governance strategies. Likewise, it shows how mobilizing stakeholders with different perspectives and timescales can be enhanced in promoting European innovation ecosystems and value chains.

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