Universities of Applied Sciences' Leadership Role in Regional Innovation Ecosystems

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Abstract: The 2030 Agenda for Sustainable Development contains 17 Goals. Goal 9 concerns building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation. Hence, the development of innovation ecosystems in the European community plays an important role. This development is carried out at all levels of governance with an emphasis on the regional governance. The innovation ecosystem approach considers innovation a process that emerges from interaction among different types of companies and other organizations. One of the common success factors and actors in the innovation ecosystem consists of educational organizations that provide access to knowledge and creating knowledge infrastructure. However, the role of universities of applied sciences is not clear in empowering regional innovation ecosystems. In this conceptual paper, the role of universities of applied sciences in regional innovation ecosystems, is discussed. The research has been carried out by conducting an integrative literature review to identify themes, debates and gaps about the role of educational organizations using the Regional Innovation System model (RIS-model) and the system elements for diagnosing ecosystems. The outline of the paper shows that there is a great potential for universities of applied sciences in taking a leadership role in the regional innovation ecosystem due to their neutrality, practical-oriented accumulated knowledge, and expertise in relation to different stakeholder groups. This paper provides an overview of the key findings regarding the potential leadership role of universities of applied sciences in the regional innovation ecosystem for the management board of universities of applied sciences and regional policy makers. Thus, contributes to the formulation of regional innovation policies by including universities of applied sciences more clearly as active partners.

Keywords: educational organizations; universities of applied sciences; UAS; regional innovation ecosystem; leadership

1. Introduction

The United Nations (2015) masterminded the 2030 Agenda for Sustainable Development by categorizing 17 Sustainable Development Goals. Building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation is captured by goal 9. According to Pidorycheva et al. (2020) regional innovation ecosystems play an important role in the framework of European integration processes to amplify innovative and developed nations. Moreover, as reported by the World Economic Forum (2019), Europe acknowledges an ambitious goal: "to compete for global innovation leadership". The EU policy focuses on improving innovative competitiveness and hereby illustrates the strategic relevance of innovation in ensuring economic growth and improving welfare.

The innovation system at national or regional level is understood as a network of organizations and institutions in the public and private sectors of the economy (companies, educational and research organizations, financial and advisory institutions, public authorities, etc.), whose activities and relationships lead to innovation (Stam and van de Ven, 2021; Pidorycheva et al., 2020). The development of innovation ecosystems in the European community is carried out at all levels of governance, particularly regional governance has a priority role. The regional level is considered to be the most suitable for innovation, because the process of creating new knowledge is concentrated in the regions. In addition, regions consist of appropriate infrastructure in order to further disseminate, apply and transfer knowledge. Thus, the regional level has an stimulating role in the development of national economies (Andersson and Karlsson, 2004; United Nations, 2011; OECD, 2013; Pidorycheva et al., 2020). There is a tremendous growth in the number of publications and citations in the research area 'regional innovation ecosystems' (Alvedalen and Boschma, 2017; López-Rubio, Roig-Tierno and Mas-Tur, 2020). This has several reasons, such as the increased intensity of international competition in the globalized economy, traditional regional development models and policies which have shortcomings, and the rise of successful clusters of companies and industries in many regions around the world. As a result, the topic has received a lot of attention from the scientific community, government departments and (international) organizations (Stam, 2015; Stam and Spigel, 2016; Isenberg, 2010; 2011; Mack and Qian, 2016).

The innovation ecosystem concept represents the actors and the interrelationships between the different parts that drive innovation (Alvedalen and Boschma, 2017). However, little is known on the innovation contribution

of universities of applied sciences (Mäkimattila, Junell and Rantala, 2015; Schlegel et al., 2022). Therefore, in this conceptual paper the following question is discussed: 'What is the role of universities of applied sciences in regional innovation ecosystems?'.

2. Theoretical background

2.1 Innovation ecosystem concept

The innovation ecosystem concept evolved from the concept of business ecosystem in which a company is seen as part of a system instead of a single industry (Moore, 1993). In a similar manner, Forrest (1991) defines companies as open systems that are connected to the external context. The innovation process in a firm or an organization, or in terms of higher level of abstraction, within the country or region is not only related to internal factors such as human capital, but also external factors such as institutions. Therefore, innovation ecosystems consist of interdependencies between firms, organizations, institutions and networks. However, Alvedalen and Boschma (2017) and Oh et al. (2016) emphasizes several points of attention about the innovation ecosystem concept. Firstly, a clear analytical framework which is able to distinguish cause and effect in an innovation ecosystem is missing (Stam and Spigel, 2016). Secondly, there is uncertainty on how the proposed elements are connected in an innovation ecosystem. It is also unclear which interactions and which institutions matter most. Lastly, it is not clear which institutions, and at what spatial scale, impacts the structure and performance of an innovation ecosystem (Motoyama and Knowlton, 2017). As a consequence, the role of educational organizations in empowering regional ecosystems and boosting the broader economic development is unclear (Wakkee et al., 2019; Clauss et al., 2018). Moreover, there is an overlap in the literature between a modern understanding of Porter's cluster concept, innovation systems and regional ecosystems for entrepreneurship and innovation. Thus, the terms ecosystem, innovation ecosystem, innovation system, ecosystem for entrepreneurship and innovation and entrepreneurial ecosystem are used interchangeably in the literature (van Bree et al., 2021; Oh et al., 2016). In this paper 'innovation ecosystem' is used.

2.2 Broader role for educational organizations

An ecosystem describes the evolutionary characteristics of interactions among actors, their relationship to innovative activities, and their relationships with the environment (Adner, 2017; Adner and Kapoor, 2016; Frenkel and Maital, 2014). Societal environment is becoming increasingly knowledge-based and therefore the relevance of the role of educational organizations in societal engagement, especially in the regional context, is becoming a shared understanding (Etzkowitz et al., 2000; Pinheiro, Langa and Pausits, 2015). The main role of educational organizations is related to education and research. However, several authors point out the broader role for educational organizations, because they are involved in regional governance, linked to national and regional policy makers, and engage with local industry and community in order to play a development role for economic objectives (Charles, Kitagawa and Uyarra, 2014; Gunasekara, 2006; Pugh et al., 2016; Brennan et al., 2018).

2.3 Differences between universities and universities of applied sciences

Education systems differ among countries. This paper focuses on the Dutch education system in which there are two types of higher education. On the one hand, there are research-oriented universities which are focused on doing fundamental research and are highly academic. On the other, there are profession-oriented universities of applied sciences (UAS) which are practice-based. The core mission of UAS is providing higher professional education and applied research with a strong orientation towards professional practice (Vereniging Hogescholen, n.d.). Research at UAS has a high societal impact, is demand-driven and conducted in cooperation with various stakeholders, such as SMEs, businesses and the public sector. This makes UAS distinctive compared to research-oriented universities. However, the potential of applied research is not yet fully exploited in the research landscape of the Netherlands (Mulder et al., 2021). The role of UAS as an actor in the regional innovation ecosystem will be explored using the Regional Innovation System model (RIS-model).

2.4 Regional Innovation Systems

The system approach to innovation emerged in the context of industrial policy debates in Europe in the late 1980s and gave way to the National Innovation System (NIS). Cooke (1992) elaborated the regional approach as Regional Innovation System (RIS). In the RIS-approach localized innovation networks are embedded in specific socio-cultural settings (Isaksen, Martin and Trippl, 2018). These innovation networks, consist of a triple helix constellation of industry, educational organizations and regional government, along with agencies and

institutions, forming the core elements of a RIS consisting systematic interdependency (Asheim, Isaksen and Trippl, 2019).

Autio (1998) provides a schematic representation of the structuring of regional innovation systems (Figure 1). A RIS consists of two subsystems embedded in a common regional socio-economic and cultural environment. Firstly, the knowledge application and exploitation subsystem includes the companies, their customers, suppliers, competitors and their industrial cooperation partners. Secondly, the knowledge generation and dissemination subsystem consists of various institutions involved in the production and dissemination of knowledge and skills.

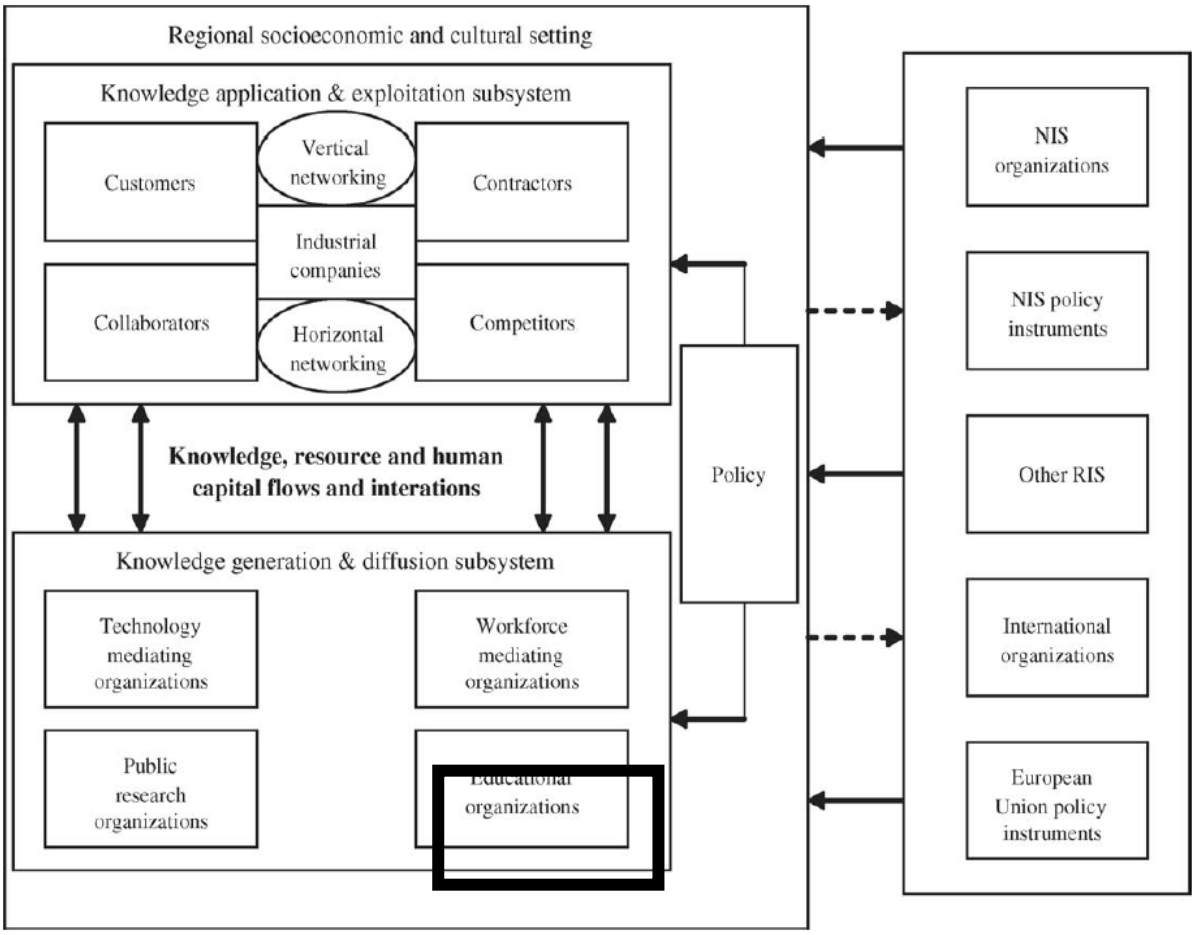

Figure 1: Main structure of regional innovation systems (RIS)

Source: Modification of Autio (1998) by Tödtling and Trippl (2005)

The ideal situation of a RIS maintains intensive interactive relationships within and between the subsystems facilitating a continuous flow or exchange of knowledge, resources and human capital. However, there are several types of RIS problems and failures such as lack of relationships within and between the subsystems. According to Tödtling and Trippl (2005) and Alvedalen and Boschma (2017), the lack of organizations in the field of research, education, and technology transfer as well as a too strong orientation of existing institutions on traditional economic and technological structures may lead to serious innovation problems. Moreover, Pidorycheva et al. (2020) and Tödtling and Trippl (2005) argue that based on differences among regions, marked as the socioeconomic and cultural setting, it is impossible to create an unified model of innovation management. To conclude, even though differentiated innovation policy is needed for the different types of regions, knowledge generation and diffusion as the subsystem in RIS remains of great importance (Tödtling and Trippl, 2005). This process of knowledge circulation is essential for a learning economy and promotes dialogue between research and society. The 36 Dutch UAS are spread throughout the Netherlands and strongly embedded in the region. UAS are well placed to provide profession and practical-oriented knowledge generation and diffusion

because they connect different parties and disciplines with education and research (Mulder et al., 2021). By taking on the practical role as the knowledge facilitator and driver of the innovation ecosystem, UAS can contribute positively to regional innovation ecosystems.

2.5 The roles and functions of universities of applied sciences

One of the common success factors and actors in the innovation ecosystem consists of educational organizations that provide access to knowledge and creating knowledge infrastructure for business and industry (Markkula and Kune, 2015; Leendertse, Schrijvers and Stam, 2021; Pugh et al., 2021; Thomas, Faccin and Asheim, 2021; Tödtling and Trippl, 2005). The European University Association specified four roles of universities in regional innovation systems which are applicable to UAS as well (Reichert, 2019). Firstly, education: providing human capital for innovation. UAS ensure innovation, knowledge and talent development in their regions (Mulder et al., 2021). Secondly, doing research: knowledge (co-)production for private and public value creation. Applied research at UAS has developed rapidly and the knowledge function has become increasingly important in the Dutch knowledge landscape. For example in the Netherlands, the 36 UAS in their regions have often taken the lead in public-private partnerships aimed at knowledge development. Moreover, applied research at UAS is directly fed by contemporary questions from society (Mulder et al., 2021). Thirdly, knowledge exchange for innovation systems: from technology transfer to multi-actor co-creation. The interaction between education, research and professional practice characterizes applied research of UAS which is multidisciplinary in nature and takes place in networks (Mulder et al., 2021). Lastly, strategic transformation: embedding innovation within the organization and region. According to Pugh et al. (2021) UAS have the potential to initiate a strategic transformation within the internal organization in order to contribute more to innovation ecosystems.

Moreover, Goldstein, Maier, and Luger (1995) identify eight different functions for modern research universities that may potentially impact economic development. The eight functions are creation of knowledge, human-capital creation, transfer of existing know-how, technological innovation, capital investment, regional leadership, knowledge infrastructure production, and influence on regional milieu. Little research has been conducted regarding the impacts of regional leadership of UAS (Drucker and Goldstein, 2007). Overall, UAS can have a number of different roles and functions in regional development. The Triple Helix (Etzkowitz and Leydesdorff, 2000) or Quadruple Helix model (Miller, McAdam and McAdam, 2018; Carayannis and Campbell, 2009) and the System of Innovation approaches (Edquist, 2005) not only regard UAS as suppliers of human capital, but also value the direct contribution of (practical) applied research in collaboration with business and industry (Asheim, Isaksen and Trippl, 2019; Reichert, 2019). According to Mulder et al. (2021), the UAS are functioning as the accelerators of knowledge, the missing link between fundamental research and professional practice, where knowledge is obtainable to apply. At any rate, UAS are becoming active players in their communities, contributing to the quality of life and regional wellbeing, to regional development, and ensure the importance of knowledge in the regional innovation ecosystem (Markkula and Kune, 2015).

3. System elements for diagnosing ecosystems

The broader role of UAS is also explored according to the system elements for diagnosing ecosystems. Leendertse, Schrijvers and Stam (2021) defined ten preconditions and system elements as a tool, that is used in several regions of the Netherlands, for diagnosing the ecosystem (Figure 2). Based on the presence and functioning of the ten preconditions and system elements, the underlying regional-economic structure can be explored, so that strengths and weaknesses in the ecosystem can be identified. The preconditions for interaction in the ecosystem are social conditions, consisting of formal institutions and culture, physical conditions (infrastructure and facilities) and market demand. The six system elements are networks, leadership, finance, talent, knowledge, and intermediaries. These form the core and engine of the ecosystem. As a results of the interaction between these system elements, innovation activity by and between actors takes place. This ecosystem model will indicate in which system elements the broader role of UAS can be utilized.

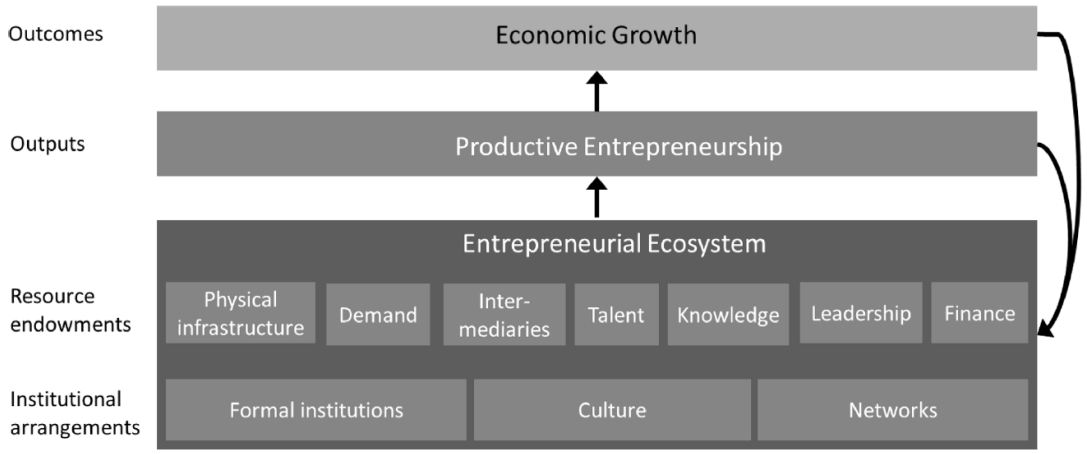

Figure 2: Elements, outputs and outcomes of an entrepreneurial ecosystem

(adapted from Stam, 2015; Stam & Van de Ven, 2021)

3.1 System elements: knowledge and talent

Educational organizations, such as UAS, cover mainly the system elements 'knowledge' and 'talent'. Pugh et al. (2021) and Sorama (2020) encourage UAS to fulfill functions in society by engaging in learning and knowledge transfer activities that connect UAS with businesses in their locality and regions. UAS' designed and delivered programs can contribute to regional learning in order to realize better social and economic outputs and outcomes for people, businesses and places.

3.2 Covering other system elements

Taylor (2016) provides several recommendations for creating innovative regions through the role of universities. UAS are important hubs and key partners of networks serving as an institutional arrangement (Reichert, 2019). UAS can also contribute and channel some of the (financial) resources needed for innovation, by supporting businesses by identifying sources of funding or acting as intermediaries for funding opportunities. Furthermore, UAS can operate as delivery partners for national government-funded products and provide advice and guidance to businesses. UAS make significant investments in (physical) infrastructure by increasingly developing their estates to provide environments for businesses, researchers and graduates to innovate together, because of the vital importance which infrastructural development can play in fostering innovation dynamics (Reichert, 2019). UAS are often involved in the management and running of incubators, and science and innovation parks, as an active partner in activities. UAS, which educate their students to develop entrepreneurial attitudes, make a significant talent contribution to innovative businesses and local start up environments. The foundation of ecosystem thinking can be characterized as expanding an actor's capabilities beyond its own limits and transferring knowledge for the purpose of innovating in collaboration with others (Adner, 2006). This also applies to UAS. Hence, UAS have a great potential to cover more aspects in the preconditions and system elements of the entrepreneurial ecosystem conceptualized by Leendertse, Schrijvers and Stam (2021). The UAS is able to take on a new role for trust-building between actors in innovation ecosystems, in which interactions among actors can be understood as social relations with knowledge exchange as an output (Cai, Ma and Chen, 2020). To conclude, UAS can provide innovation ecosystems - besides knowledge and talent - also networks, physical infrastructure, intermediary services and finance. Furthermore, Reichert (2019) argues that connective leadership by a small number of people and a few small networks is seen as the mobilizing force for the region's development. Therefore, as a final point, UAS can make a difference by providing leadership in regional innovation ecosystems (Taylor, 2016). These findings have been supported by conversations with expert practitioners during the conference Research and Innovation Ecosystems organized by Rijksdienst voor Ondernemend Nederland (RVO, 2022).

4. Leadership role of universities of applied sciences

According to Sorama (2020) regional innovation ecosystems almost have the same actors, but not every actor may have the same role. The role and status of the actor may vary according to the objective of the ecosystem. Reichert (2019) mentions that the university finds itself in a new and challenging central position with multiple roles. Firstly, as a central regional actor in terms of knowledge generation and diffusion (Drucker and Goldstein,

2007). Secondly, as a cultural actor that facilitates regional interaction (Reichert, 2019). Educational organizations strive for more interaction in various forms with their environment. According to Thomas, Faccin and Asheim (2021), they are expected to fulfill their traditional missions of education and research as well as undertaking new activities that focus on economic, social and cultural contributions to regional development. Leadership and coordination determines to a large extent how actors in the innovation ecosystem embrace new possibilities and choose strategic direction (Van Bree et al., 2021). The relevance of developing strategic leadership capabilities becomes of great importance for UAS in order to explore new activities. UAS wants to collaborate more frequently and more sustainably with the region (Mulder et al., 2021). In achieving this intention, UAS can play a leading role in regional ecosystems because of their neutrality, accumulated knowledge and expertise with regard to different groups of stakeholders (Clauss et al., 2018). Furthermore, businesses and governments see UAS as ideally suited to bring together the actors in the regional innovation ecosystem, because they are impartial, and long-term oriented, rather than driven by commercial interests and short-term goals (Thomas, Faccin and Asheim, 2021; Sorama, 2020; Reichert, 2019) and provide a practice-oriented education approach by work placements and internships in (inter)national companies (Vereniging Hogescholen, n.d.; Mulder et al., 2021).

Moreover, current societal challenges are demanding broader roles for UAS as well, which requires changes within the internal organization. In order to tackle societal challenges, new knowledge should be quickly converted into new solutions. Thus, making applied research at UAS a key link between fundamental research and the society (Mulder et al., 2021). Cai, Ma and Chen (2020) justly emphasize the call for a renewed understanding of UAS in regional innovation ecosystems. The transformation of UAS should be addressed more in innovation models and policies (Vetoshkina et al., 2022). UAS can influence regional policy through their own strategy development (Reichert, 2019). For example, the engagement with other actors in the innovation ecosystem could be formalized more clearly in UAS mission statements (Smith, 2007). UAS rectors, presidents or vice-presidents can act as key transformative leaders for the region, whilst mobilizing partnership with other leaders from the city or region, and joining forces to develop and realize an innovation vision together (Reichert, 2019). Therefore, strategic transformation within the internal organization of UAS should be utilized by developing leadership capabilities in order to contribute more to innovation ecosystems development (Pugh et al., 2021).

5. Conclusion

There is a strategic relevance of innovation in ensuring economic growth and improving welfare within the EU. Regional innovation ecosystems play an important role in the framework of European integration processes to amplify innovative nations. However, the role of universities of applied sciences (UAS) in regional innovation ecosystems is unclear. This paper outlines the role of UAS in regional innovation ecosystems as significant. The relevance of the role of UAS is emphasized based on the Regional Innovation System model (RIS-model). Knowledge generation and diffusion are crucial to both fostering innovation as a part of the Sustainable Development Goal, as well as to Europe's ambitious goal to compete for global innovation leadership. Thus, UAS can take the practical role as the knowledge facilitator and driver of the innovation ecosystem. Furthermore, the various roles of UAS is explored according to the preconditions and system elements for diagnosing ecosystems. Next to knowledge and talent, UAS can provide regional innovation ecosystems, networks, physical infrastructure, intermediary services and finance. Eventually, UAS are able to take a new role in innovation ecosystems by developing strategic leadership capabilities. This strategic transformation will lead to embedding innovation by interacting with remaining actors in the regional ecosystem. The strategic leadership role of UAS in the regional innovation ecosystem can be substantiated because of their neutrality, long-term commitment, practical-oriented accumulated knowledge, applied research, involvement in regional governance, engagement with local industry and community, and expertise with regard to different groups of stakeholders. UAS will become active players in their communities, contributing to the quality of life and regional wellbeing, and adding value to regional development processes.

In this paper, key findings for UAS' leadership role in the regional innovation ecosystem is described. Thus, contributing to the formulation of regional innovation policies. Local authorities and government institutions at both the national and regional levels can benefit from existing best practices and should include UAS as active partners more clearly in the creation of strategic regional innovation policy planning. Although there has been elaborated a lot about regional innovation ecosystems, practical substantiation of the role of UAS within this system is still lacking. Further in-depth studies related to UAS' leadership capabilities and the impact on the

structure, performance and interaction with other actors of a regional innovation ecosystem, will offer valuable new insights regarding fostering innovation.

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