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DELIVERABLE 4.2

VALIDATED FRAMEWORK FOR KEY RELATIONAL, CONTRACTUAL, AND DIGITAL COORDINATION MECHANISMS FOR ECOSYSTEM BUILDING AND MANAGEMENT

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ABOUT EINST4INE

The European Training Network for InduStry Digital Transformation across Innovation Ecosystems, also known as **EINST4INE**, is a consortium of universities, research organisations and industry partners working in the domain of industrial digital transformation.

EINST4INE aims to develop new concepts, approaches, and methods in the area of digital transformation and brings together a unique group of world-leading experts in the areas of Open Innovation, Industry 4.0, digital transformation and innovation ecosystems. '**Deliverable 4.2**' (D4.2) is one of the technical reports produced from the ongoing research conducted within this network. It aims to disseminate cutting-edge knowledge from research and practice in addressing future industrial challenges – for D4.2, we focus on key mechanisms for ecosystem building and management.

Read more at: https://www.einst4ine.eu/

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INTRODUCTION

Ecosystems, in the organisational sense, have become prevalent in recent years to address the need for bringing together communities of different actors and provide them with a supportive environment to work together (for a recent review of this literature, see Bogers et al., 2021; also see Jacobides et al., 2018). Given the complex and diverse nature of ecosystems, with the central idea that different actors are dependent on one another to bring about an integrated value proposition, it is a challenge to effectively build and manage them. Managing ecosystems of loosely interdependent actors that have diverse motivations is particularly challenging in comparison to managing contractual alliances and networks (Aarikka-Stenroos & Ritala, 2017). To make sense of this challenge, this report outlines a framework with some of the tools that are key to building and managing ecosystems.

This framework has been validated in collaboration with Spinverse, a Nordic innovation consultancy, that helps customers to grow and solve global challenges through ecosystem projects. Spinverse has extensive experience in EU funding instruments and company-led innovation projects to help European innovators reach their growth targets. Their core services include:

1. Exploring opportunities for publicly fundable innovation and ecosystems,
2. Planning and applying for public funding for ecosystem projects,
3. Managing complex innovation projects, ecosystem relationships, and communication.

To validate this framework, we first conducted a review of the academic literature to scope the mechanisms for ecosystem building and management from the latest science. We then used publicly available materials (such as white papers, company reports, and the Ecosystem Handbook[1]) to confirm whether this is what is carried out in practice. Through a series of discussions, interviews, and a workshop, we were able to conclude together with Spinverse about the key relational, contractual, and digital coordination mechanisms for ecosystem building and management.

Through this report, you can gain an overview of how ecosystems work, what it takes to build and manage ecosystems (Part 1), and which mechanisms are important to consider (Part 2), all with illustrative examples.

[1] The Ecosystem Handbook provides a fresh and engaging insight to everyone collaborating within ecosystems, to those who wish to build and lead them successfully — with an impact. This handbook was written by Sari Kola and Ulla Koivukoski, alongside experienced insights, and developments from Laura Koponen (CEO, Spinverse) and Markku Heino (Principal Consultant, Spinverse).

1. BUILDING AND MANAGING ECOSYSTEMS

WHAT IS AN ECOSYSTEM?

The term 'ecosystem' has been translated from biology and adopted into the management literature as a holistic metaphor to describe groups of diverse organizations working together. Natural ecosystems consist of plants, animals, and other organisms, as well as weather and landscape, working together to form a bubble of life. A similar logic has been applied to so-called 'man-made' ecosystems consisting of research institutions, start-ups, corporations, and other forms of organizations, as well as the necessary resources and collaboration environment, working together to achieve a shared goal. As a starting point, Spinverse typically contribute to the building and management of what academics have labelled as "knowledge ecosystems" (Järvi et al., 2018), which focus on knowledge creation and discovery among multiple cross-sectoral partners, such as universities, research institutions, and companies. From this basis, they can then generate R&D projects, innovation projects, and new business.

> At large, ecosystems are collaboration mechanisms that **serve some purpose**, whether it's about the knowledge or the ideas or business. So, after all, they serve at developing, competing business models and products and services to whatever market you operate at. And you have different players for different purposes at different stages.
>
> Pentti Launonen, Ecosystem Leader (Spinverse)

Types of ecosystems

Many different prefixes can accompany 'ecosystems' which bring new and different meanings to this way of organizing. While this concept grows and spans different contexts and purposes, we will focus on differentiating the three common types: 'knowledge ecosystems', 'entrepreneurial ecosystems', and 'innovation ecosystems'. These can generally be differentiated by the ecosystem-level output they generate.

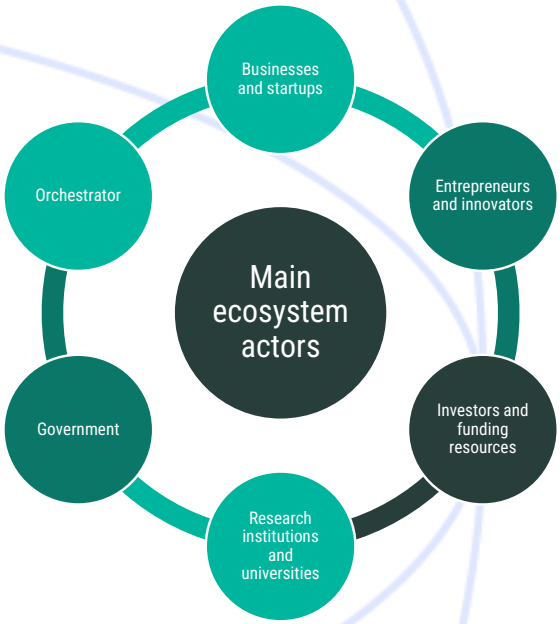
Table 1. Typology of ecosystems

Ecosystem: "a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate an ecosystem output" Autio & Thomas (2021, p.16)		
Knowledge ecosystem: Involves multiple and diverse actors engaged in joint knowledge creation and discovery. Reflective of the open processes of R&D. Van de Borgh et al (2012) ; Clarysse et al (2014); Järvi et al. (2018)	**Innovation ecosystem:** Develops and delivers value propositions with complementary roles for ecosystem actors. Often has a platform or a set of shared technological compatibility standards that enable sharing of knowledge and resources. Adner (2006); Adner & Kapoor (2010)	**Entrepreneurial ecosystem:** Ecosystems that provide entrepreneurial environments and interdependencies that facilitate new opportunities, ideas, and growth. Often located in particular geographical areas or around a certain industry. Prahalad (2005); Isenberg (2010)
Output: new research-based knowledge	**Output:** ecosystem value offering targeted at a defined audience	**Output:** business model innovation encapsulated in new start-up ventures

There are several key actors in any given ecosystem, to illustrate a few:

Companies of all sizes play an essential role in an ecosystem, as they provide the resources, expertise, and market opportunities for new ideas to grow and flourish.

These can include individuals, teams, or a hub firm that provide resources, mentorship, and networking opportunities to help partners co-create, develop and commercialize their ideas, guided by the ecosystem goal.



These are the people with creative ideas, who take risks and work hard to develop and market new products and services.

These entities create policies and regulations that support innovation, protect intellectual property rights, and foster a competitive business environment.

These can include venture capitalists, angel investors, and government funding programs that provide the necessary financial support for ecosystem

Figure 1. Ecosystem Actors

These organizations conduct cutting-edge research and produce skilled talent that can contribute to the innovation process.

Fundamentally, ecosystems consist of various actors (non-exhaustive of the ones named above) who participate in different capacities to co-create and capture value based on a shared goal. What is important to acknowledge and note, is that each given context will have different conditions and thus require different roles and subsequent processes. Nonetheless, there are some guiding principles and rules that should be understood and can be adapted to meet the needs of your ecosystem.

HOW TO BUILD AN ECOSYSTEM

Biological ecosystems occur and exist naturally, including various life cycles as a self-sustaining system. In contrast, human made ecosystems are a community of actors who come together united by a shared challenge or opportunity they wish to address and cannot deal with alone. Since we are interested in 'building' an ecosystem, this suggests it is an intentional and strategic choice, and therefore we focus on deliberate actions to accomplish this goal.

Ecosystems are distinct from other collectives such as supply chains, clusters, alliances, and networks due to four main characteristics: the system-level outcome, participant diversity, the nature of being dependent on one another, and coordination mechanisms. These characteristics alone do not make ecosystems distinct from other organisational collectives, but it is the combination of these four characteristics that make ecosystems unique (Autio & Thomas, 2021). Therefore, building an ecosystem can be a complex task that requires careful planning and execution. Generally, it can involve the following:

Defining the scope and objectives: Start by defining the scope of your ecosystem and what you want to achieve with it. Consider what kind of ecosystem you want to build, such as an innovation ecosystem, an entrepreneurial ecosystem, or a knowledge ecosystem.

Identifying key stakeholders: Identify the key stakeholders who will be involved in your ecosystem. This may include customers, suppliers, partners, investors, and other relevant parties. Understand their interests and motivations, and how they can contribute to the ecosystem.

Defining the rules of engagement: Establish the rules of engagement for your ecosystem, such as the terms and conditions of participation, the roles and responsibilities of stakeholders, and the mechanisms for managing disputes and conflicts. These can include formal contracts but also shared norms of behavior.

Developing the infrastructure: Develop the necessary infrastructure for your ecosystem, such as a digital platform and interfaces, communication channels, and tools for collaboration and knowledge sharing.

Building the community: Build a community around your ecosystem by engaging with stakeholders and creating opportunities for collaboration and networking. Encourage participation and contribution and recognize and reward those who make valuable contributions.

With regards to the type of ecosystem being built, this can also be a more 'evolutionary approach' depending on the goals and needs of the ecosystem participants as well as what the operating conditions and environment allow, as depicted in Figure 2. The evolutionary approach means that an ecosystem could start as a knowledge ecosystem fostering ideas and knowledge sharing, which could branch out to developing and implementing innovations, and eventually becomes a flourishing business ecosystem – it evolves to the changing purpose needs (see also Clarysse et al., 2014).

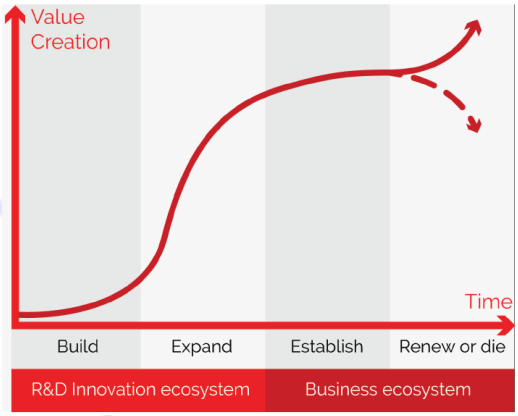


Figure 2. Evolution from knowledge/innovation to business ecosystem. Source: Spinverse (2018a)

Whereas, depending on what the conditions and environment allows, ecosystem participants may be set on one shared goal that they wish to address and proves beneficial to focus on and sustain e.g. university ecosystems producing knowledge spillovers. In those cases, after a knowledge ecosystem ceases to exist, the ecosystem actors engage with their own business and other priorities and utilize the ecosystem-generated insights in other arenas.

HOW TO MANAGE AN ECOSYSTEM

Since working in ecosystems are a way to collectively create value (e.g., knowledge, ideas, innovation, business opportunities), it means that the system or network of actors is **loosely coupled**. Loose coupling refers to a situation where each actor is separate within the system with their own identity and actions but remains responsive to the collective identity and goal (Weick, 1976; Orton & Weick, 1990). As a result, loosely coupled systems (i.e., ecosystems) tend to require coordination to help materialize their efforts. Loosely coupled systems have called for new types of coordination focusing on managing the interdependencies in a non-hierarchical way – labelled as "orchestration" by management scholars (Dhanaraj & Parkhe, 2006; Ritala et al., 2023). Yet also the classic management approaches remain useful in ecosystems beyond the novel orchestration approaches.

The **coordination** of ecosystems can adopt different styles or approaches dependent on the needs of the ecosystem. This typically consists of either management, orchestration, or leadership.

Table 2: Adapted and further modified from: Ritala, P., Hurmelinna-Laukkanen, P., & Nätti, S. (2012).

Coordination style	Main coordination mechanisms in ecosystem building	Main coordination mechanisms in ecosystem maturity
Management	Delegating roles and tasks for ecosystem members and setting up schedules.	Overseeing contractual obligations and coordinating efficient workflows.
Orchestration	Motivating members to join the ecosystem, ensuring knowledge sharing, and communicating vision.	Maintaining the ecosystem structure and value capture from innovation based on individual and overall ecosystem goals.
Leadership	Providing a clear vision, designing structure and strategy, and mobilizing resources.	Actively engaging with stakeholders, facilitating collaboration, and networking, and adapting plans and strategies.

In practice, effective ecosystems require a combination of management, orchestration, and leadership. Management provides structures, monitors performance, and ensures efficiency. Orchestration helps align and integrate different parts of the organization, facilitating collaboration and synergy. Leadership inspires and guides individuals and teams, fostering a culture of innovation and adaptability.

It's important to note that these roles are not mutually exclusive and can overlap. Successful ecosystem orchestrators often exhibit leadership qualities, and leaders may also perform management functions. The specific emphasis on management, orchestration, or leadership depends on the context, organizational needs, and the nature of the challenges being addressed.

This central role can be observed by a “hub firm” or an “ecosystem orchestrator”, or it can be a role that alternates between ecosystem participants. It is this actor who (or whom, if it alternates) has the crucial job to facilitate, coordinate, and support participants in achieving the ecosystem goal. Coordinating an ecosystem can be challenging as it involves balancing the interests and needs of the various ecosystem participants, ensuring the sustainability of the ecosystem, and adapting to changing circumstances.

With this holistic perspective, encompassing management, orchestration, and leadership as coordination styles, effective ecosystem management involves:

Establishing governance: Establish a governance structure that defines the roles and responsibilities of stakeholders, the decision-making process, and the mechanisms for resolving any potential conflicts and tensions – such as who has ownership over certain intellectual property.

Performance monitoring and measuring: Regularly monitor and measure the performance of the ecosystem to ensure that it is meeting its objectives and delivering value to stakeholders. Use (qualitative and quantitative) data and feedback to identify areas for improvement and optimize the ecosystem.

Fostering collaboration: Foster collaboration among participants by creating opportunities for networking, sharing knowledge, and working together on common goals. Encourage participation and contribution and recognize and reward those who make valuable contributions.

Managing risks: Identify and manage risks that could affect the sustainability of the ecosystem. This may include risks related to economic, social, environmental, and technological factors – such as one of the ecosystem participants going bankrupt or a major cybersecurity breach.

Adapting to change: Be prepared to adapt to changing circumstances and evolving stakeholder and participant needs. This may involve adjusting the governance structure, modifying the objectives, or introducing new stakeholders.

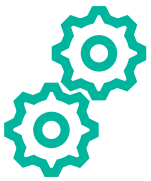
Communicating effectively: Communicate effectively with stakeholders and among participants to build trust, transparency, and accountability. Keep all necessary participants informed of key decisions and changes and solicit their input and feedback.

Research tells us that coordinating such collaborative practices in ecosystems requires the following skills, capabilities, and properties at individual, organisational, and network level:

Table 3. Adapted from Launonen (2015). Original sources: Dhanaraj & Parkhe, 2006; Ritala et al., 2009; Muller-Seitz, 2012; Järvenpää & Wernick, 2011; Launonen, 2012, action research material

	Knowledge Mobility "The ease with which knowledge is shared, acquired, and deployed within the network" (Dhanaraj & Parkhe 2006, p. 660)	**Innovation Appropriability** "[a mechanism to] ensure value is distributed equitably and perceived as such by network members" (Levén, Holmström, & Mathiassen 2014, p. 159)	**Network Stability** "The pursuit of sustaining relatively stable system dynamics among actors, technologies, and institutions" (Aarikka-Stenroos & Ritala, 2017, p. 29)
Individual skills	Interpersonal communication and social skills Facilitation skills Design and visualising skills	Balancing skills Negotiating skills Entrepreneurial skills	Influencing skills Visioning skills Motivating skills Selling skills Problem-solving skills Change management skills
Organizational capabilities	Operational capability Collaboration capability Competence leveraging capability Co-learning capability Prototyping capability	Legitimizing capability Balancing capability Entrepreneurial capability Decision-making capability	Visioning capability Influencing capability Paradoxical thinking capability Conflict management capability
Ecosystem / network properties	Marketing / representation Knowledge transfer Forums for interaction	Trust & culture Rules / ecosystem structure Focus / goal	Strategic thinking Ecosystem vision and identity Capability strategy Measures / indicators Transparency Reflexivity

2. KEY MECHANISMS FOR ECOSYSTEM BUILDING AND MANAGEMENT



WHY MECHANISMS?

Organisations and collectives of organisations in particular (i.e., ecosystems) are typically rife with "mechanisms" and "practices". Organizational mechanisms are often implicit, meaning that they are present but not consciously recognised. Understanding mechanisms can help explain the underlying how and/or why of something that is happening (Anderson et al., 2006). For ecosystem building and management, this means understanding the 'cogs and wheels' that make up the wider ecosystem and its coordination. Essentially, mechanisms are the foundational elements to ecosystems achieving their purpose - if all the right mechanics are in place and fully functioning.

This report highlights three key types for mechanisms to ecosystem building and management – **relational, contractual, and digital coordination mechanisms**. While we focus on these three types, it is important to acknowledge these are by no means exhaustive of the most important building blocks of ecosystems. Nonetheless, this report hopes to share useful insights to better understand these core areas of ecosystem building and management.

Relational mechanisms

the ways in which two or more people or actors are (socially) connected

Contractual mechanisms

agreements, often in writing and legally binding

Digital Coordination mechanisms

the organisation of different elements via digital tools and technologies to enable them to work together effectively

KEY RELATIONAL MECHANISMS

Relational mechanisms are concerned with the extent to which relationships are governed by interactions, such as personal contacts, information sharing, mutual support, and teamwork (Cao and Lumineau 2015). In other words, they are the ways in which individuals and organizations relate to each other. Particularly when working in ecosystems, given the diversity of actors involved, it is important for participants to feel connected and have a shared purpose to enable meaningful collaboration.

Economic activities are shaped by relationships between the actors. Relational bonds vary across countries and regions, but also across different organizational cultures and institutions. Actors in organizations with different cultures may have very divergent views and expectations of economic relationships. Relational aspects of ecosystem building and management are found to be rather fragile (e.g., Shen, Su, Zheng, & Zhuang, 2020), prone to ambiguities (e.g., Cannon, Achrol, & Gundlach, 2000), and can be easily exploited through opportunism (e.g., Liu, Yuan, Luo, & Balaji, 2021).

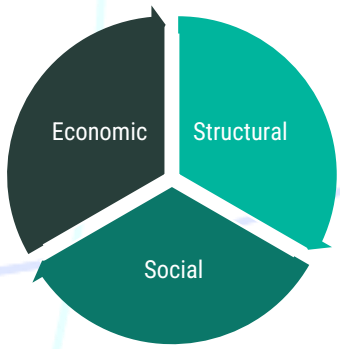
IN THE BUILDING PHASES

Relational bonds and trust are formed during negotiation activities when actors define their expectations and state their uncertainties. In an ecosystem context with different inter-organizational actors and various social and institutional governance contexts, "reliance on long-term, stable relationships are an increasingly important, even essential organizing principle for doing business" (Ring & Van de Ven, 2019, p. 14).

Once the parties develop **mutual agreements**, they make **commitments** on the **obligations and rules** for future action. These agreements form the structure of their relationship governance and can be either formal contracts or informal agreements. In inter-organizational relations, three kinds of relational bonds can be distinguished: (1) Trust; (2) Patience/tolerance; (3) Doubt, worry, and mistrust (Ring and Van de Ven, 2019).

For the successful orchestration of ecosystems, **trust** is an essential part to be built, as the participating actors need to interact and develop their commitments to one another. Trust is needed for successful knowledge exchange among the ecosystem actors and thus for efficient collaboration. However, inter-organizational and interpersonal trust needs time to be built, it develops over time and eventually leads to social capital creation (Ritala et al., 2023).

> So, in the beginning, it is very important that people get to know each other, and there's a cosy feeling. […] We try to get the different players to understand their own needs. That is the need of your company, why would you be involved in this? We have the project idea here, there's the big goals, what could be your contribution? Is that important for you? What will you come to do in this project? Is that important for you as a company? What are the bigger strategies behind? And so on. So those kinds of simple things first to make sure, that people are serious, and they could benefit.
>
> Markku Heino, Ecosystem Leader (Spinverse)



Relational bonds involve economic, structural, and social dimensions (Vesalainen & Kohtamäki, 2015). Structural dimensions and social dimensions may co-exist and create enabling conditions that are needed for relationship building. These structures also support dealing with complexity that results from increased information requirements due to more actors and elements (i.e. technology) being involved.

Economic dimension – investments in inter-organizational relationships, how much they each put into relations. E.g. investments in tools and equipment, production competencies, information systems, etc.

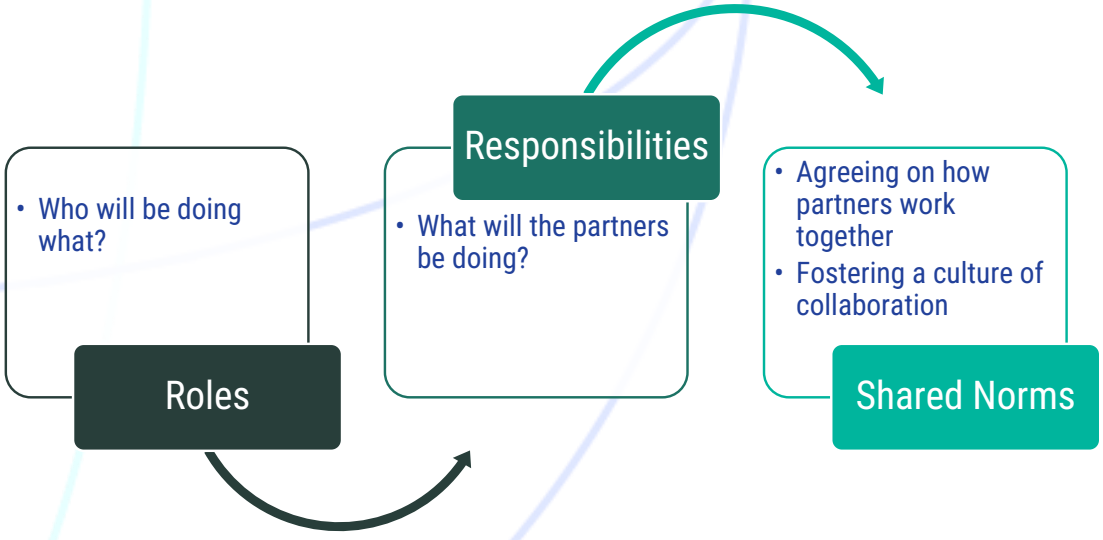
Structural dimensions – the relational bonds between organizations, how they relate to each other. E.g. steering group of key personnel, using common development teams, IT systems are well integrated, technical information that is shared inter-organizationally, etc.

Social dimension – the relational capital, how familiar organizations are with each other. E.g. trust, openness of interaction, room for constructive criticism, problem-solving abilities, having shared goals, togetherness, etc.

In practice, the extent of information processing and sharing needs are connected to the building of relationships. Thus, partnership-type relationships have been shown to be superior to transactional relationships (Vesalainen & Kohtamäki, 2015). Relationships benefit from orchestrators who closely monitor relational learning processes and focus on relationship performance improvement – how well ecosystem participants understand and know each other and communicate with each other.

These dimensions are essentially about relational integration, the interplay between these relational dimensions then influences cooperative behaviours. By implementing relational mechanisms, ecosystem builders can create a collaborative, inclusive, and supportive ecosystem where participants actively engage, contribute, and benefit from their participation. These mechanisms help foster strong relationships, drive collaboration, and enhance the overall success and sustainability of the ecosystem.

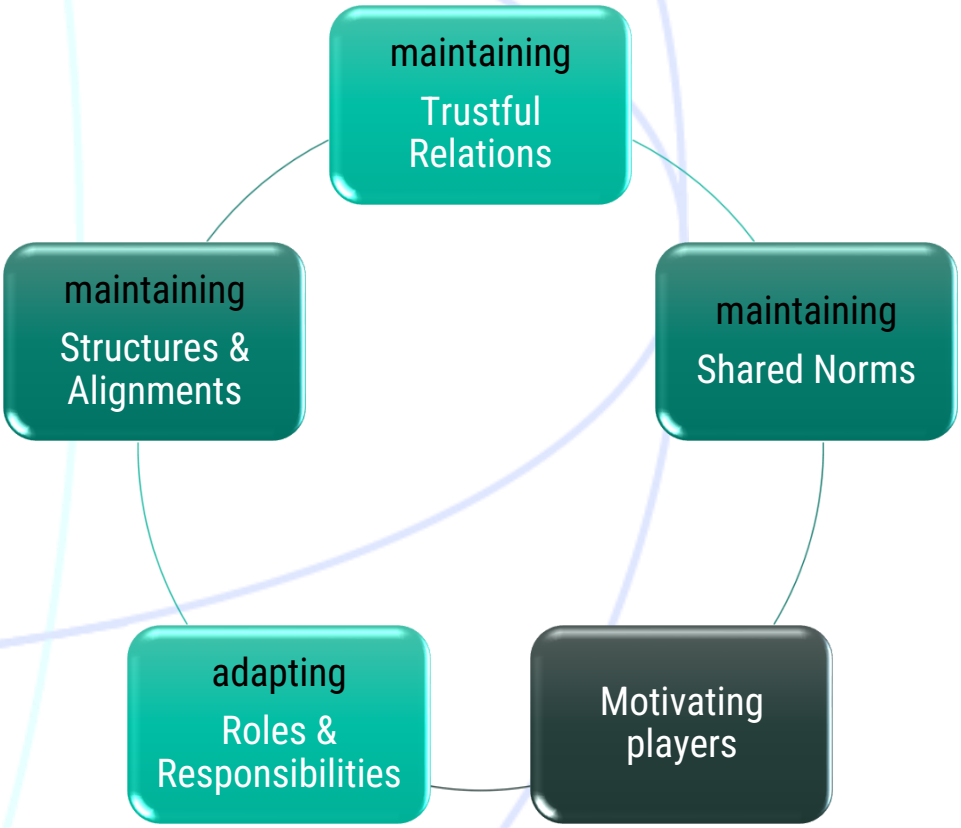
Collaboration in ecosystems, in practical terms, includes defining how to collaborate:



IN THE MANAGING PHASES

When the commitments are carried out, the actors become familiar with other actors through their interactions - familiarity and trust usually develop. **Establishing trust** complements and can sometimes even replace contractual relationships. In fact, not everything can be contracted upon, especially in innovative and unclear contexts such as knowledge development and R&D. Therefore, in managing knowledge ecosystems and other R&D-intensive contexts, establishing inter-organizational and inter-personal trust and relational norms becomes essential for coordination (Olander et al., 2010).

For practitioners at this stage, management of the ecosystem typically involves:



At Spinverse, they recognise that **collaborative attitude and capabilities** are fundamental to their clients' success in ecosystems (Spinverse, 2018b). They adopt the view of collaborative capability meaning continuous and extensive efforts in communication, joint engagement in various networking opportunities, joint exploration for various potential ecosystem partners, and

continuous goal identification exercises (Benham et al, 2018; Dangelico et al., 2013). Spinverse adopts ecosystem leadership practices (related to the above) that are guided by this joint mission and vision to help overcome issues related to complexity with the large number of stakeholders.

While less is known about the dynamics specifically in ecosystem contexts, we do know that during the finalisation phase of buyer–supplier R&D collaboration (which can be considered the bridging between the building and managing phases of ecosystems) the lack of contractual governance has the potential to damage relational governance, and vice versa (Olander et al., 2010).

KEY CONTRACTUAL MECHANISMS

If we reflect on biological ecosystems once again, they are self-enforcing systems that grow, thrive, and perish in organic flows. In the human world, however, we tend to strive for control and a degree of certainty while maintaining a sense of agility. This is essentially the role of contracts; an agreement that specifies certain legally enforceable rights and obligations pertaining to two or more mutually agreeing parties. Contractual mechanisms highlight the importance of contracts between firms and formal rules to safeguard against opportunism and conflict (Cao and Lumineau 2015).

Since ecosystems are inherently diverse in the types of organisations that they are composed of, contracts should play an important role in facilitating agreement across and between all the different parties, specifying the roles and obligations.

On the contrary, when building and managing ecosystems, it is found that there tends to be a strong reliance on **non-contractual governance** (Gulati, Puranam, & Tushman, 2012; Jacobides et al., 2018). While there might be a stronger reliance on non-contractual governance, certain aspects of the ecosystem configuration and collaboration still need to be formally agreed upon. Ecosystems are more about collaborating, so the role of contracts is more concerned with safeguarding trust and preventing conflicts. For instance, in knowledge-intensive ecosystems, there might be an important role for NDAs, collaboration agreements, and other contractual frameworks to ensure safe and fluent knowledge sharing.

IN THE BUILDING PHASES

When building ecosystems, there are key questions to consider what and how contractual mechanisms might apply:

What's in it for my business?

1. All partners are in it to win it – strategic positioning and motivations need to be explicitly communicated and when necessary, contacted. For instance, companies might disclose their "background" and "foreground" knowledge to make it explicit what is their intellectual property outside the project, and what type of intellectual property is created in the project.

How do we measure success?

2. What you measure is what you get – define clear and measurable objectives at all levels. Some of such goals can be included e.g., in a "consortium agreement" or a "collaboration contract" in the formation stages of an ecosystem. Such agreements are particularly used in publicly funded research consortia, but also elsewhere.

How do we know that we are on the right track?

3. Change is inevitable and context matters – it is important to reflect and review from outside-in view to the problem as a fact-based sanity check to ensure there are the right ecosystem competencies.

Another point-of-view: *Are formal contracts needed at all?*

4. Formal contracts can achieve a sense of security amongst the ecosystem participants and help encourage openness and unity, contributing even to the joint ecosystem identity by making the boundaries of the ecosystem clear. It is important to establish from the beginning whether these are needed, such as Intellectual Property Rights (IPR) and Non-Disclosure Agreements (NDAs). In some cases, contracts might not be needed, especially if the ecosystem focuses on issues that do not involve proprietary knowledge or other IP, and if there are no formal obligations to the underlying project or consortia.

IN THE MANAGING PHASES

To sustain a successful ecosystem, it is important to be:

1. **Measuring success**: what does "success" mean formally, and do we need contractual clauses or frameworks to ensure that the ecosystem delivers outcomes that are successful?
2. **Ensuring value capture:** ecosystem participants often have their own goals in addition to the overall goals of the ecosystem. Are there any contractual means to secure and ensure that these two aspects are realized?
3. **Ensuring commitments / monitoring performance**: what are the formal metrics for performance and delivery? Are there deliverables or other outcomes for the ecosystem as a whole or for individual participants?

For instance, IPRs (Intellectual Property Rights) such as patents, trademarks, copyrights, or trade secrets are widely used tools for contractual governance. IPRs can make knowledge assets transferable and manageable (Olander et al., 2010).

Agreements need to be made on project schedules, costs, pricing, and technological and engineering capabilities. In addition, non-disclosure and confidentiality clauses provide basic rules for knowledge sharing. IPRs act as a balancing factor between knowledge sharing and protection. They can protect against risks such as abuse and opportunism, and they make knowledge assets more transferable and manageable.

To illustrate the more formal scoping and obligations of a functioning ecosystem, we can take a look at the CleverHealth network (see Table 4) that Spinverse orchestrates alongside HUS (The Hospital District of Helsinki and Uusimaa). Spinverse must ensure that the projects within this network are aligned with the overall vision, that project partners are fulfilling their roles and obligations, gauging the overall success of the ecosystem through its performance and ensuring it is viable. In this case, the formal contracts exist via the frameworks and agreements in place from the funding institutions and Spinverse's role is to support and coordinate the network to fulfill these obligations.

Table 4. Adapted from Rinkkala et al. (2019)

Description
Key partners and roles: The joint activity of 14 world-class technology companies and leading healthcare professionals develop together efficient patient care solutions for specific clinical needs utilizing precise health & wellness data. The companies are specialized in data collection and analysis, software, genomic data as well as health technology devices and applications: BCB Medical, BC Platforms, CGI, Elisa, Fujitsu, GE, Innofactor, Microsoft, Noona, Planmeca, Productivity Leap, Reaktor, Takeda, Tieto.  **Segment/Industry:** Health care, health technologies. **Customer problems:** The amount of healthcare data is growing exponentially, but the knowledge and resources of healthcare professionals are not adequate; efficiency and improved healthcare solutions are urgently needed globally; digital, artificial intelligence-based healthcare solutions are promising but solutions do not yet exist. **Solutions/s:** Data-driven digital health care innovations - program portfolio for eMOM GDM, AI Head Analysis, Child with Diabetes/IHAN, eCare for Me. **Competition:** Other countries investing in creating attractive data ecosystems with genomic data sequencing of populations. **Project website:** https://www.cleverhealth.fi
Strategy
Vision/objectives: To be an internationally renowned ecosystem, which processes and cultivates health and welfare data, a forerunner in the healthcare revolution, and create dozens of world-class solutions related to the cultivation of healthcare data; Objectives: 1) Create product and service innovations in the field of health and wellbeing technology, 2) Improve health and patient care of Finns, 3) The innovation function takes place in the development & innovation projects, that are established within the ecosystem. **Value proposition:** A new approach to solving global healthcare problems using real-world data, AI, and machine learning all in a real-time clinical and research setting, resulting in improved treatment planning, more accurate diagnostics, and proactive and more personalized treatment. The world's fastest track to commercialization for digital health and wellbeing innovations. **Strategic capabilities:** Data lake - co-creating new solutions with a globally unique data set: 3.5 million population with unique national ID numbers, collected since 1950´s including whole

population; leading expertise of clinicians; CE-marked secure environment; HUS brand, largest academic research hospital in Europe; Biomedicum innovation hub.

Internationalization/scalability: Annually several projects start that will create world-class solutions related to the cultivation of healthcare data; Co-development with members and contributing companies to test, scale, and develop for commercial use; global market via company partners

Link to other ecosystems: HUS linked to European University Hospital Alliance and PiPPi Procurement Innovation program; a large number of other companies and research institutes take part in CleverHealth Network's development projects; HUS collaboration with Oulu University Hospital.

Investments to date and future needs: Funding from Business Finland, participating companies, and HUS.

Status and main future actions to achieve goals: Growth Engine status by Business Finland. Development projects with separate funding.

However, although they facilitate knowledge exchange, it is crucial to be aware that not all knowledge can be protected by IPRs. While contracts can facilitate task allocation and commitment, and commonly accepted rules for knowledge exchange, they incur costs and are not always effective. Relational governance and associated mechanisms are therefore needed in addition to contracting.

KEY DIGITAL COORDINATION MECHANISMS

Digital coordination refers to the use of digital technologies and platforms to facilitate collaboration and coordination among individuals or groups. Here are some examples of digital coordination:

Digital platforms: There are various types of platforms that enable communication and collaboration among members, such as social media, forums, community websites, etc. Additionally, there are other types of platforms that provide various services such as crowdfunding (e.g., GoFundMe), ride-sharing (e.g. Uber), and online marketplaces (e.g. Amazon or eBay). These platforms allow individuals and businesses to raise funds, match drivers with riders, and sell products to a global audience. In the context of online platforms which carry a variety of digital tools, these can be used to manage inventory, orders, and shipping, as well as facilitate knowledge and data transfer between actors. Ecosystem leaders can use a variety of "off-the-shelf" digital platforms to facilitate collaboration and knowledge sharing or build custom-made, invitation-only platforms to cater to the specific needs of an ecosystem.

Project Management tools: Ecosystems can use project management software to track progress on different projects, assign tasks to different members and communicate about their work. Examples include Trello or Asana, which not only allow communication between users but also allows collaboration on projects. Spinverse, for example, use industry-standard tools to remove the barriers of adoption when working across and between a variety project partners.

Social media: Platforms like Facebook, Twitter, and Instagram enable individuals and groups to connect, share information, and coordinate action on a global scale. They can also be used to mobilize communities for social, political, or environmental causes for example. Social media can be very powerful and influential, particularly from external actors' perspectives, which ecosystems can use to leverage legitimacy.

Data-sharing and AI-powered analytics: Data is increasingly perceived as a source of knowledge, which can help ecosystem partners to make informed decisions and identify trends and patterns. Sharing data on customer behaviour and preferences in the ecosystem, for instance, can help the different actors to better align the interests of the different actors and develop a precise value proposition. Advanced AI-powered analytics can help broaden the scope of ecosystem players. Through their ability to identify trends and make sense of the abundance of data,

ecosystem players can make informed decisions about new collaboration opportunities and suggest new avenues of research and development. New generative AI tools such as ChatGPT can further help ecosystem actors in ideation, brainstorming, and analysis of textual materials.

Example: Spinverse has developed an AI-based EU funding & partner search tool, called Spinbase[2], that provides more freedom and simplicity in searching, bringing funding and partnerships data from tens of different resources under one single platform, and recommends you the best matching opportunities just like a consultant 24/7.

Overall, digital coordination has the potential to increase efficiency, reduce costs, and facilitate innovation by enabling individuals and groups to work together more effectively, regardless of their location or organizational affiliation.

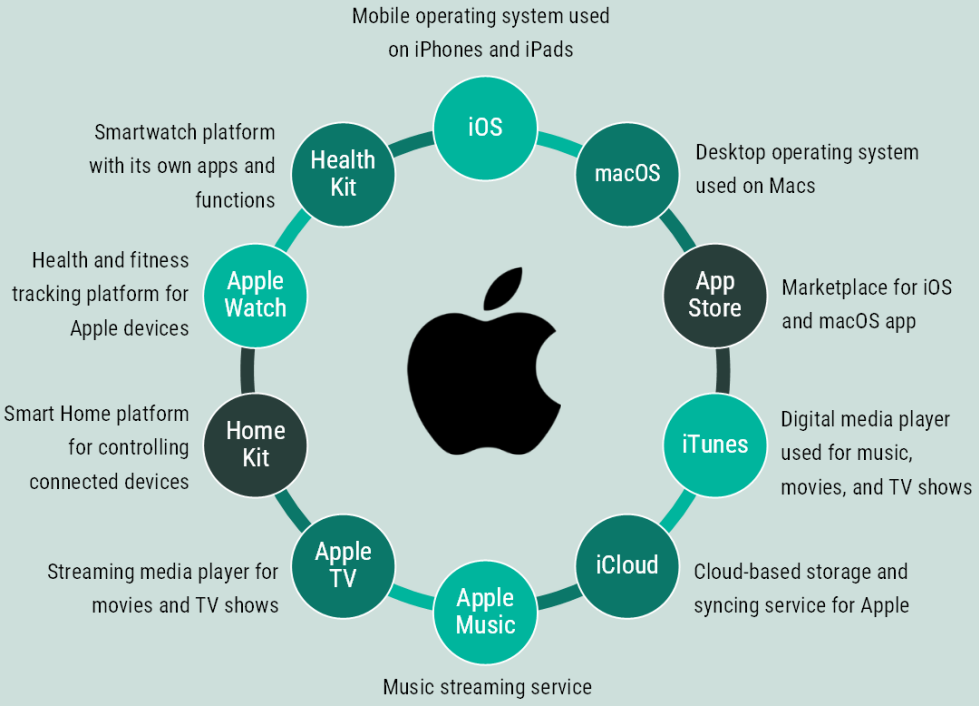
[2] https://spinverse.com/spinbase/

IN THE BUILDING PHASES

There are two main ways to consider digital coordination for building ecosystems:

1. The use of digital technology as the ecosystem architecture i.e., technology-enabled platform ecosystems.

One popular example of a platform ecosystem is the Apple ecosystem, which includes the following platforms:



These platforms are all interconnected and work together seamlessly to provide users with a comprehensive and integrated experience across their Apple devices. Developers can also build apps that integrate with multiple platforms, further expanding the ecosystem.

However, building a platform ecosystem is not very simple and being successful in such a task requires tackling several platform design problems (see. Tura et al., 2018). Particularly for knowledge and innovation ecosystems, it is not necessarily the most appropriate model or structure to adopt.

2. The use of digital tools to facilitate ecosystem participant interaction and collaboration.

Digital collaboration platforms such as Slack, Microsoft Teams, or Google Workspace provide virtual spaces where ecosystem participants can communicate, share information, and

collaborate on projects. These platforms offer real-time messaging, document sharing, and video conferencing capabilities, allowing stakeholders to collaborate effectively regardless of their physical location.

Digital tools also enable the organization of virtual events, webinars, and conferences where ecosystem participants can gather, learn, and collaborate. Platforms like Zoom, Webex, or Hopin allow for virtual presentations, panel discussions, breakout rooms, and networking sessions. Participants can engage in real-time discussions, interact with speakers, and connect with other attendees.

At Spinverse, ecosystem projects are generally hosted on the Microsoft Teams platform. Often, this is accessible to ecosystem participants, and they are familiar with its functionality. On Microsoft Teams they can securely share and store files and documents, host online calls and meetings, instantly message one another in shared or private communication channels, and much more.

Generative AI tools such as content-generating chatbots (ChatGPT, Bard, etc) or visual tools (e.g., Dall-E, Midjourney) can help in the building phases by bringing in new input to joint ideation and brainstorming processes. Such tools can help in both idea generation, as well as idea selection, and improvement (see Bouschery et al., 2023).

IN THE MANAGING PHASES

A lot of companies are increasingly using digital technologies such as platforms, project management tools, data and AI, as well as social media, not only to increase communication, collaboration and innovation but also to manage, monitor and grow their ecosystem.

There are several ways in which this can be done:

1. **Adopting a platform business model:** Adopting a platform business model can help to add services to a business, which in turn can lead to ecosystem growth. Servitization involves shifting from a product-centric business model to a service-centric business model, where a company provides not only products but also additional services that enhance the value of the products and can attract more players. The platform itself can facilitate the integration of services across different providers (Parker, 2016).

2. **Enhancing ecosystem cooperation through digital technologies:** Platforms, AI-advanced software, and tools can help provide a shared infrastructure and strengthen the relationship, cooperation, and expectations between ecosystem partners.
    - Platforms often offer space to centralize important information and provide a shared for ecosystem partners to interact
    - project management tools can help participants better negotiate contractual terms and rules, which can reduce information asymmetries (Mukhopadhyay & Bouwman, 2019).

3. **Digital technologies for monitoring and safeguarding:** Digital technologies such as platforms and advanced digital storage solutions can have an impact on formal rules in safeguarding against opportunism and conflict in ecosystem. By improving efficiency, transparency and security, these mechanisms can help promote a more cooperative and trustworthy ecosystem. This can ideally lead to increased collaboration and innovation, if done right.

However, there are some things to consider

Data issues - Inaccurate data which provide the main market insights are the main basis for a subsequent decision. Too much data or inaccurate data can lead to incorrect decisions and can undermine trust among participants.

Standardization and specialization - Another issue arises when the technologies are not standardized or customized to a certain degree. Indeed, digital coordination mechanisms are often designed to be scalable and standardized, which can limit their ability to accommodate the unique needs and preferences of individual ecosystem participants. At the same time, ecosystem actors might also use different technologies and systems, which can make coordination more difficult.

CONCLUSION

Generally, when building and managing ecosystems you should consider:

- What kind of ecosystem are you coordinating?
- What type of coordination approaches are needed?
  What types of mechanisms could be useful?

Based on Spinverse's experience, they recommend that ecosystem participants pay careful attention to six key elements when building and managing **innovation ecosystems**:

1	Joint visioning with the dream team partners
2	Co-create Win-win Business models
3	Set transparent and clear enough Roles & Responsibilities
4	Lead in complexity
5	Facilitate interactions and dialogue
6	Manage the balance between discipline and creativity

Moreover, it is important to constantly improve the ecosystem management and orchestration, as the ecosystem emerges, changes, and evolves. Summarized nicely by the 'Ecosystem Handbook' key learnings:

1. It's all about diversity – ecosystems are exist for different organizations and people sharing a joint purpose and collaborating towards it.
2. It's all about people – finding what brings the community together and harnessing everyone's unique talents.
3. It's all about adaptation – ecosystems change all the time, responsiveness and resilience to changes are necessary.

For researchers, while the ecosystem concept begins to broach some clarity, there is still a lot to empirically understand and test. Research can focus in more detail to understand these mechanisms for specific types of ecosystems, different coordination styles, and beneficial conditions for collaboration and coordination.

For policymakers, as described broadly in this report, the environmental conditions largely determine whether ecosystem emergence is possible and which kind of ecosystem can evolve. Therefore, appropriate policies and tools can help support this, informed by some of the mechanisms we have introduced.

REFERENCES

Aarikka-Stenroos, L., & Ritala, P. 2017. Network management in the era of ecosystems: Systematic review and management framework. *Industrial Marketing Management*, *67*, pp.23-36.

Adner, R. and Kapoor, R., 2010. Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic management journal*, *31*(3), pp.306-333.

Adner, R., 2006. Match your innovation strategy to your innovation ecosystem. *Harvard business review*, *84*(4), p.98.

Anderson, P. J., Blatt, R., Christianson, M. K., Grant, A. M., Marquis, C., Neuman, E. J., Sonenshein, S., & Sutcliffe, K. M. 2006. Understanding mechanisms in organizational research: Reflections from a collective journey. *Journal of management inquiry*, *15*(2), pp.102-113.

Autio, E. and Thomas, L.D., 2020. Value co-creation in ecosystems: Insights and research promise from three disciplinary perspectives. In *Handbook of digital innovation* (pp. 107-132). Edward Elgar Publishing.

Autio, E. and Thomas, L.D., 2021. Researching ecosystems in innovation contexts. *Innovation & Management Review*, *19*(1), pp.12-25.

Behnam, S., Cagliano, R. and Grijalvo, M., 2018. How should firms reconcile their open innovation capabilities for incorporating external actors in innovations aimed at sustainable development?. *Journal of Cleaner Production*, *170*, pp.950-965.

Bouschery, S. G., Blazevic, V., & Piller, F. T. 2023. Augmenting human innovation teams with artificial intelligence: Exploring transformer-based language models. *Journal of Product Innovation Management*, *40*(2), pp. 139-153.

Cannon, J.P., Achrol, R.S. and Gundlach, G.T., 2000. Contracts, norms, and plural form governance. *Journal of the academy of marketing science*, *28*(2), pp.180-194.

Cao, Z. and Lumineau, F., 2015. Revisiting the interplay between contractual and relational governance: A qualitative and meta-analytic investigation. *Journal of operations management*, 33, pp.15-42.

Clarysse, B., Wright, M., Bruneel, J. and Mahajan, A., 2014. Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research policy*, *43*(7), pp.1164-1176.

Dangelico, R.M., Pontrandolfo, P. and Pujari, D., 2013. Developing sustainable new products in the textile and upholstered furniture industries: Role of external integrative capabilities. *Journal of Product Innovation Management*, *30*(4), pp.642-658.

Dhanaraj, C. and Parkhe, A., 2006. Orchestrating innovation networks. *Academy of management review*, *31*(3), pp.659-669.

Gulati, R., Puranam, P. and Tushman, M., 2012. Meta-organization design: Rethinking design in interorganizational and community contexts. *Strategic management journal*, *33*(6), pp.571-586.

Isenberg, D.J., 2010. How to start an entrepreneurial revolution. *Harvard business review*, *88*(6), pp.40-50.

Jacobides, M.G., Cennamo, C. and Gawer, A., 2018. Towards a theory of ecosystems. *Strategic management journal*, *39*(8), pp.2255-2276.

Järvenpää, S.L. and Wernick, A., 2011. Paradoxical tensions in open innovation networks. *European Journal of Innovation Management*, *14*(4), pp.521-548.

Järvi, K., Almpanopoulou, A., & Ritala, P. 2018. Organization of knowledge ecosystems: Prefigurative and partial forms. *Research Policy*, *47*(8), pp.1523-1537.

Launonen, P. 2013. 'Orchestrating Open Innovation Networks: Experiences from a Finnish Research Programme'. Conference Paper presented at *The XXIV ISPIM Conference – Innovating in Global Markets: Challenges for Sustainable Growth* in Helsinki, Finland on 16-19 June 2013.

Launonen, P. 2015. 'Determinants for Orchestrating Open Innovation Networks'. In Lappalainen, P., Markkula, M., & Kune, H (Eds). *Orchestrating Regional Innovation Ecosystems – Espoo Innovation Garden*. Finland: Aalto University, pp.199-208.

Levén, P., Holmström, J. and Mathiassen, L., 2014. Managing research and innovation networks: Evidence from a government sponsored cross-industry program. *Research Policy*, *43*(1), pp.156-168.

Liu, P.C., Yuan, R., Luo, J. and Balaji, M.S., 2021. Evolution of B2B relationship stages in China: A study of confucianism philosophy. *Industrial Marketing Management*, *96*, pp.1-17.

Mukhopadhyay, S., & Bouwman, H. 2019. Orchestration and governance in digital platform ecosystems: A literature review and trends. *Digital Policy, Regulation and Governance*, 21(4), pp.329–351.

Müller-Seitz, G., 2012. Leadership in interorganizational networks: a literature review and suggestions for future research. *International Journal of Management Reviews*, *14*(4), pp.428-443.

Olander, H., Hurmelinna-Laukkanen, P., Blomqvist, K., & Ritala, P. (2010). The dynamics of relational and contractual governance mechanisms in knowledge sharing of collaborative R&D projects. *Knowledge and Process Management*, *17*(4), pp.188-204.

Orton, J.D. and Weick, K.E., 1990. Loosely coupled systems: A reconceptualization. *Academy of management review*, *15*(2), pp.203-223.

Parker, G., Van Alstyne, M. and Choudary, S., 2016. Platform revolution: How networked markets are transforming the economy – and how to make them work for you. 1st ed. New York: W. W. Norton & Company, Inc.

Prahalad, C. K. 2005. *The fortune at the bottom of the pyramid*. New Delhi: Pearson Education India.

Ring, P.S. and de Ven, A.H.V., 2019. Relational bonds underlying cooperative inter-organizational relations in different societal contexts. In *Managing Inter-organizational Collaborations: Process Views* (pp. 13-37). Emerald Publishing Limited.

Rinkkala, M., Launonen, P., Weckström, N., Koponen, P. and Oy, S., 2019. Internationally significant innovation and growth ecosystems in Finland. *Spinverse Oy*. Accessible at: https://teknologiateollisuus.fi/sites/default/files/2020-01/Internationally%20significant%20innovation%20and%20growth%20ecosystems%20in%20Finland.pdf (Last accessed: 29/05/2023)

Ritala, P., Armila, L. and Blomqvist, K., 2009. Innovation orchestration capability—Defining the organizational and individual level determinants. *International Journal of Innovation Management*, *13*(04), pp.569-591.

Ritala, P., De Kort, C., & Gailly, B. 2023. Orchestrating knowledge networks: alter-oriented brokering. *Journal of Management*, *49*(3), pp.1140-1178.

Ritala, P., Hurmelinna-Laukkanen, P., & Nätti, S. 2012. Coordination in innovation-generating business networks-the case of Finnish Mobile TV development. *The Journal of Business and Industrial Marketing, 27*(4), p.324

Shen, L., Su, C., Zheng, X.V. and Zhuang, G., 2020. Between contracts and trust: Disentangling the safeguarding and coordinating effects over the relationship life cycle. *Industrial Marketing Management*, *84*, pp.183-193.

Spinverse. 2018a. *The secrets in leading successful open innovation ecosystems* (White Paper 1). Available at: https://news.spinverse.com/key-insights-into-building-and-leading-open-innovation-ecosystems (Last accessed: 25/05/2023)

Spinverse. 2018b. *Collaborative Capabilities Boost Open Innovation Ecosystems* (White Paper 3). Available at: https://news.spinverse.com/key-insights-into-building-and-leading-open-innovation-ecosystems (Last accessed: 25/05/2023)

Tura, N., Kutvonen, A., & Ritala, P. 2018. Platform design framework: conceptualisation and application. *Technology Analysis & Strategic Management*, *30*(8), pp.881-894.

Van der Borgh, M., Cloodt, M. and Romme, A.G.L., 2012. Value creation by knowledge-based ecosystems: evidence from a field study. *R&D Management*, *42*(2), pp.150-169.

Vesalainen, J., & Kohtamäki, M. 2015. Toward a typological view of buyer–supplier relationships: Challenging the unidimensional relationship continuum. *Industrial Marketing Management*, *49*, pp.105-115.

Weick, K.E., 1976. Educational organizations as loosely coupled systems. *Administrative science quarterly*, pp.1-19.

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