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## **Fostering Innovation Ecosystem Development – Tools and Practices**

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**Abstract:** Capability to create, manage and develop innovation ecosystems to capture value via ecosystem collaboration. Previous literature provides a relatively limited amount of results on how innovation ecosystem can be systematically and concretely developed in order to reach the set objectives for the ecosystem. Therefore, this paper introduces Ecosystem Development Canvas based on the conducted literature review that have been used in practice to manage and continuously improve six ecosystems in the Eastern Finland. Based on the results, the main benefits of the Innovation Ecosystem canvas are: 1) System-based and a comprehensive overview for the ecosystem management, 2) Concrete tool for all short/mid/ and long-term planning and innovation ecosystem development, and 3) Acceleration of the value creation for ecosystem members towards the defined ecosystem main objectives. In addition, we highlight the managerial implications for the ecosystem managers and developers.

**Keywords:** Innovation; ecosystem; orchestration; ecosystem canvas; development

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## 1 Introduction

The success of an organization in a dynamic environment depends on its capabilities to identify, analyse and effectively exploit external sources of all kinds of resources and knowledge (Pellikka and Ali-Vehmas, 2016). Well-created and managed inter-organisational collaboration can provide a strong basis for new innovations by providing business benefits such as 1) effective access and use of wider resource base e.g. create strategic research partnerships with universities, research labs to leverage partner's complementary R&D to tailor offerings for new markets, 2) shorten time to market via combinatory flexibility, and enhanced flexibility and scalability of the required resources, e.g. collaboration at the concept development phase is can be essential to ensure compatibility of the new technology solution, and 3) enhance innovation capability via joint-learning and co-creation with the ecosystem partners with proven capabilities.

In the dynamic business environment, the organizations' capability to manage the development of an ecosystem offers increasing potential as a powerful source of competitive advantage that underlines the importance of ecosystem strategies and their execution (e.g. Adner, 2006; Pellikka and Ali-Vehmas, 2019). In addition, Williamson and De Meyer (2012, 33) listed six ways (advantages) on how organizations can realize the benefits of the ecosystem: 1) pinpointing the added value, 2) structuring differentiated partner roles, 3) stimulating complementary partner investments, 4) reducing transaction costs, 5) enabling flexibility and co-learning, and 6) engineering value capture mechanism.

However, it is important to note that traditional strategy frameworks are unable to provide recommendations nor relevant perspectives when designing or participating in an ecosystem (see Jacobides, 2019). In addition, it is not clear how these strategies should be put into use to create and capture value both at the organizational and ecosystem level (Bharadwaj et al. 2013). In addition, previous research has shown that value creation within an ecosystem context is challenges e.g. due to unbalanced activities and resourcing by the ecosystem members (see Radziwon et al. 2017).

Therefore, is it essential that an ecosystem must be able to identify in more detail the key value creation elements, drivers, roles and the key constraints (see e.g. Dedehayir, 2018; Collins and Porras, 1996). Based on the perspectives described above, this paper introduces a practical tool (i.e. Ecosystem Development Canvas) and the previous literature that has created the basis for the tool. Therefore, our aim is to answer the following key questions:

*What the ecosystem developers can plan, manage and improve value creation and capturing in ecosystems?*

*How Ecosystem Development Canvas can be used in ecosystem development?*

The paper is organized as follows. Section 2 discusses previous literature related to the key elements on ecosystem development. Section 3 describes the analysis of the literature review and the basis for Ecosystem Development Canvas, and finally, Section 4 discusses its key results, implications and the avenues for the next steps.

## **2 Literature review – An Importance of Ecosystem Management Framework and Practices**

Knowledge, information and data have become primary wealth-creating assets of firms that are essential for innovation, and hence for maintaining competitiveness (e.g. Pellikka and Ali-Vehmas, 2016; Liao et al., 2009). In addition, the competitiveness in a dynamic business environment depends on the competitive quality of its knowledge-based assets, data and especially successful application of these assets in operational activities in order to fulfil its strategic objectives (Teece, 1998). In the ecosystem setting it is essential that the ecosystem can mutually predetermine what they want to achieve via ecosystem collaboration. The potential list of the targeted objectives and a concrete value can include for example first reference customer, proof-of-concept, real-life technology testing, joint-pilot, co-creation, funding, innovation support services, new distribution channels, etc. All of these influences the potential way of working and models for ecosystem collaboration (e.g. Pellikka and Ali-Vehmas, 2019; Radziwon et al. 2017). Moreover, ecosystem development is centrally dependent on the value-capture process, which implies a purposive management of knowledge flows at the level of the ecosystem that fits to each member's priorities and objectives. In order to realize the potential benefits of ecosystems, an appropriate management framework must be created and implemented to help ecosystem managers and developers to orchestrate the wide and complex entities (Hurmelinna-Laukkanen et al. 2012).

In this paper we define the term ‘orchestration’ as the selected activities developed by a coordinator or a hub organization that plan, manage and mobilize relevant resources, capabilities and actors in order to reach the defined objective of a different type (knowledge, innovation and business) of ecosystem (see also Hara et al., 2015). The orchestration of the innovation ecosystems depends on establishing inter-organizational collaborative practices that are for example designed to facilitate knowledge, asset and information sharing among the ecosystem partners. In addition, orchestration is based on the three subprocesses (see Dhanaraj and Parkhe, 2006): 1) managing knowledge mobility among the partners e.g. for new innovations, 2) managing innovation appropriability e.g. to ensure that ecosystem members can capture the results of innovation, and 3) managing network stability e.g. to maintain and continuously improve collaboration among the ecosystem partners.

Another essential element of ecosystem formation and management is related to the key roles that the partners play. Previously Dedehayir et al. (2018) proposed several roles seminal to innovation ecosystem birth, which can be divided into four categories: 1) leadership roles (‘ecosystem leader’ and ‘dominator’), direct value creation roles (‘supplier’, ‘assembler’, ‘complementor’, and ‘user’), value creation support roles (‘expert’ and ‘champion’), and entrepreneurial ecosystem roles (‘entrepreneur’, ‘sponsor’, and ‘regulator’). They also pointed out in their study that some role are pivotal in ensuring that the innovation can move successfully from idea to market as part of commercialization process (see also Pellikka and Ali-Vehmas, 2016; Pikkarainen et al. 2017). In addition, we can expect the optimal balance of these roles and actors must be taken into account when planning, orchestrating and improving ecosystems, which also underline the need for a management framework for the ecosystem leader and/or for ecosystem developers.

### **Ecosystem Development Canvas – Key elements and Reasoning**

From the perspective of an innovation management, innovation ecosystem participants co-create, innovate and develop new business opportunities around a shared set of capabilities, knowledge and technologies. At the same time, they need to manage the dynamic changes and uncertainty to develop new products, satisfy customer and market needs. Innovation ecosystems allow firms to create value that no single firm could do alone, and it has been pointed out that innovation ecosystems have become the new basis of competition. However, the basis for managerial insights and implications remain fragmented, especially from an essential perspective of entrepreneurship, which underline the importance of the studies that elaborates the concrete tools and approaches on how an ecosystem developer can create, manage and continuously develop these collaborative settings. of an innovation ecosystem among both public and private organization that play a key role in the innovation ecosystems.

In this presentation we will explain on how to use a created tool for the innovation ecosystem developers (i.e. Ecosystem Development Canvas and guidelines), and what are the latest results that we have achieved as a part of a public funded RDI initiative in Finland targeted to develop six different ecosystems across multiple domains (please see Appendix 1: Summary of the ecosystems). Rather than relying on internal resources, firms, ecosystem developers and policy makers are increasingly seeking new approaches to create and capture value via the other partners in the innovation ecosystems. This however means that these parties must be in practice able to facilitate the key activities including (e.g.): 1) the definition of a winning strategy for a selected ecosystem (formation and implementation), 2) creation of a managerial capabilities and roles & responsibilities, and 3) external search practices and effective way of working with the business partners that can provide the complementary assets and resources for the further business development and growth. Finally, ecosystems must be also able to monitor the impact and manage change to effectively response to the changes in the operating environment.

The following sections summarizes the key elements of the ecosystem development canvas and their essential role to provide concrete approach for the ecosystem developers based on our ongoing collaboration among six different ecosystems.

### **Vision and goal setting**

Ecosystems must have a vision, a core purpose and the key objectives that remain relatively stable while the strategies and practices continuously adapt to a changing environment (Collins and Porras, 1996). Leithwood et al. (1996) presented that vision building is intended to create a fundamental, ambitious sense of purpose, one to be pursued over many years. Powerful visions clearly indicate the long-term approach on how the ecosystem create and capture value for the member organizations in the dynamic environment in which it operates. This is because a vision has no power to inspire staff members or attract their commitment unless it offers a view of a clearly better future (e.g. Kantabutra and Avery, 2010). In addition, based on the articulated ecosystem vision, the decision-makers can create an ecosystem strategy, which is the key to succeeding in ecosystems (see Adner, 2006). Finally, once the ecosystem leader has developed a vision of what market they want to enter, with what offering, they come up with a tentative agreement on the performance expectations that enable to reach the set objectives.

## **Industry and business environment**

Ecosystems can enhance their performance in a dynamic business environment by focusing on their dynamic capabilities (see e.g. Teece et. al. 1997). Dynamic capabilities can help innovation ecosystems to adapt to the emerging changes in the business environments. In addition, it can help to identify and to develop new innovation and business opportunities and in general, to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the organization's intangible and tangible assets (Teece, 2007).

As pointed out by Möller et al. (2020) the industries and business environment are constantly forming and transforming through exploration, mobilization and stabilization. Therefore, a broad environmental scanning on the emerging changes and opportunities is essentially needed in order to know what is happening and what is going to happen. From this perspective, ecosystems must develop their capabilities to adapt and beyond that be complemented with sufficiently agile structures and processes so that the ecosystem and the ecosystem partners can also effectively adapt its operations. Building these types of capabilities require also decentralized decision-making, a collaborative organizational culture in the ecosystem and a shared vision among the ecosystem partners (also Heaton et. al 2019).

## **Ecosystem management and facilitation**

Although innovation ecosystems have been increasingly used by companies to foster innovation through collaboration, there are still challenges regarding how to successfully orchestrate ecosystems (Pikkarainen et al. 2017). It has been noted that one main challenge is to effectively orchestrate a network of actors, assets, data and resources in the ecosystems (Hofman et al. 2016). In addition, assets and resources must be orchestrated by a strong player willing to take the lead (Heaton et al. 2019). Therefore, ecosystem management and facilitation are crucial elements in order to realize the potential benefits of an ecosystem. Management and facilitation create a basis for good governance and the structured management practices (e.g. stakeholder engagement and communication). In other words, it is crucial that ecosystems are managed and facilitated via structured way based for example on the pre-defined and articulated governance model. Some ecosystems have clear, possibly de jure defined standards, especially if they have many members. Others, especially those not based on technology, might have de facto expectations in terms of the rules of engagement (see Jacobides et al. 2018).

## **Capabilities and complementary assets**

Previous studies have clearly indicated an essential role in the innovation ecosystem to jointly create, use and further develop knowledge, capabilities, data-based resources and complementary assets (Pellikka and Ali-Vehmas, 2019; Brouthers et al. 2015). In addition, ecosystem need also: 1) capabilities to manage knowledge-based assets effectively (both internally and externally), 2) high quality of its knowledge-based assets, and 3) successful application of these assets to fulfil organization's strategic objectives (e.g. Teece, 1998). Therefore, firm's resources should not only be valuable, rare, and inimitable to facilitate superior performance, but the firm must also have an appropriate strategy, organization and processes in place to take advantage of the knowledge-based resources and data within in the ecosystem (see e.g. Wiklund and Shepherd, 2003).

In addition, it has been previously noticed that an increasing role of data and knowledge have become one of the primary wealth-creating assets enabling innovation, business opportunity development and commercialization (Virtanen and Pellikka, 2017). It has been previously highlighted an essential role of data-based view (DBV) in the ecosystem context by Pellikka and Ali-Vehmas (2016). Digitalization of the society is a key opportunity for techno-entrepreneurs and startups to successfully commercializing innovations. Therefore, accessing and effectively utilizing complementary data and knowledge-related assets in the ecosystem is a critical success factor. As pointed out earlier, many industry sectors and domains (e.g. IoT and digital healthcare) and new business opportunities are generated by an ecology of private, public and nonprofit organizations. In order to stay relevant in the business all ecosystem stakeholders (e.g. other startups, large companies and universities and end-users) must plan and continuously align both the inbound and outbound data and knowledge flows via pre-determined practices e.g. via effective boundary resources.

In addition, previous studies have shown that platforms can accelerate the value recognition function of absorptive capacity and, therefore, can accelerate further diffusion of knowledge, data and knowledge acquisition and co-development among the innovation ecosystem partners (see Kokshagina et al . 2017; Clarysse et al. 2014). These activities can also enable startups and small companies to deepen their specialization while further developing their business opportunities via business concepting, business modeling, market launching and business planning (Virtanen and Pellikka, 2017). The final vital element in the ecosystem is the need for an industry leader company or a 'keystone' company. Their role is to ensure the continuous improvement of ecosystem and engage new innovative start-ups to join the ecosystem and create offerings that are compatible with the expectations of other ecosystem stakeholders, including end-users.

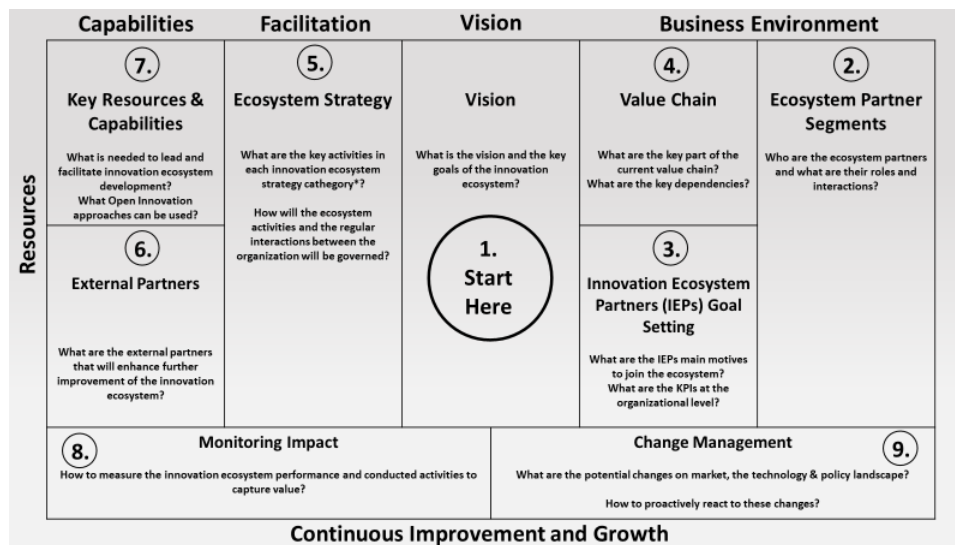


## **Monitoring impact and change management**

Innovation ecosystem typically considers the complex and dynamic structure as it brings multilevel perspective and captures the complex relationships that are formed between multiple actors such as large companies, SMEs, startups, universities, government, NGOs, citizens, local communities, infrastructure, customers and other actors. In order to be successful in this context i.e. to create and capture value in the ecosystem, organizations must develop the explicit ways to manage change (see e.g. Valkokari, 2015; Carayannis and Campbell, 2009). A specific need for change can be caused by the wide variety of drivers including market changes, legislation, emerging new technologies and changes on the customers needs. In addition, internal dependencies between the ecosystem members may create a need to change the ways on how ecosystem reforms itself. Therefore, change management capabilities should built into ecosystem's capabilities in order to be in full operation mode when the indicated changes (e.g. due to changed priorities) must be put in place.

It has been widely seen that the favourable impact on innovation ecosystem is related to value and innovation creation, productivity improvement and overall innovation and business performance (e.g. Adner, 2006). From this perspective, it is essential that ecosystems can systematically develop key enablers of trust building among the ecosystem partners including e.g. complementarity of obligations over the product lifecycle, differing perceptions of obligation fulfilment, and balance between value creation, ecosystem objective and overall mission (see also Pellikka and Ali-Vehmas, 2019; Weiblen and Chesbrough, 2015). Moreover, ecosystem development involves a wide variety of the partners including established companies, universities, and the non-profit sector, all of whom share the responsibilities in developing business environments. Within this context, the main activities on the change management can involve initiatives towards the key regional and national stakeholders and policymaker to proactively contribute on the continuous improvement of the business and innovation friendly environment and economic growth (also Scaringella and Radziwon, 2018).

Based on this section, the following picture present the Ecosystem Development Canvas (Picture 1).



**Figure 1.** Ecosystem Development Canvas – key elements and key questions

### Managerial implications and discussion

In this paper we have highlighted how the ecosystem developers can plan, manage and improve value creation and capturing in the ecosystems via an introduced tool (i.e. ‘Ecosystem Development Canvas’). Especially we have briefly described the areas that plays a key role to enable value creation and capturing on top of the new innovations, data, new technologies and via new business opportunity development. The key areas of the ecosystem canvas can create the crucial linkage between the ecosystem level and the innovation enabling elements including e.g. the following components (see e.g. Möller and Halinen, 2017; Veeckman et al. 2013): 1) institutional arrangements (e.g. legitimisation, governance and technology standards), 2) resource endowments (e.g. scientific/technological research, financial and insurance arrangements, and human competence pools) and 3) proprietary functions (e.g. technological development functions, innovation networks, living labs and market creation/consumer demand). Several of these elements are targeted to support the capacity of firms and other ecosystem actors to operate and create linkages within the regional ecosystems, for example between the universities and firms, by broadening knowledge and data transfer and exploitation in order to increase their capacity to stimulate and commercialise innovations.

From the ecosystem management perspective this means that among other the various ways in this context need to be orchestrated and facilitated (also Faccin et al. 2020) including: 1) commercialisation of knowledge through licensing and/or the formation of new firms, 2) provision of suitable conditions for educating students in entrepreneurship and/or establishment of educational training programs for local companies, 3) recruitment and training of people related to specific innovations and 4) sharing knowledge via research collaboration or collaborative ventures with other firms in the industry, e.g. at conferences or through informal networks.

Because ecosystem collaboration is based on knowledge that spreads outside the boundaries and structures of any individual organization. Therefore, well-planned ecosystem orchestration of the areas indicated in the ecosystem canvas is needed (also Hurmelinna-Laukkanen et al. 2012). In particular, the ecosystem leader organization can contribute to ecosystem development in three main ways: 1) via orchestration and well-executed ecosystem strategy to enhance creation and exploitation of innovations, 2) contributing to the ecosystem's joint innovation and business opportunity development processes by accelerating use of the knowledge and data across the partners, and 3) acting as an intermediaries by integrating various actors' knowledge and resources in order to create innovations (also Pellikka and Ali-Vehmas, 2019).

To summarize the main contribution of the paper can be summarized as follows:

- Identify the areas to be managed and developed in the innovation ecosystem context based on the literature review
- Introduce the Ecosystem Development Canvas tool, which is currently in use among six regional ecosystems (please see an Appendix 1). The Ecosystem Development canvas is designed as an orientation guide and provide a framework for the ecosystem leader and/or developers to focus on the areas that need to be orchestrated in the ecosystem context. This is especially important due to the different architectural models and ecosystem (internal) collaboration culture (also Sant et al. 2020).
- List of the main questions on each area in the canvas to help to set the management, orchestration and development practices at the ecosystem level.

Although our paper provides the latest insights on how to orchestrate and develop ecosystem, several essential elements of this research area are still waiting for the future research efforts. From this perspective, we propose that future research on the innovation ecosystem studies should focus on the concrete measurements and benefits both at the ecosystem level as well as the organizational level for value creation. It is essential to elaborate the detailed value creation dynamics e.g. via the introduced Canvas tool and to understand how the ecosystem creates and delivers value in the different phases of the ecosystem evolution and how the value is increasing sequentially (also Vlasisavljevic et al. 2020).

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## Appendices

### Appendix 1: Summary of the ecosystems

	Kuopio Water Cluster	Food & Agriculture	Kuopio Health	Machine & material technology	Bio and Circular Economy Cluster – North Savo	Energy Technology
Contact details	<a href="https://kuopiowatercluster.com">https://kuopiowatercluster.com</a>	Food: <a href="https://www.ruhohakko.fi/en/">https://www.ruhohakko.fi/en/</a> Agri: <a href="https://agri/foodclusters.fi/">https://agri/foodclusters.fi/</a>	<a href="https://kuopiohealth.fi/">https://kuopiohealth.fi/</a>	<a href="https://www.materiaalikeskus.fi/">https://www.materiaalikeskus.fi/</a>	Dr. Harri Auvinen, D.Sc. Research and Development Manager tel. +358 44 785 6923 Bio and Circular Economy Savonia University of Applied Sciences PO Box 6 (Mikrolatu-1), 70201 Kuopio FINLAND <a href="mailto:harri.auvinen@savonia.fi">harri.auvinen@savonia.fi</a>	<a href="https://energyclusternorthsavo.fi/">https://energyclusternorthsavo.fi/</a>
Type of ecosystem (Knowledge, innovation or business)	Knowledge and Innovation Ecosystem Moving towards Business Ecosystem area	Food: knowledge ecosystem Agri: innovation ecosystem	Innovation ecosystem and business ecosystem	Knowledge ecosystem	Knowledge and Innovation Ecosystem	Innovation ecosystem
Mission & main objectives	Kuopio Water Cluster concentrates the research, development and innovation in water sector in Pohjois-Savo region of Finland. The Cluster offers a one-stop solution for rapid product development, testing and commercialisation services for companies operating in the water technology sector.	Food: To bring together expertise, needs and know-how and to support the expertise of wellbeing promoting food production, development and processing. Agri: To develop partnership, share knowledge and experiences and to create project initiatives by coordination and facilitating collaboration.	Kuopio Health aims to generate inspiring opportunities for new ideas and innovations, provide experts in the field of health and nutrition with opportunities for success, and communicate about excellence in the Kuopio region.	Machine & material technology aims to help industry to go international markets, find out the new innovations in the sector and offer help in commercialisation. Ecosystem shares research base information about the material technology.	The Bio and Circular Economy Cluster - North Savo, promotes the business growth and competitiveness of companies operating in the field. It opens opportunities for finding potential partners as well as a wide range of services for technological product and business development.	The Energy Cluster North Savo will provide services for its members in different phases of the innovation processes from identification of ideas to product commercialisation. We monitor sectoral development and predict future needs in RDI thematic teams, while preparing and implementing RDI projects aimed at new product innovations in cooperation with our partner companies.
Year of establishment	2019	Food: 2018 Agri: 2021	2019	2016/2021	2021	2015
Coordinator organization / core management org.	Savonia UAS	Food: Savonia University of Applied Sciences, University of Eastern Finland (UEF), SavoGrow, Sakky, YSAO, Praxityö Agri: Savonia	Kuopio health cooperative	Savonia University of Applied Sciences	Savonia University of Applied Sciences, University of Eastern Finland (UEF), Natural Resources Institute Finland, Savo Consortium for Education	Savonia University of Applied Sciences, University of Eastern Finland (UEF)
Number of the member organizations (#)	40	Food: 25 Agri: 13	30 (24 companies, 6 universities / research institutes)	4	6	20+
Selection of the new members (open vs. closed)	Open (Member fee)	Food: Companies can join the network for free. Agri:	Open for new members, membership is based on the annual fee.	Open for new members. Network building is starting.	Open	Open
# of R&D projects (2018-2020)	1	Food: 2-4 Agri: -	-	-	1	6

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