A strategical approach towards ecosystem construction
a comparative case study of the ecosystems of InnoEnergy in Spain and Sweden

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Abstract

In this study, the processes concerning the orchestration and birth of an ecosystem are analysed. A literature review and a comparative case study of two ecosystems in Spain and Sweden was conducted to gain more insight in the internal processes. Findings suggest that a clearly identified and communicated vision of the ecosystem is necessary for an orchestrating firm to identify and attract valuable partners to the ecosystem. Specifically, identifying and communicating the specific benefits partners gain by joining an ecosystem allows an orchestrating firm to attract a wide variety of partners required for an ecosystem to thrive. Furthermore, the study supports earlier findings that suggest knowledge mobility, innovation appropriability and network stability influence the innovative output of the ecosystem.

Keywords: ecosystem birth, ecosystem orchestration, ecosystem strategy, internal ecosystem processes, innovation management, network roles

Foreword

This is my master thesis project, in which you can read my research on ecosystem orchestration. I've been working and thinking about this project since late August 2018, and officially started the thesis trajectory in October 2018. The process has not been without difficulties, however I'm positive personal growth only comes from overcoming these hardships. In all, I can say I have worked on the project with much joy and enthusiasm, and I'm glad I was able to graduate by making a contribution to a company that is aimed at addressing some large societal issue. These societal problems are the issues that I find most interesting and worthwhile to work on.

I'd like to thank Lotte Meijer for finding a way for me to graduate in a subject that I find interesting and at a company that I value greatly, for guidance and help in the set-up of the research and the data acquisition aspect, and overall for putting trust in me. I'd also like to thank my supervisor, Josette Gevers, for constantly providing me with feedback on any aspect of the research, while also guiding me through the entire process. I found the meetings to be both fun and valuable. Finally, I'd like to thank Anneleen van Boxstael, for providing me with additional in depth feedback on the thesis.

Additional gratitude for the managers of the companies that participated in the interviews for sparing some of their time, as without them the research could not have been conducted.

Management summary

Introduction

InnoEnergy is an initiative by the European Institute of Innovation and Technology (EIT), that aims to spur development in the field of sustainable energy all over Europe. It does so by supporting and investing in innovation projects, and by connecting different partners across Europe, including large businesses, knowledge institutes, entrepreneurs and employers. By bringing together these disciplines, InnoEnergy aims to accelerate the development and sales of innovative projects in the field of sustainable energy. However, InnoEnergy experiences several challenges with providing this type of service:

1. These innovative projects are highly complex and demand the involvement of a variety of partners in order to address problems that occur (Järvi et al., 2012). InnoEnergy needs to connect the different partners that are involved (e.g. industry, entrepreneurs, researchers).
2. InnoEnergy loses its funds from the EIT in 2020, making it essential that InnoEnergy is able to capture enough value to sustain itself. This is made more difficult due to the raising competition in the field of accelerators, as they are widely provided in the Netherlands.

In light of these issues, InnoEnergy plans to build a community, or an *ecosystem,* in the Netherlands. In this ecosystem, partners of various fields and disciplines exchange knowledge and work in alignment in order to maximize the acceleration of the innovative processes in the field of sustainable energy. If done so properly, InnoEnergy will be able to provide a distinct competitive advantage, and to build a sustainable business. It is unclear though how to approach this matter, as there are no clear guidelines on how to build such an ecosystem. Thus, InnoEnergy wishes to know how to create such a sustainable ecosystem.

Research aim

The purpose of this study is to design and create a tool that will aid InnoEnergy in constructing a sustainable ecosystem in the Netherlands by providing a set of practices and guidelines that will influence the internal factors of the ecosystem of InnoEnergy. This is captured in the research question of this study: *"What ecosystem strategy can InnoEnergy employ in order to create and orchestrate an ecosystem in which the creation and capturing of value is stimulated in order for the ecosystem to be sustainable?".* The question encompasses three key components, in order to build a sustainable ecosystem: the *ecosystem strategy* of the focal firm, the *creation and orchestration* of an ecosystem, and the *stimulation of the creation and capturing of value* in the ecosystem. A qualitative research is required to gain a deeper understanding on the matter. Specifically, after a thorough study of the literature, a comparative case study of the ecosystem of InnoEnergy Sweden and InnoEnergy Iberia is performed.

Theoretical background

The theoretical lens used in this study is the ecosystem perspective. The ecosystem is defined as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p. 42). One particular model that was discovered in the literature is a framework created by Dhanaraj & Parkhe (2006), and is shown in figure 1 below. The model represents the orchestration processes of the endogenous factors of the ecosystem of a focal firm, and the outcomes that the ecosystem creates. The framework identifies three orchestration processes a hub firm can influence: the management of knowledge mobility, the management of innovation appropriation and the management of relationship stability. These will lead to a network innovation output as outcome. This study looks into these orchestration processes and their influence

on the innovation output of a network, and will identify how these orchestration processes can be influenced by an orchestrating firm.

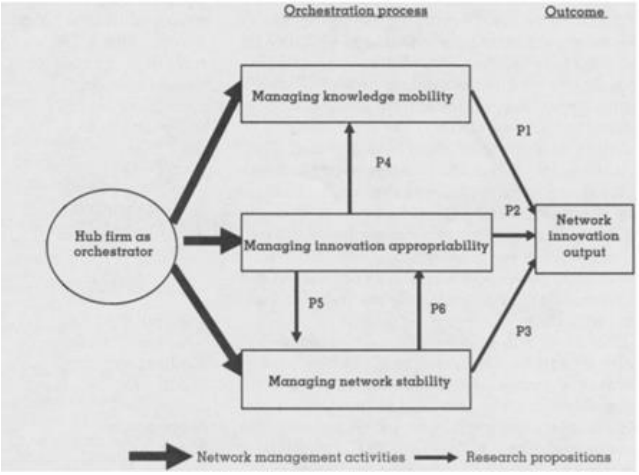

Figure 1. Framework for orchestration processes in an ecosystem (Dhanaraj & Parkhe, 2006).

Furthermore, the study will look into the long term *strategy* an orchestrating firm can employ for the ecosystem. Here, focus can lie on the interactions between the actors of the network and on macro-level effects, or on the value proposition of the ecosystem and how the various partners give rise to this value proposition. The alignment of the different partners to work towards a common goal is considered to be the main activity of the orchestrating firm of the network (Ander, 2017). Finally, concerning the *roles* partners can fill to *create and capture value in an ecosystem,* Dedehayir, Mäkinen and Ortt (2018) find four groups of roles that are required in an ecosystem during early stages in order to successfully transition to subsequent stages: leadership roles, direct value creation roles, value support roles and entrepreneurial ecosystem roles. Roles in each of these groups perform activities related to specific phases of early ecosystem development which are required for the ecosystem to be able to mature.

Research Methodology

The research was conducted using a comparative case study method. As specific antecedents and important factors on the matter are unknown, and the ecosystems function differently, a qualitative, comparative case study method is ideal to compare the two ecosystem. The ecosystems of InnoEnergy in Sweden and in Spain were analysed using a total of 28 interviews amongst various partners in the ecosystem. Only high level managers (e.g. CEO, senior business developer) involved with InnoEnergy were interviewed to ensure validity of the data. Most interviews were done in person, although some were done through skype for practical reasons.

Results

There are several important findings when comparing between the ecosystems of Spain and Sweden. The ecosystem of Spain is better positioned with a vision of a widely varied European-wide network, focused on accelerating the industry of sustainable energy by focusing on aiding high TRL projects. The right partners were more easily found and attracted to the ecosystem of InnoEnergy, as the value proposition was more clear, and it was made clear to every partner what exactly the use of InnoEnergy for them is. In contrast, the ecosystem of Sweden has not set and communicated a clear vision towards their partners. A focus on lower TRL projects made commercialization more difficult. It is unclear to other partners in Sweden what InnoEnergy is and why they would need to be a part of the ecosystem. Especially big partners are difficult to attract, which Sweden has been unable to do. Spain has succeeded to some extent in this regard. Interviewees at InnoEnergy in Spain indicate that a attracting

a variety of partners in the ecosystem is essential. Additionally in Spain, it is often noted that positioning as complementary to the local accelerators by providing a European network and a network specific for sustainable energy is highly important, as InnoEnergy can avoid competition in this fashion and work together with these local accelerators. Concerning the internal ecosystem processes, for knowledge exchange it was found that in both ecosystems relationships function on trust, and communication is transparent, open and clear, and based on collaboration. These collaborations in Spain are relational on nature, whereas in Sweden these collaboration are more functional. Concerning innovation appropriability, the connect between start-ups and big clients is regarded key to commercialize projects. Here, the ecosystem of Spain was more able to commercialize more projects than the ecosystem of Sweden due to having big partners in the ecosystem and having a focus on high TRL projects. Concerning network stability, both ecosystems have trouble attracting big partners, although Sweden has this to a much bigger extent than Spain, and both have not yet been able to achieve critical mass at which partners.

Conclusion

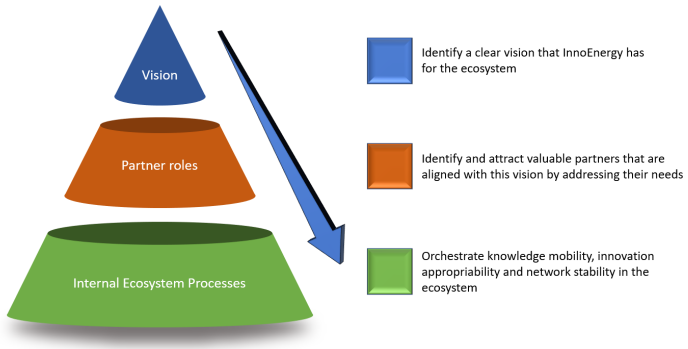

Figure 2. Overview of the managerial recommendations.

Based on this study, findings suggest that InnoEnergy should focus on three aspects in order to create and orchestrate a thriving ecosystem in which they can capture enough value to become sustainable: the overall *strategy* of the ecosystem, the *identification and attraction of the right partners* to the ecosystem, and the management of the internal process of the ecosystem. This is summarized in Figure 2. First of all, considering the overall strategy, it is paramount to have a clear vision and communicate this vision towards the ecosystem, focusing on three aspects: the *sustainable energy field*, a *European-wide* network, and an emphasis on *high TRL projects.* This positioning has several advantages: InnoEnergy can be complementary to local accelerators and provide a distinct value to partners by focusing on a *European-wide network*, InnoEnergy can select the appropriate partners based on their contribution to the field of *sustainable energy* and be assured that these partners contribute to the ecosystem, and InnoEnergy can capture value quicker and with a higher chance of success by commercializing *high TRL projects.* Being able to communicate this vision clearly to the outside world is highly important. Secondly, by having a clear vision the right partners and the right partner roles that are in alignment with this vision can be identified and attracted. Furthermore, due to the clear positioning of the ecosystem of InnoEnergy, a distinct value when joining the ecosystem can be provided to each potential valuable partner. A table showing an overview of where specifically each partner role can provide value to other partners in the ecosystem, and what each partner role could want from the ecosystem is provided in table 1. InnoEnergy can then identify which needs a specific partner has, and attract them by addressing this need through alignment with other partners in the ecosystem. Thirdly and lastly, regarding the ecosystem processes, concerning knowledge mobility, enabling trust, openness and clarity amongst partners is key. Concerning innovation appropriability, specifically the link between start-ups and large companies was found to be important, as large

companies can be first clients for start-ups. Additionally, focus on high TRL projects aids in successful commercialization of projects. Concerning network stability, it was found that being able to identify the needs of the various partners in the network and finding a way to meet these various needs is key to attracting new partners. A strong network identity is key to finding these new partners and to show them what specific value the network of InnoEnergy can provide. Having a wide variety of partners is essential in this regard, and specifically big partners are valuable to an ecosystem. Specific recommendations regarding the management of the ecosystem processes are provided in table 2. By doing so, InnoEnergy will be able to attract a wide variety of partners that are necessary for the ecosystem to thrive and for InnoEnergy to be able to create and capture the value that is generated in the ecosystem.

↓ Role that provides value / Role that captures value →	START-UP	SME	LARGE COMPANY	KNOWLEDGE INSTITUTE	INNOENERGY
START-UP	-	- Innovative-ness - Latest trends	- Innovativeness - Latest trends	- Turn knowledge into real application	- Income - Success stories - Innovation
SME	- Funding - Network	-	-	-	- Income - Network
LARGE COMPANY	- First client	- Credibility - Collaboration	-	- Influence - Resources - Expertise	- Credibility - Income - Influence - Resources - Projects
KNOWLEDGE INSTITUTE	- Ideas	- Human capital	- Human capital - Latest trends - Knowledge - Network	-	- Ideas for start-ups - Education - Credibility
INNOENERGY	- Funding - Reputation - Network - Consultancy	- Funding - Reputation - Network - Human capital	- Funding - European Network - Access to innovation - Human capital	- Link between academics and industry - Aid with education	-

Table 1. Overview of the value various partners provide and gain by joining the ecosystem.

Knowledge mobility	**Build relationships based on trust, with open and clear communication:** Attract committed partners in alignment with the ecosystem vision. Form relationships informally that could turn into formal relationships later.
Innovation Appropria-bility	**Capture the value in the ecosystem by commercializing specifically high TRL projects**: Connect start-ups early on with first clients (often big industry partners). Align demands of partners in the network with supply of other partners in win-win collaborations. Differentiate from local competition.
Network Stability	**Attract a wide variety of partners by identifying and showing the specific value a potential partner can gain by joining the network:** Communicate distinct value InnoEnergy's ecosystem can offer to each partner. Ensure the right partners are attracted, coherent with the vision of the ecosystem. Use big partners and success cases of start-ups to boost InnoEnergy's reputation

Table 2. Condensed table showing recommendations for internal ecosystem processes

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1. Purpose of the research

1.1 Introduction to InnoEnergy

InnoEnergy is an initiative by the European Institute of Innovation and Technology (EIT), that aims to spur entrepreneurial innovation processes in order to deal with the greatest societal problems of this era, such as tackling climate change, supporting healthy lifestyles and fostering digital technological innovations.

InnoEnergy specifically is set on pioneering change in the field of sustainable energy all over Europe. It does so by supporting and investing in innovation projects, and by connecting different partners across Europe, including large businesses, knowledge institutes, entrepreneurs and employers. By bringing together these disciplines, InnoEnergy aims to accelerate the development and sales of innovative projects in the field of sustainable energy. Collaboration of these various disciplines is paramount in today's society, due to the difficulty of the problems at hand and the increased speed at which knowledge flows. Additionally, InnoEnergy fosters knowledge by providing master education programs in the field of sustainable energy.

1.2 Problem statement

InnoEnergy has offices around Europe, taking different approaches towards the goal of accelerating innovation in the sustainable energy field. In the Netherlands, currently this is done in accelerator programs, where entrepreneurs can apply in order to gain support (in resources and expertise) for their innovative projects from InnoEnergy. This approach towards accelerating innovative entrepreneurial ventures is fruitful, as accelerator programs are popular right now (Pauwels et al., 2016). However, in the case of InnoEnergy, there are several problems with providing this type of service.

Firstly, innovative projects involved in sectors dealing with large-scale scientific and societal problems, such as in the case of sustainable energy, are highly complex and demand the involvement of a variety of partners in order to address the problems that occur, thus forcing companies working in these sectors into a highly uncertain and difficult environment (Järvi et al., 2012). In the current high-speed and turbulent environment, an approach focused on incorporating many partners into these new, innovative projects is desirable. In order to maximize the impact of InnoEnergy on the innovative processes, InnoEnergy needs to better connect the different partners that are involved (e.g. industry, entrepreneurs, researchers, students).

Additionally, accelerator programs are widely provided in the Netherlands right now. This high level of competition makes it difficult for InnoEnergy to differentiate themselves and attract and retain new business partners. Moreover, regarding finances, InnoEnergy will lose its funds from the EIT in 2020. It is therefore highly important that InnoEnergy becomes a self-sustaining company by that time. As of such, InnoEnergy wishes to move towards providing a new, unique value proposition for its partners, so that InnoEnergy can distinguish itself from the competition. Additionally, it is key that InnoEnergy is able to capture enough value in this new value proposition.

Thus, as of now InnoEnergy is unable to reach and maintain a leading position in the turbulent and highly competitive environment involved with the highly innovative industry. Therefore, InnoEnergy plans to build a community, or an *ecosystem,* in the Netherlands. In this ecosystem, partners of various fields and disciplines exchange knowledge and work in alignment in order to maximize the acceleration of the innovative processes in the field of sustainable energy. Ideally, not only the partners will communicate and exchange their knowledge, but also the networks of the partners will be involved in the innovation projects. If done so properly, InnoEnergy will be able to provide a distinct competitive

advantage, and to build a sustainable business. Such a complex initiative however is a demanding task, and it is unclear how this should be approached. There are no clear guidelines in this regard. Thus, InnoEnergy wishes to know how to create such a sustainable ecosystem.

1.3 Research Aim

The purpose of this study is to design and create a tool that will aid InnoEnergy in constructing a sustainable ecosystem in the Netherlands by providing a set of recommendations that will influence the endogenous factors of the ecosystem of InnoEnergy (the exogenous factors are researched in another project). Here, "endogenous factors" refer to the boundary of the relevant ecosystem as created by the proposed value proposition, defined by the links, positions, actors and activities in the ecosystem (Adner, 2016). The corresponding research question is formulated as follows:

"What ecosystem strategy can InnoEnergy employ in order to create and orchestrate an ecosystem in which the creation and capturing of value is stimulated in order for the ecosystem to be sustainable?"

Considering the antecedents, processes and outputs of ecosystem construction are unclear, a qualitative research is required to gain a deeper understanding on the matter. In order to gain insight in how to construct a sustainable ecosystem and to establish recommendations for how to construct one, a case study of the ecosystems of InnoEnergy in Sweden and Spain is conducted, where similar initiatives in ecosystem construction and orchestration have been executed. The knowledge gained from this case study can then be used to design a tool that can aid InnoEnergy in the construction of an ecosystem in the Netherlands. Moreover, the case study can provide useful insight in ecosystem construction for scholars as well.

The research question will be answered using both a qualitative, comparative case study and insights gained from the literature. The question encompasses three key components, which then lead to a sustainable ecosystem: the *ecosystem strategy* of the focal firm, the *creation and orchestration* of an ecosystem, and the *stimulation of the creation and capturing of value* in the ecosystem. Answering the research question required insights from a broad variety of areas, which is done through answering a set of sub-questions. These sub-questions are divided into two sets of questions concerning the theoretical and the practical aspect of this research. These questions are aimed at gaining a deep understanding of the phenomenon encountered when managing the internal processes of an ecosystem. Specifically, the sub-questions related to the theoretical aspect of this study aim to gain understanding of the state-of-the-art knowledge of the ecosystem literature, including frameworks, antecedents and different perspectives on ecosystems. The research sub-questions related to the practical part are aimed at understanding the ecosystems of InnoEnergy in Sweden and Spain, what ecosystem management strategies are used and what the results are of this ecosystem management. The following sub-questions are formulated and used as guiding framework to answer the research question:

Research sub-questions which will be answered from a theoretical perspective:

- What is the scholarly perspective on ecosystems, ecosystem strategy and ecosystem construction and orchestration?
- What is important terminology in the ecosystem literature?
- Is there a framework which can be used to analyse ecosystems?
- When is an ecosystem successful?
- What other literature streams can provide valuable insight on the ecosystem, or parts of the ecosystem?

Research sub-questions which will be answered from a practical perspective:

- How do the internal processes in the ecosystem of InnoEnergy function?
- What strategies do managers at InnoEnergy employ for the ecosystem they work in?
- How are the interests of the partners in the ecosystem being aligned?
- What roles do the various partners play in the ecosystem and how do these roles allow InnoEnergy to create and capture value in the ecosystem?

In the discussion section, the integration of the theoretical perspective and the practical findings is given. By juxtaposing the findings of the theory with what is found in practice, specific recommendations on how to improve the functioning of the ecosystem of InnoEnergy can be given. Furthermore, the findings in practice allow a reflection of the state-of-the-art knowledge provided in literature on ecosystems in practice, providing new insights on the functioning of ecosystems in general.

1.4 Theoretical perspective

The research question can be studied from a multitude of perspectives. For example, network theory looks into networks of firms and individuals, studying the interactions between a set of actors in a network (e.g. Jack, Moult & Anderson, 2010). While this provides useful insight in the functions of the relationships and the information that flows between these actors, it lacks understanding in how value is created through the network (Adner, 2017). Another stream of literature focusses on functional diversity, showing the need for teams in turbulent and complex environments to combine their knowledge and insights to maximize performance by combining their knowledge in development teams (e.g. Sivasubramaniam, 2012), however this does not encompass a holistic view on the community InnoEnergy wishes to create. A different stream that might be of concern is the Open Innovation stream (e.g. Chesbrough, 2006), however this stream focuses on creation and exchange, not on multilateral coordination as in the case of InnoEnergy (Adner, 2017).

A more fitting theoretical lens to analyse the problem at hand is the ecosystem perspective. The ecosystem is defined as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p. 42). This perspective allows the study of the value creation that arises from the multilateral relationships in a network, and is able to provide firms involved in ecosystems a framework for *ecosystem strategy* (Adner, 2017). This ecosystem strategy of the focal firm of the company is a key component of this study.

An extensive literature review was performed on the subject of ecosystems (see chapter 2). One particular model that was discovered in the literature is a framework created by Dhanaraj & Parkhe (2006). The model represents the design of the network, the *orchestration processes* of the endogenous factors of the ecosystem of a focal firm, and the outcomes that the ecosystem creates. This model will be used as framework in which the ecosystem of InnoEnergy will be analysed. Specifically in this research, as InnoEnergy wishes to know how to properly orchestrate an ecosystem, the focus lies on the orchestration processes by the focal firm (InnoEnergy). The design of the network is therefore not taken into account. The part of the model that is used is presented in figure 1.4.1.

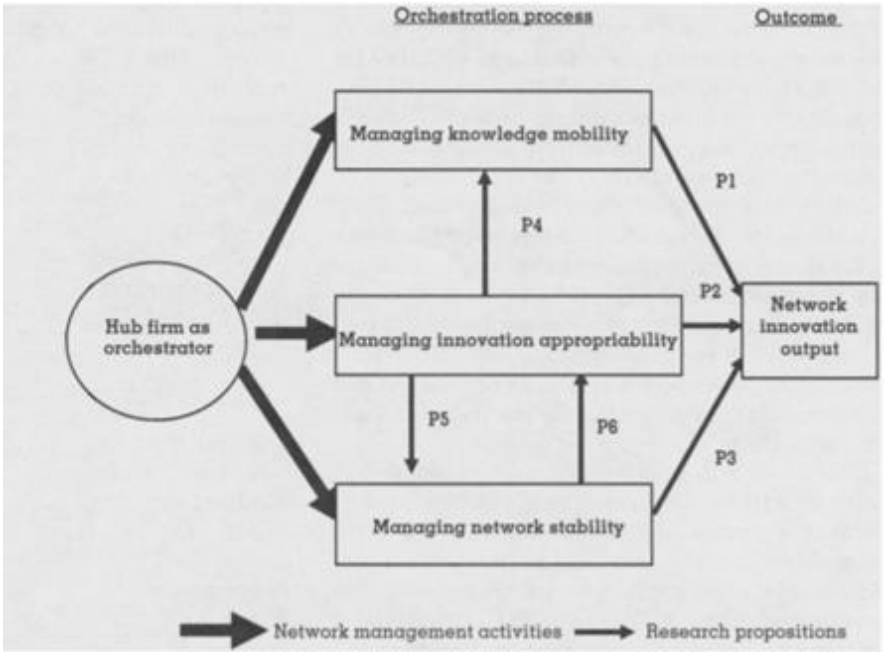

Figure 1.4.1. Framework for orchestration processes in an ecosystem (Dhanaraj & Parkhe, 2006).

The framework identifies three orchestration processes a hub firm can influence: the management of knowledge mobility (facilitate interorganizational knowledge flows), the management of innovation appropriation (create an adequate environment for value capture, with sanctions for unwanted behaviour and ways to promote trust) and the management of relationship stability (nurture partners' willingness to maintain membership in the ecosystem, through reputation, long-term goals, the promotion of reciprocity and multiplexity). These will lead to a network innovation output as outcome. Furthermore, these processes influence each other as well. This model is further explored in the literature review section (section 2.4). It should be noted that the model has not been researched thoroughly and the model is merely a proposition for analysing internal processes of an ecosystem (Jacobides, Cennamo & Gawer, 2018). As of such, the research objectives in this regard are twofold. Firstly, the research will clarify whether these orchestration processes are indeed relevant orchestration processes to increase network innovativeness when managing an ecosystem. Secondly, the research will look into how these orchestration processes can be influenced.

The final aspect of the research question revolves around *value creation and value capturing* in the ecosystem. Here specifically, the roles of the partners and their corresponding activities are important. A model found in the literature discussing the various roles in an ecosystem and their corresponding activities at a certain phase in ecosystem creation is given by Dedehayir, Mäkinen and Ortt (2018) and is shown in figure 1.4.2. This model is elaborated upon in the literature review in section 2.3.

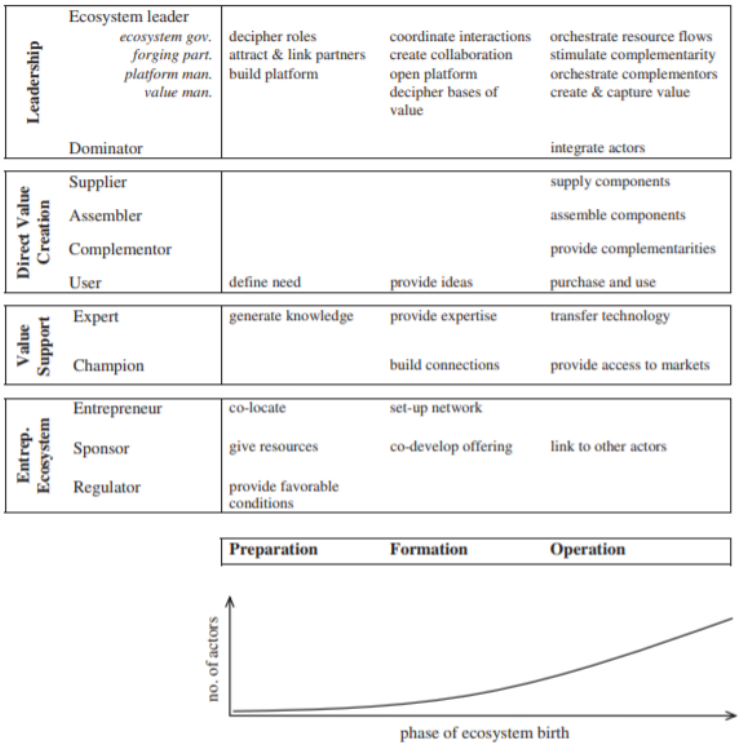

Figure 1.4.2. *Roles and activities in an ecosystem during the early phases of ecosystem development (Dedehayir, Mäkinen & Ortt, 2018).*

1.5 Deliverables

The research aims to achieve certain objectives in order to address the problem at hand:

- Describe the relevant state-of-the-art literature on ecosystems
- Describe the ecosystems of InnoEnergy in Spain and Sweden
- Describe a comparison of the two ecosystems
- Reflect on the findings of the comparative case study using the literature
- Formulate concrete recommendations for InnoEnergy

This provides several deliverables, in accordance with the TU/e guidelines:

- Thesis Presentation
- Thesis Document
- Brochure summarizing the recommendations for InnoEnergy

2. Literature background

In this section, an overview of the relevant literature on ecosystems is given. Here, the aim is to provide an answer to the research sub-questions as stated in section 1.3. These sub-questions concern the overall scholarly perspective on ecosystems, the important terminology used in ecosystem literature, the identification of relevant frameworks for ecosystem analysis, criteria for when an ecosystem is considered successful, and different literature streams that might provide insight into the working of the ecosystem. The structure of this chapter is as follows. First a general introduction to ecosystems is given. Then, an overview of how to assess the health of an ecosystem is given. Next, an overview of the roles partners in an ecosystem can play is provided. Finally, the strategy a focal firm can have for the ecosystem is given. Specifically also, in this section the ecosystem orchestration processes are discussed.

2.1 Introduction to Ecosystems

Using the perspective of ecosystems to conceptualize industries in highly competitive environments has received a surge of interest in the last few years (Adner & Kapoor, 2010; Jacobides, Cennamo & Gawer, 2018). This rise in popularity is not remarkable considering the complexity of innovative projects in the current society, where multiple companies and disciplinary fields are required to align their goals in order to overcome the challenges that firms face (Williamson & de Meyer, 2012). Firms in these turbulent sectors are required to consider not only the challenges they experience, but also the challenges faced by firms that contribute to their value proposition. Specifically, this results in relationships that do not have a typical hierarchy amongst partners in an ecosystem. Most of the 20th century revolved around economies of scale, using hierarchy to reduce transaction costs, reduce risks and uncertainty and to optimize the business processes in order to maximize the profits (Williamson & De Meyer, 2012). This hierarchy thus has some use, as the firm has more control. However, today's society demands highly complex solutions. In order to stay relevant, highly specialized partners have to align to stay competitive. This alignment happens in ecosystems, of which Jacobides, Cennamo and Gawer (2018) have identified three types: innovation ecosystems, platform ecosystems and business ecosystems.

Innovation ecosystems revolve around a central innovation, where collaborating firms in the ecosystem are aligned in a way offer a coherent, customer-facing solution (Adner, 2006). As a clarifying example, Adner (2017) discusses a case in the tyre industry, where PAX attempted to bring new, innovative tyres to the market. The tyres were technically proficient and added distinct value to a customer, but what PAX overlooked was that these tyres require various adjustments by many partners in the ecosystem in order to be properly adopted. In this case, the purchase of new equipment and the acquisition of new knowledge on how to service these new tyres by car mechanics seemed too much of an effort to adopt the new innovation. Had PAX been aware of this situation, they could have anticipated the reaction of this important actor group. *Platform ecosystems* are comprised of a focal firm that provides a platform on which complementors contribute to make the platform more valuable to consumers (Jacobides, Cennamo & Gawer, 2018). This occurs in the form of a hub-and-spoke system, with bilateral relations between the complementors and the platform, and is often seen in software and open source technologies (e.g. video game platforms) (McIntyre & Srinivasan, 2017). The last type of ecosystem is a *business ecosystem*. This stream of research focuses on an individual firm, and looks at the ecosystem as a set of actors (organizations, individuals and institutions) that can have an impact on the focal firm and its customers and supplies (Teece, 2007). Here, Jacobides, Cennamo and Gawer (2018) find that the business ecosystem has been studied from various angles. Teece (2007) studies the ecosystem as an environment that can be reacted to and monitored, whereas Iansiti and Levien (2004) emphasizes on the link between the performance of individual members and

the performance of the ecosystem as a whole (e.g. if one member performs weakly, the whole ecosystem performs weakly). Dhanaraj and Parkhe (2006) argue that there are key firms in ecosystems that provide stability in the ecosystem and that can influence the ecosystem. This view is supported by Williamson and De Meyer (2012), who emphasizes that a key activity in ecosystems is to actively stimulate and shape the partners in an ecosystem.

2.2 A successful ecosystem

When can an ecosystem be considered to be successful, or 'healthy'? A much-used framework here has been developed by Iansiti & Levien (2002), who identified three aspects to assess the health and competitiveness of business ecosystems: robustness, productivity and niche creation (or innovation). Here, robustness refers to how well an ecosystem can deal with perturbations and disruptions, which one can measure by looking at market betas and firm survival rate, or by analysing whether or not the firms managed to recover from a major disruption (Iansiti & Richards, 2006). Productivity in this regard is viewed as how much value can be created from raw material, often measured as output per hour (Iansiti & Richards, 2006). Finally, niche creation or innovation is the diversification of the network over time, which results in new choices for the firm, and is often measured as return on venture capital investment (Iansiti & Richards, 2006).

Another approach towards ecosystem health is created by Den Hartigh, Tol & Visscher (2006) (see figure 2.2.1. for the relation between the two models), who take a more managerial stand on ecosystem health. In an attempt to find more workable variables, the authors have built a model that incorporates two measures: network health and partner health (strongly related to productivity in Iansiti & Richards' (2006) model). Here, network health refers to the embeddedness of and the impact made by a partner in an ecosystem. It is measured by a combination of the number of partners in a network, the visibility of the network and the covariance of the market. Partner health on the other hand reflects the long-term financial well-being of the partner, and is captured using a variety of variables commonly used in finance to measure this long-term stability, including solvency, liquidity, total asset growth, working capital, retained earnings and total revenue.

These models provide a workable approach towards measuring the health of an ecosystem, however they are not sufficient in measuring the health of such an ecosystem. For one, these ecosystem models lack insight in the impact of external factors on such an ecosystem (Jacobides, Cennamo and Gawer, 2018). Additionally, the measurements do not include the strength between ties of partners (Den Hartigh, Tol & Visscher, 2006). Also, the valuation of the ecosystem is measured using company-specific data (Den Hartigh, Tol & Visscher, 2006), even though the actors in an ecosystem are mutually influential and hold multilateral relations (Adner, 2017). Furthermore, these models provide insight in the health of an ecosystem, but do not provide insight in how to (and even, whether to) deal with unhealthy partners in an ecosystem (Den Hartigh, Tol & Visscher, 2006). As of such, these models might provide useful insight in measuring the ecosystem from a business perspective, but is not useful in measuring the quality of relationships in an ecosystem.

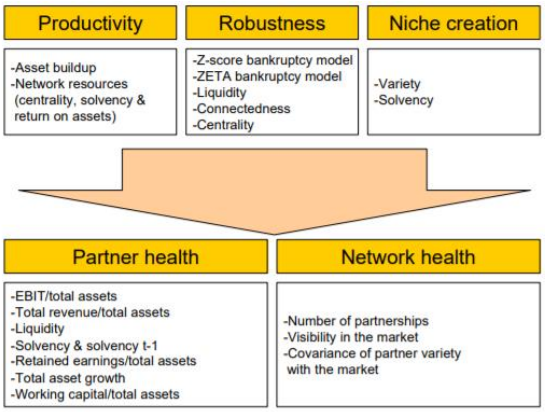

Figure 2.2.1. Two models on ecosystem health by Iansiti & Levien (2002) and Den Hartigh, Tol & Visscher (2006) and their relation (Den Hartigh, Tol & Visscher, 2006).

2.3 Actor roles and activities

In order to understand the functioning of an ecosystem, it is important to consider what roles various actors in the ecosystem can take on, and which activities belong to every role. Here, Dedehayir, Mäkinen and Ortt (2018) provide a particularly useful framework for actor roles in the early stages of the creation of an ecosystem. The paper is specifically aimed to understand the various roles actors can play during the early stages of ecosystem birth, and the corresponding activities these roles perform. It finds that attracting the right partners in the ecosystem is key, so the ecosystem can transition from the early birth stage to the subsequent stage of expansion. They find that the roles in an ecosystem during the early stages can generally be divided into four groups: leadership roles (ecosystem leader and dominator), direct value creation roles (supplier, assembler, complementor, user), value creation support roles (expert and champion) and entrepreneurial ecosystem roles (entrepreneur, sponsor, regulator). A role in this sense is defined as “a characteristic set of behaviours or activities undertaken by ecosystem actors” (Dedehayir, Mäkinen & Ortt, 2018, p.18). An overview of these roles are given in figure 2.3.1. Additionally in this figure, the activities and their relevance during every stage of the ecosystem are given. Initially, the activities by the actors are centred around preparations of the ecosystem, such as role deciphering, definition of needs and the attraction of new partners. Thereafter, activities are focused more on forming of the ecosystem, giving purpose to the ecosystem. These activities include the interaction and collaboration of actors, the establishment of networks by entrepreneurs and the provision of ideas by users. Then, the ecosystem operates and creates and captures direct value. Activities in this phase are for example the purchase and use of technologies, opening up access to markets, and the orchestration of resource flows.

These roles and their corresponding activities are of particular interest to this study, concerning their influence on the early stages of ecosystem formation and the insight they provide on the functioning of an ecosystem. Therefore, the groups and corresponding roles as presented by Dedehayir, Mäkinen and Ortt (2018) will now be explored more elaborately.

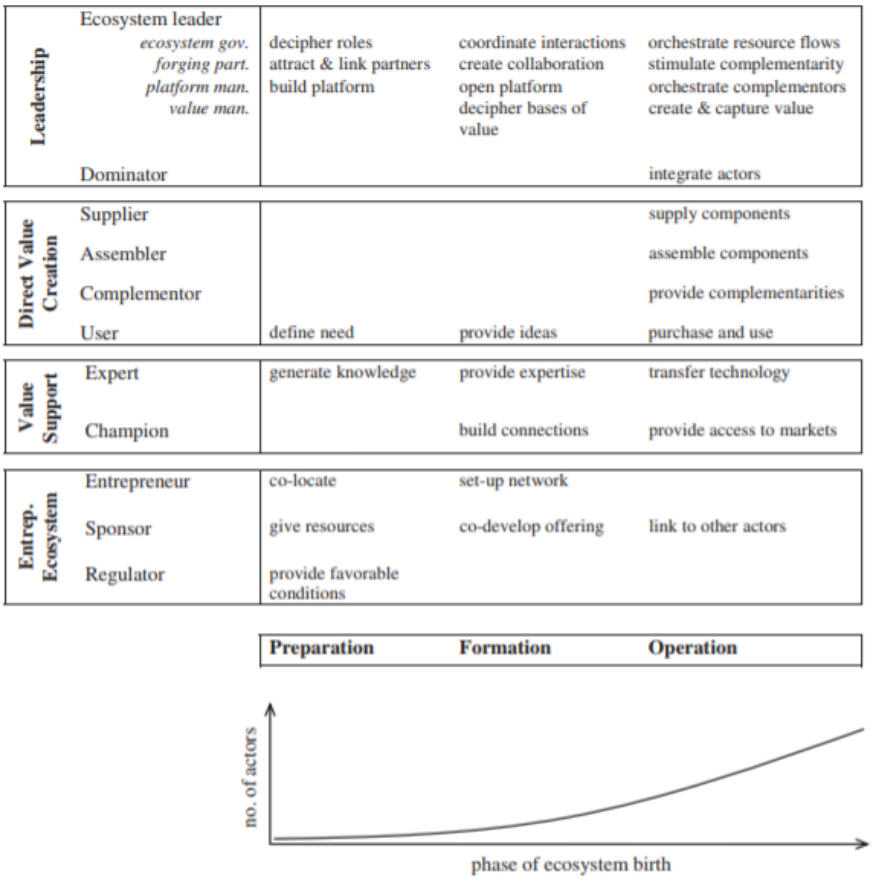

Figure 2.3.1 Roles and activities in an ecosystem during the early phases of ecosystem development (Dedehayir, Mäkinen & Ortt, 2018).

Leadership role

The ecosystem leadership roles encompasses the actions of a central actor in the ecosystem that governs the ecosystem in the early stages of ecosystem formation. This role is specifically important to gain critical mass and to allow collaboration to generate value. The leadership role is further divided into the role of the ecosystem leader and the dominator. The ecosystem leader is engaged in four types of activities: ecosystem governance, partnership formation, platform management (if applicable) and value management. This actor is first of all engaged in activities concerning governance of the ecosystem, including the designing of ecosystem actor roles, the coordination of internal and external interactions and the orchestration of resource flows amongst the actors of the ecosystem. These activities are mostly relational in nature. Additionally, the second group of activities the leader is engaged in is the forging of relationships in order to create a network. These activities include the attraction and gathering of relevant partners, the formation of links with various firms owning different resources from different industries, the creation of collaborations amongst the different partners, and the stimulation of investments and the provision of opportunities to create a niche market. The third set of activities are platform management and are only applicable to platform ecosystems. These activities encompass the design, opening and orchestration of the platform. The final set of activities concern the management of value in the ecosystem. The ecosystem leader here attempts to create and capture value of the ecosystem, by producing its own offerings and aggregating the value of the partners in the ecosystem, while still enabling the partners in the ecosystem to create their own value.

In this sense, the ecosystem leader is concerned with the wellbeing of the whole ecosystem and does not solely create and capture value for their own good. In contrast, the second ecosystem leadership role is the dominator. This leadership role is a style of leadership that might be of the demise of the ecosystem, as the leader attempts to integrate actors in the ecosystem through merger and acquisitions, causing the desirability of the ecosystem to collapse.

Direct value creation roles

The second group of roles concern the direct value creation roles. In this group the roles are essential for the value creation in the ecosystem, and consists of four roles: the supplier, assembler, user, and complementor. The first three roles are traditional part of the value proposition. The supplier delivers components by supplying key resources to other partners in the ecosystem. The assembler assembles components and processes information supplied by other actors. The user contributes to the value creation process by defining the need, developing ideas, using the offerings of the ecosystem and purchasing these offerings. The complementor is a different role specific to ecosystems, which provides complementary offerings to the ecosystem to meet the expectations of the customers, while specifically being accustomed to the ecosystem.

Value creation support roles

The value creation support roles are of particular importance to the ecosystem. These actors don't add value directly, but do so by providing supporting elements. The Expert role support the value creation by generating knowledge from research, by providing consultation and by encouraging technology transfer and commercialization. Additionally, the champion supports the ecosystem construction specifically by building connections between actors, by interacting between the different partners and by providing access to local and nonlocal markets. These activities are also present in the leadership role, but may also be accomplished by other actors in the ecosystem due to their importance.

Entrepreneurial ecosystem roles

The final group concerns entrepreneurial roles, and consists of the entrepreneur, the sponsor and the regulator. The entrepreneur starts a new venture by co-locating in an appropriate region, by setting up a focused network and by coordinating research and commercialization. The sponsor supports the entrepreneur by giving resources, finance markets, purchase and co-develop the offerings of firms and by linking entrepreneurs to other actors in the ecosystem. Finally, the regulator (e.g. regional government) supports the emergence of the ecosystem by providing economic and political reformation and by loosening the regulatory restrictions.

2.4 Ecosystem Strategy

Ecosystem strategy encompasses the long term plan of a focal firm concerning the ecosystem environment it is involved with, and is an essential aspect of ecosystem orchestration (Adner, 2017). Initially, some scholars remarked that the fate of a firm is intertwined with the performance of the other firms in the ecosystem (Iansiti & Levien, 2004), however there is consensus that hub firms – defined as firms with enough power and prominence gained through individual attributes and a central position in the ecosystem to employ a leadership role in order to align the resources and capabilities of partners in an ecosystem (Dhanaraj and Parkhe, 2006) - can actively shape and influence the ecosystem (Williamson & De Meyer, 2012). Moreover even, some scholars suggest that the ability to manage the ecosystem is critical to the company, and cannot be considered separately from the company itself (Ritala, Armila & Blomqvist, 2009).

The literature as of yet has focused on reasons for applying ecosystem logic (e.g. Adner, 2017), and on what ecosystems exactly are and how they function (e.g. Dhanaraj and Parkhe, 2006). The importance of hub firms and the need for proactive shaping of the ecosystem has been emphasized upon, however only few have researched what specific mechanisms can be employed in order to actually do so (Jacobides, Cennamo & Gawer, 2018). Some studies have looked at governing methods, such as IP rights (Azzam, Ayerbe & Dang, 2017; Ritala et al., 2013), however these studies are limited. As of such, the understanding of mechanisms that may influence the overall strategy by a focal firm in an ecosystem is lacking. Specific recommendations for managers are not yet present.

In this literature review, ecosystem strategy is approached from two perspectives: ecosystem-as-affiliation and ecosystem-as-structure, as defined by Adner (2017). Ecosystem-as-affiliation is defined as "ecosystems as communities of associated actors defined by their networks and platform affiliations" (p. 40), whereas ecosystem-as-structure is defined as "the configurations of activity defined by a value proposition" (p. 40), which has the value proposition as central outcome. The ecosystem-as-affiliation approach sets the network relations as central, and provides useful insights in network effects and macro-level interactions. The ecosystems-as-structure sets the value proposition as central and then identifies a set of actors that are required to interact for this value to be captured.

2.4.1 Ecosystem-as-structure perspective

The ecosystem-as-structure perspective is proposed by Adner (2017). Here, the value proposition is positioned as central in the ecosystem, after which, the set of actors required to enable this value proposition to come to fruition is identified. Adner (2017) states this definition helps to border who is of relevance in the ecosystem, and who falls outside of its boundaries. Moreover, Adner (2017) identifies four elements in an ecosystem structure - activities, actors, positions and links (see figure 2.4.1) – that can be (re)aligned in order to ensure the value proposition is realized. According to Adner, this is a proper way of approaching one's ecosystem. The corresponding definition of an ecosystem strategy then is as follows: "Ecosystem strategy is defined by the way in which a focal firm approaches the alignment of partners and secures its role in a competitive ecosystem." (Adner, 2017, p. 47). This definition has several implications. Firstly, an ecosystem consists of a variety of firms, each with their own view on the ecosystem strategy, which may contradict or be consistent with each other. Consistency amongst strategies is key here. Secondly, the alignment of partners by the focal firm. It is paramount that the focal firm identifies gaps, and identifies ways to close these gaps. These gaps can be activity-based challenges and challenges from partner's expectations. Activity-based challenges can be further distinguished into co-innovation risks (involving the *ability* of a firm to undertake new activities in line with their planned contribution) and adoption chain risks, (involving the *willingness* to undertake these new activities). Partner's expectations encompass challenges concerning the position of firms, namely who is the leader/follower, who faces the end customer and who takes on which role. Thirdly, role securement is paramount. Actors need to agree on who is the leader (the one to set and enforces rules, government mechanisms, determines timing and sets value capture mechanisms) and who is the follower (the one to agree to these terms) in an ecosystem. Moreover, these positions (both leader and followers) are constantly competed over. Finally, the definition encompasses the competitiveness in an ecosystem. Here, competitiveness can refer to competition within the ecosystem by securing activities, positions and roles in order to capture value, or across ecosystems, where actors may choose to engage in rivalling ecosystems instead. A company can adjust its strategy based on these four implications. Adner (2017) furthermore emphasizes that alignment is key in ecosystem strategy, as aligning the partners gives rise to unique value that could otherwise not be accomplished.

Elements of Ecosystem Structure

Elements of Ecosystem Structure	Ecosystem-as-Structure Perspective	Ecosystem-as-Affiliation Perspective
Activities	Discrete actions to be undertaken in order for the value proposition to be created	Not applicable
Actors	Entities that undertake activities	Entities that are tied to the focal actor
Positions	Specified locations in the flow of activities across the system	Derived from links to other actors
Links	Transfers across positions, which may or may not include the focal actor	Ties between the focal actor and other actors

Figure 2.4.1. Elements of an Ecosystem Structure (Adner, 2017, p. 44).

2.4.2 Ecosystem-as-affiliation perspective

A different perspective on ecosystems is the ecosystem-as-affiliation perspective. Dhanaraj and Parkhe (2006) take on this ecosystem-as-affiliation perspective and have constructed an important framework in the ecosystem literature in their widely cited article "Orchestrating Innovation Networks", as shown in figure 2.4.2 below. They have identified three processes involved in shaping an ecosystem and its impact on innovation output: the management of knowledge mobility (facilitate interorganizational knowledge flows), the management of innovation appropriation (create an adequate environment for value capture, with sanctions for unwanted behaviour and ways to promote trust) and the management of relationship stability (nurture partners' willingness to maintain membership in the ecosystem, through reputation, long-term goals, the promotion of reciprocity and multiplexity). Dhanaraj and Parkhe (2006) propose that these processes positively influence the network innovation output, and also propose that these processes positively influence each other. However, even though the article is considered of high importance to the ecosystem literature stream, Jacobides, Cennamo and Gawer (2018) find that this framework of the orchestration of the endogenous processes of a focal firm in an ecosystem after more than a decade still lacks research and understanding. This is supported by Ritala, Armila and Blomqvist (2009), whom moreover note that this orchestration can be categorized and analysed on the individual level and the organizational level, and find that these levels are interconnected as the organizational orchestration is executed on the individual level. These levels are summarized in table 2.4.1. The capabilities of the individual play a key role in the orchestration processes of the focal firm of an ecosystem. For example, certain *brokers* are individuals that cross boundaries and build relationships for the focal firm with a diverse number of stakeholders, enabling a the creation of a network. Additionally, the capabilities of the individual in this regard influence the three orchestration processes as identified by Dhanaraj and Parkhe (2006).

Due to the importance of this model for this study, these three orchestration processes will be explored in more detail. Specifically, it should be noted that all three areas of ecosystem orchestration processes are heavily intertwined, and failing at one of these areas will likely lead to failure in the others as well (Dhanaraj & Parkhe, 2006; Hurmelinna-Laukkanen et al., 2012).

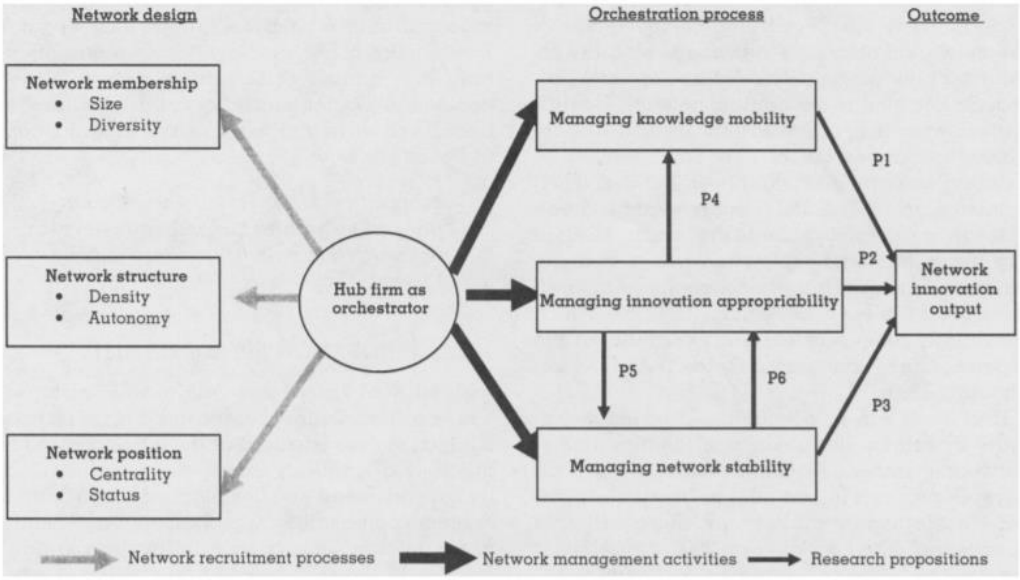

Figure 2.4.2. A Framework for Orchestration in Innovation Networks (Dhanaraj & Parkhe, 2006).

	Knowledge Mobility	Innovation Appropriability	Network Stability
Individual skills	Interpersonal communication and social skills	Balancing skills Negotiating skills Entrepreneurial skills	Influencing skills Visioning skills Motivating skills
Organizational capabilities	Operational capability Collaboration capability Competence leveraging capability	Legitimizing capability Balancing capability Entrepreneurial capability	Visioning capability Influencing capability

Table 2.4.1. Individual skills and organizational capabilities involved with the orchestration processes (Ritala, Armila and Blomqvist, 2009).

Knowledge mobility

Knowledge mobility is defined as the ease with which knowledge is shared, acquired, and deployed within the network (Dhanaraj & Parkhe, 2006). Knowledge mobility across organizations has long been found to be of high importance in innovative processes, as new combinations from different backgrounds can be made in order to come up with creative ideas, which in turn promotes value creation in the network. Specifically here, Dhanaraj and Parkhe (2006) note that knowledge absorption, network identification and interorganizational socialization are key. It is found that cooperation, commitment and trust is key in facilitating knowledge mobility, which is supported by good individual communication and social skills (Ritala, Armila and Blomqvist, 2009). A common network identity enforced by the focal firm enables the actors in the network to work towards a common goal, which enhances knowledge mobility (Dhanaraj & Parkhe, 2006). Additionally, it is important to take into account the importance of the capabilities of the individual engaging in the network, such as effective listening, paying attention to others and being understanding (Ritala, Armila and Blomqvist, 2009).

Additionally, the way knowledge flows differs between companies. Specifically, when trust between two companies is low and the relationship is new, more formal approaches towards knowledge exchange are used (IP/Joint Ventures/Contract based). When trust is high, more informal methods are possible, making cooperation more efficient and straightforward, and it helps in building an open atmosphere of communication (Dhanaraj and Parkhe, 2006).

Furthermore, on an organizational level, the absorptive capacity of the focal firm is key, which includes the recognition, assimilation and conversion of new, external information into a commercial application (Hurmelinna-Laukkanen et al., 2012). The information that is flowing in the network only contributes to the innovation output if this knowledge is absorbed (Heiman & Nickerson, 2004).

Innovation Appropriation

In regard of innovation appropriation, where appropriability is defined as "an environmental property that governs an innovator's ability to capture the profits generated by an innovation" (Dhanaraj & Parkhe, 2006, p.660), Dhanaraj and Parkhe (2006) emphasize that value creation is key, and that this value creation should be distributed appropriately in the network. Specifically here the authors note that active prevention of freeriding, or even worse, the leaking of new knowledge towards different ecosystems is essential. Trust, procedural justice mechanisms and joint asset ownership are paramount in creating an environment in which innovation appropriability levels are high (Dhanaraj & Parkhe, 2006). Similar to knowledge mobility, here also trust, communication and commitment among partners is key (Ritala, Armila & Blomqvist, 2009). It is important to balance contradicting forces like competition and cooperation, formal and informality, and trust and contracting (Ritala et al., 2009; Hurmelinna-Laukkanen et al., 2012). These are different approaches towards reaching a similar goal: fostering the ecosystem orchestration processes. It should be carefully considered which approach is most suitable for every relationship in order for the relationship to also create and capture value. Specifically also, Ritala, Armila and Blomqvist (2009) find that the communication of a clear vision, and exerting trust, and being able to balance (being fair, neutral and open) all members in the network is critical for cooperation to successfully capture value. Moreover, on an individual level, good entrepreneurial skills (discovering new opportunities, bargaining and negotiating about resources, roles and responsibilities) are key to mutually align goals and objectives and to share and collaborate, and specifically also at the start of the network orchestration stages as the firm has to invest high amounts of resources into setting up the network without any assurance of return on investment (Ritala, Armila & Blomqvist, 2009).

Network stability

Considering network stability, defined as a non-negative growth rate in a network, Dhanaraj and Parkhe (2006) point out that both strong and weak ties are important for a stable ecosystem. Ecosystems may profit from loose ties as they provide access to new information, they may also negatively impact the stability of the network (Zhang, 2010). The stability of the network can be influenced in three ways: enhancing the reputation of the ecosystem so that actors are more inclined to join and stay in the network; lengthening the shadow of the future by setting long-term goals, which ensures actors stay part of the network; and by building multiplex relationships as these strengthen the connection to the ecosystem (Dhanaraj & Parkhe, 2006). In addition, Ritala, Armila and Blomqvist (2009) find that the focal firm has the strongest interest and motive for the innovation at hand, and will need a clear goal and vision to support it in order to be able to motivate other partners to cooperate. Furthermore, the position and reputation of the focal firm is key in being able to attract the right partners. Finally, the individual skills and competences are deemed of high importance, as individuals need to persuade and influence new partners to join the network. Furthermore, it should

be noted that network stability is a double edged sword: whereas being familiar with the other actors in the firm improves knowledge mobility, supports fairness and improves overall success (Dhanaraj & Parkhe, 2006), it can turn into stagnation as there is a lack of variety in the knowledge that is absorbed (Hurmelinna-Laukkanen et al., 2012).

A summary of the orchestration processes and the factors that influence these processes is given in table 2.4.2. The influencing factors were found in various papers that discussed specifically the orchestration processes as shown in figure 2.4.2 (Dhanaraj and Parkhe, 2006; Hurmelinna-Laukkanen et al., 2012; Jacobides, Cennamo and Gawer, 2018; Ritala, Armila & Blomqvist, 2009).

ORCHESTRATION PROCESS	INFLUENCING FACTORS
KNOWLEDGE MOBILITY	Knowledge absorption; network identification; interorganizational socialization; cooperation; commitment; trust; transparency; formality; effective listening, paying attention to others & being understanding
INNOVATION APPROPRIABILITY	Trust; procedural justice mechanisms; joint asset ownership; communication; commitment; cooperation vs competition; formality vs informality; freeriding; being fair and neutral towards all partners; entrepreneurial skills; communication of a clear vision
NETWORK STABILITY	Credibility; multiplexity; long-term goals; focal firm reputation, interest and motive; clear goal and vision; individual competences to persuade and influence new partners to join the network

Table 2.4.2. Summarization of influencing factors of orchestration processes.

2.4.3 Different perspectives on ecosystem thinking

Adner (2017) notes the differences between employing an ecosystem-as-affiliation approach and an ecosystem-as-structure approach: the ecosystem-as-affiliation perspective studies various aspects of relationships between actors in a network, but in comparison to the ecosystem-as-structure approach neglects the purpose of the network, or the value that is created by the network. Although this insight is valuable, some aspects of the ecosystem can be explained more thoroughly by incorporating a network theory perspective on the whole. The model as presented by Dhanaraj and Parkhe (2006) incorporate knowledge mobility, innovation appropriability and network stability. These aspects are strongly linked to tie properties between actors such as trust, reciprocity and multiplexity (Dhanaraj & Parkhe, 2006). Furthermore, Den Hartigh, Tol and Visscher (2006) note that partner relationships might be unhealthy and cost more than they are valuable, and find that how to, and even whether to deal with these unhealthy partners is still unexplored from a theoretical perspective.

Here, insights from network theory can provide some useful insight. Components of interactions, such as reciprocity, level of affection, strength of tie, levels of trust, or levels of obligation, are found to have a great influence on the interaction between actors in a network (e.g. Brzozowska & Zdziarski, 2016; Dodgson, 2011; Hayter, 2013; Martinez & Aldrich, 2011; Jack, Moult & Anderson, 2010). A common theme in this regard is the strength of ties between actors. Tie strength is seen as a combination of the amount of time, the intensity, and the reciprocity of the relationship, and are an important aspect of the interactions that take place in a network (Granovetter, 1973). Usually these ties are considered to fall under one of two categories: *strong ties,* defined as relationships with high commitment and high frequency of contact, usually among socially homogeneous individuals, or *weak ties,* defined as relationships with low commitment and low frequency of contact (Martinez & Aldrich, 2011). Weak ties in a network provide actors access to a new set of behaviour, ideas and knowledge (Marinez &

Aldrich, 2011; Partanen, Chetty & Rajala, 2014), whereas strong ties are supported by social constructs such as trust, power, influence and reputation (Hayter, 2013) and are more important in exploitation practices (Fuentes et al., 2010; Schott & Sedaghat, 2014). A combination of weak and strong ties seems important here, as being too embedded in the network may slow down communication (Zhang, 2010), requires some sort of payment (Marinez & Aldrich, 2011 and can hinder the actor through high levels of obligations (Zhang, 2010). Specifically, Zhang (2010) notes that some ties might not be worth the required invested resources to maintain the tie.

Furthermore, the network should not be regarded as static, but as a changing entity. Weak ties in the network may grow into strong ties as trust and reciprocity of the relation increases (Jack, Moult & Anderson, 2010). Here, it can be noted that networks as studied from this perspective are often only regarded as progressive in nature, and neglect the potential regression of a network (Slotte-Kock & Coviello, 2010; Zhang, 2010).

It should be kept in mind however, that these descriptions are bilateral of nature. The multilateral nature of these ecosystems is not captured by this insight as provided by network theory, in comparison to ecosystem theory (Adner, 2017). It does show however that some tie components can influence a relationship in such a way that it influences the overall ecosystem health.

2.4.4 Pitfalls of the ecosystem

Having discussed the need for ecosystem thinking in order to create unique value in today's society, and having explored various ecosystem perspectives, it should be noted that the employment of ecosystem strategies is not without disadvantages. The inherent lack of hierarchy, and therefore control, brings some difficulties to focal firms.

One of the key pitfalls of an ecosystem is the difficulty of value capturing. Here, Dhanaraj and Parkhe (2006) note that ecosystem lack the ability to prevent companies from free-riding, or even worse, leaking profits towards other ecosystems. This is detrimental for the focal firm, as they spend resources to create value but fail to capture this value. Some mechanisms to capture this value should be implemented, such as IP rights (Ritala et al., 2013) or by reaping from the economies of scale (Williamson & De Meyer, 2012). Specifically however, Jacobides, Cennamo & Gawer (2018) note that the mechanisms that allow for value capturing in an ecosystem (exploitation through strong relationships) are also the mechanisms that prevent the ecosystem from acquiring new members (exploration of new relationships). Moreover, it can be unclear where the actual value in the ecosystem is being created, and which partners are required to contribute to this value (Adner, 2006). Pinpointing where this value is created is vital for the success of the ecosystem (Williamson & De Meyer, 2012).

Ecosystems lack a full hierarchical structure, allowing the ecosystem to be flexible. This flexibility is great for learning and innovative processes, which should be actively encouraged and stimulated by the focal firm (Williamson & De Meyer, 2012). However, this lack of hierarchy also comes with higher costs of transactions, as relationships are loose and unstructured. This flexibility of weak ties is required in ecosystems to increase explorative processes in the network which allows access to new ideas, knowledge and partners (Martinez & Aldrich, 2011). As of such, mechanisms that deal with lowering the transaction costs while keeping the flexibility of the relationship should focus on the process of the communication rather than the outcome (Loch, de Meyer & Pich, 2011).

The great variety of partners within an ecosystem that the focal firm has to manage form a threat to the focal firm on their own. For one, the value as provided by the ecosystem can depend on the joint successes of various partners in the ecosystem, of which each has their own risks. This means that as the amount of partners that *need* to be successful in order for the ecosystem to create value, the risks

increase and the probability of successful value creation decreases rapidly (Adner, 2006). The risks of all these partners should be managed by the focal firm in order for the ecosystem to thrive. Moreover, the amount of partners causes a tendency of the focal firm to lose focus on its key partners, making it difficult to interact the appropriate amount with the right partners. By differentiating between partner roles and their importance, the focal firm can keep the amount of communication in check and distribute it accordingly (Williamson & De Meyer, 2012). In regard of taking on a leader role, Iansiti & Levien (2004) also note that by extracting too much value from the ecosystem, a dominating firm can cause an ecosystem collapse as underlying firms are unable to sustain themselves.

2.5 Literature Summary - important takeaways from the literature

Based on this literature review, a number of important conclusions can be drawn regarding the research sub-questions.

Firstly, there are three types of ecosystems: the innovation ecosystem, revolving around a particular innovation (e.g. the electric car), the platform ecosystem, revolving around a platform that members can contribute to (mostly found in software), and finally the business ecosystem, which revolves around a particular business (e.g. Apple's ecosystem supporting Apple's activities) (Jacobides, Cennamo & Gawer, 2018). Furthermore, there are two ways of approaching ecosystem thinking: ecosystem-as-affiliation and ecosystem-as-structure (Adner, 2006). Here, when employing an ecosystem-as-affiliation approach, the focus lies on the interactions between the actors of the network and on macro-level effects, whereas the focus of the ecosystem-as-structure approach lies on the value proposition of the ecosystem and how the various partners give rise to this value proposition. Specifically, these ecosystem are multilateral in nature, meaning that the relationships and collaborations happen amongst multiple actors. The alignment of these different partners to work towards a common goal is considered to be the main activity of the orchestrating firm of the network (Ander, 2017). The ecosystem strategy encompasses the long term plan of a focal firm concerning the ecosystem environment it is involved with, and is an essential part of the orchestration of an ecosystem (Adner, 2017).

The paper of Dedehayir, Mäkinen and Ortt (2018) on actors and their roles during the early stages of the creation of an ecosystem is particularly relevant. They find four groups of roles that are required in an ecosystem during early stages in order to successfully transition to subsequent stages: leadership roles, direct value creation roles, value support roles and entrepreneurial ecosystem roles. Roles in each of these groups perform activities related to specific phases of early ecosystem development which are required for the ecosystem to be able to mature. As of such, early on the activities are related to preparation of the ecosystem (e.g. attracting new partners, defining user needs). Then, activities are more related to the formation of the ecosystem (e.g. provision of ideas by users, creation of collaborations amongst partners). Thereafter, the activities in the ecosystem are targeted towards operationalization by creating and capturing value (e.g. orchestration of resource flow, purchasing and using offerings).

Dhanaraj and Parkhe (2006) proposed a model for the internal orchestration processes of an ecosystem that influence the output of the network, as shown in figure 2.4.2. The model describes three internal ecosystem processes that can be orchestrated: knowledge mobility, value appropriation and network stability. Here, knowledge mobility refers to the ease with which knowledge is shared, acquired, and deployed within the network and is influenced by factors such as trust, commitment and network identification. Innovation appropriation refers to the ability to capture the profits generated by an innovation, and is influenced by factors such as coopetition, a clear vision, justice mechanisms and a fair and neutral environment. Finally, network stability refers to a non-negative flow of new partners to the network, and is influenced by factors such as longevity, reputation and a clear goal and

vision. These processes are mutually intertwined and cannot be considered separately. These factors can be influenced by the orchestrating firm to increase the output of the network. The orchestration processes and their influencing factors are summarized in table 2.4.2.

The literature study was aimed to gain a deep understanding on the state-of-the-art knowledge of ecosystem theory. In order to analyse the functioning of the ecosystem of InnoEnergy in practice and to test to what extent this corresponds to the findings of the literature study, a comparative case study using qualitative data acquisition methods was performed. The methodology and the findings are described in chapters 3 and 4 respectively. These are then discussed in chapter 5.

3. Research methodology

3.1 Research design

This research includes the combination of an empirical (research) cycle and a regulative (design) cycle, where the empirical cycle is used as analysis and diagnosis step in the regulative cycle. A theoretical understanding of the ecosystem orchestration processes is used as basis for in-depth qualitative interviews of firms involved in the ecosystems of InnoEnergy in Spain and in Sweden. These two ecosystems have been researched in the form of a comparative case analysis using interviews with CEOs and high level managers of the involved companies. The reasoning behind performing a comparative case study came from the CEO of InnoEnergy Benelux, who found that one of the ecosystems was developed better than the other, and wished to understand the nuances in these ecosystems better in order to apply the lessons learned to the ecosystem in the Netherlands. A comparative case study is therefore an ideal method to compare both ecosystems and analyse the influences of different ecosystem strategies that have been employed by the different departments of InnoEnergy. From a theoretical perspective also, the case study method is fitting for this research as it is particularly effective at answering "how" and "why" questions within an unclear context (Baxter & Jack, 2008), fitting to the research question. As of such, a comparative case study method as described by Baxter and Jack (2008) was used. Here, the interviewer employs a constructivist paradigm towards the study at hand which emphasizes on the subjective perspective of humans, as this allows the interviewee to collaborate closely with the participating interviewers (Baxter & Jack, 2008).

3.2 Procedure

In total, 13 interviews were held in Sweden, of which interviewees were selected from 5 start-up companies, 2 SMEs, 1 large company, 2 knowledge institutes and 3 at InnoEnergy. 15 interviews were held in Spain, of which interviewees were selected from 3 start-up companies, 2 SMEs, 4 large companies, 3 knowledge institutes and 3 at InnoEnergy. The interviewees were selected based on their perceived knowledgeability of the relationship of the company they are working at and InnoEnergy and its ecosystem, and were often identified and contacted in consultation with company representatives through email. Considering the explorative nature of this research, interviewing was chosen as qualitative method to offer clarity and a descriptive understanding on the underlying processes at hand. The interviews were structured using an interview form based on theoretical knowledge of the internal and external processes of a network. The interview scheme can be found in Appendix A.

An interview scheme aimed to examine these research models had been set-up and can be found in Appendix A. The interview scheme was used to hold semi-structured interviews. Employing such a semi-structured scheme allows the researcher to have consistent data amongst various interviews and provides the researcher guidelines during the interviewing process, but still allows the interviewee to speak freely about the ecosystem they are involved in and to elaborate on aspects the interviewee deems important. The questions are aimed at gaining a deeper understanding of the strategies of managers at InnoEnergy for the ecosystem they are orchestrating, the internal ecosystem processes and the output of these processes. Specifically, the questions under "Company General" provide a general insight in the company, the questions under "Current Ecosystem" provide insight in the orchestration processes in the ecosystem (knowledge exchange, communication, prevention of value leaking (Q4-Q8) and how this contributes to the value of the ecosystem (what is the value proposition of the ecosystem (Q1), what are the benefits of the ecosystem (Q2), what does the interviewee contribute (Q3)), the questions under "Ecosystem Partner Alignment" provide insight in the alignment of partners as identified as main activity of the ecosystem orchestrator (common goal (Q1), common value proposition (Q1), Leader vs Follower (Q2)) and the ecosystem strategy (ecosystem strategy (Q3)),

the questions under “Partnership with InnoEnergy” provide insight in the relationship between companies and InnoEnergy specifically to gain a more holistic view on the ecosystem and the influence of the strategies managers at InnoEnergy assert on the ecosystem, and finally the questions under “Development of the Ecosystem” provide insight in the reputation (Q5), longevity (Q2/Q12), trust (Q6), commitment (Q6) and satisfaction (Q6). Additionally in this final section the exogenous factors are asked about for a different research.

3.3 Partner identification and selection criteria

Using the InnoEnergy partner map on their website along with interviews with the CEOs from InnoEnergy Spain and InnoEnergy Sweden, a list of partners had been identified by a representative of InnoEnergy. These partners were mapped out, including contact details, and reached out to through mail and phone. Additionally, some of these partners were contacted in person on The Business Booster the 17th and 18th of October in Copenhagen by a representative of InnoEnergy in order to arrange interview sessions from the end of October until the end of November. These interviews were done in person and through skype.

Partners were included in the list of partners of InnoEnergy as soon as a project has been worked on together. As of such, all companies that have worked on a project together with InnoEnergy in the past are included in the selection for the sample. Furthermore, the interviewee was required to have been part of the project that was worked on with InnoEnergy, as well as being a high level manager (e.g. CEO, Senior Business Development Manager, Strategic portfolio manager). Not all companies responded to the request for participation in the research however, or responded to be unavailable for participation: of the 42 companies in Spain and the 44 companies in Sweden that were contacted (including InnoEnergy) a total of 28 representatives of 24 companies were interviewed (11 in Sweden and 13 in Spain).

3.4 Sample description

The sample of companies was divided in multiple ways. Firstly, the participating companies were divided into the ecosystem of Spain and the ecosystem of Sweden. Then, a further division was made based on the size and function of the company. Based on the sample, these divisions are as follows: start-ups and SMEs, large corporations, knowledge institutes and InnoEnergy. This is illustrated in tables 3.4.1 (Sweden) and 3.4.2 (Spain). The company names are abbreviations to ensure anonymity of the participants. A more elaborate description of each company is given in Appendix B.

Sweden		
Company type	Companies	Total interviews
Start-ups and SMEs	GM, MB, NV, SDAB, SIM, SWT, SAE	7
Large corporations	E.	1
Knowledge institutes	AN, K.	2
InnoEnergy	InnoEnergy (3)	3

Table 3.4.1. Overview of companies in Sweden

Spain		
Company type	Companies	Total interviews
Start-ups and SMEs	AEI, FL, ORC, PA, RB	5
Large corporations	C, EDP, MD, TEC	4
Knowledge institutes	ES, IR, U.	3
InnoEnergy	InnoEnergy (3)	3

Table 3.4.2. Overview of companies in Spain

3.5 Data acquisition

Data was acquired by interviewing high level managers of various companies that are part of the networks of InnoEnergy in Sweden and Spain. These interviews were done in separation by two researchers. The reasoning behind the division of interviews was partly triangulation of the data acquisition, as although the test was standardized as much as possible it is unavoidable that different researcher ask questions differently and focus more on different aspects in an interview, and partly practical due to budget constraints. The interviews were mostly done in person, meaning travelling to the country to interview the company of interest and have a one-on-one interview session, which would last between sixty and ninety minutes. Some interviews were unable to be taken in person due to planning constrictions. These were instead done through a Skype-call. Often, these meetings would last shorter (around 30 to 40 minutes), and were less in-depth due to the less personal nature of a call compared to a face-to-face meeting.

Furthermore, during the interviews the questionnaire that was developed was used as a guiding framework for the interview. At the start of the interview, the interviewee was ensured anonymity and was made to feel comfortable and at ease in order to encourage an open conversation about the relationships of the company. The questions were asked in an open-ended, neutral fashion, in an attempt not to bias the answer given by the interviewee. Additionally, the open-ended questions enabled the interviews to flow like a conversation, letting the interviewee talk openly about his or her experiences of the ecosystem. In the case of interesting remarks, follow-up questions were asked by the interviewer for further clarification.

3.6 Data analysis

Here the method for data analysis is presented. Firstly, all the interviews were transcribed. Then, the interviews were organized based on the ecosystem (Sweden or Spain), and based on one the roles in the ecosystem (focal firm: InnoEnergy, Start-up, SME, Large company, Knowledge institute). This allows the data to be analysed on multiple levels: within a role, within an ecosystem and across ecosystems.

Both inductive and deductive methods were applied to analyse the data. The inductive analysis of the transcribed data was done using a Thematic Content Analysis approach (Anderson, 2006), which is a predictive presentation of qualitative data. Specifically in this method, the researcher interprets the various transcriptions of the interviews at various points in time (by reading and interpreting the interviews several times), identifies common themes in the texts and uses these themes to describe and interpret the data. Here, the total data set was first read through without analysing the data in order to get familiar with the set. Then, the interviews were summarized. Specific themes and important remarks in an interview were highlighted and reviewed. These themes were found through various iterations. These themes and important remarks were then interpreted and compared to other interviews in that particular role. The identified themes are as follows: ‘Benefits

for InnoEnergy', 'Benefits from InnoEnergy', 'Overall ecosystem strengths', 'Overall ecosystem weaknesses', 'Value creation by company', 'Value capture by company', 'Ecosystem strategy', 'Freeriding', 'Leadership vs Follower', 'Collaboration amongst partners', 'Collaboration with InnoEnergy', 'Network Attraction'. Tables indicating descriptions of each theme and an illustrative quote are provided in appendix C. Interesting findings and specific similarities or differences within a role, within an ecosystem and between ecosystems were then identified and examined. Finding results using the thematic content analysis was heavily emphasized upon in this research. These findings are presented in the results chapter (chapter 4). Furthermore, a deductive analysis of the data was done specifically for the internal ecosystem processes, as identified by Dhanaraj & Parkhe (2006). This analysis was performed in order to test the model by Dhanaraj & Parkhe (2006), which is a propositional model, and to further strengthen findings of the thematic analysis concerning the extent in which these processes are present in each ecosystem. A table scheme was set up incorporating these internal ecosystem processes to identify whether specific factors of the internal ecosystem processes were mentioned in the ecosystem, using table 2.4.2 that summarizes the influencing factors of the internal ecosystem processes. Then, for each interview it was analysed whether or not an interviewee remarked a specific influential factor as important and present in the ecosystem. This was used to make scores of the influential factors of the internal ecosystem processes, showing the percentage of interviews within an ecosystem that indicate presence of that factor. Due to the length of these tables, they are presented in Appendix D. Notably here, even though an interviewee might not mention a particular influential factor as important it does not necessarily mean that the influential factor is not present or relevant in an ecosystem: it merely shows whether or not an interviewee mentioned it. These findings should thus be considered as supporting evidence for claims of the thematic content analysis.

3.7 Quality of the data and data processing

Concerning the quality of the data and the quality of the processing of the data, Morse et al. (2002) emphasize that reliability and validity in all research methods are of the upmost importance to ensure the research is valuable and worthwhile. However, qualitative research lacks objectiveness and certainty due to the absence of hard data. This is entrenched in the constructivist paradigm that is employed in a qualitative research. In order to still ensure reliability and validity of the data, a list of strategies has been set up: methodological coherence, sample appropriateness, concurrent data analysis and collection, theoretical thinking and theory development (Morse et al., 2002). All of these strategies function interactively and contribute to the reliability and validity of the data. Each of these strategies will be discussed for this study.

Firstly, methodological coherence aims to ensure congruence between the research question and the research method components. Here, the interview scheme as shown in Appendix A is matched to the research question and the research model that is used in this study (see section 3.1). This interview scheme is used in all interviews. Secondly, sample appropriateness refers to the participants that have been interviewed and their relevance and knowledgeability of the research topic. Concerning sample appropriateness, only high level managers (e.g. CEO, Senior Business Development Manager, Strategic Portfolio Manager) that were involved in the relationship with InnoEnergy were interviewed (see section 3.3 and Appendix B). Thirdly, concurrent data analysis and collection refers to the interaction between what is known and needs to be known. In this research, the data at hand was naturally interpreted and actively transcribed as interviews were being held. Fourthly, theoretical thinking refers to the interaction between new themes and ideas that are found in the data and verification of these ideas in old data as to build a solid foundation. This was ensured by using the inductive and deductive analysis methods as described in section 3.6. Finally, theory development refers to fluent movement between the data and the macro perspective of the theory at hand. By doing so, the theory is

developed as outcome of the research process and as a template for comparison and further development of the theory. In this study, this achieved by reflection on each step of the process.

4. Results

The results of the data analysis are presented in this section. The findings were included in the results section based on whether these results aid in answering the research (sub-)questions. Here, the internal processes as described by the model by Dhanaraj and Parkhe (2006) are discussed firstly, then the strategy InnoEnergy employs for its ecosystem and the perceived strategy by the partners in the ecosystem is discussed, and finally the roles of the partners in the ecosystem are elaborated upon. Furthermore, the description of the ecosystem is divided into the ecosystem of Sweden (section 4.1) and the ecosystem of Spain (section 4.2). These ecosystem are then compared to find differences and comparisons (section 4.3).

4.1. Findings Ecosystem Sweden

The findings of the ecosystem of Sweden are presented in this section. Here, the internal ecosystem processes are presented first, then the ecosystem strategy InnoEnergy Sweden has for its ecosystem is presented, and finally the findings on the different roles in the ecosystem is given.

4.1.1 Internal ecosystem orchestration processes

The first research sub-questions concern the functioning of the internal processes of the ecosystem. Several findings concerning the three internal ecosystem processes of knowledge mobility, innovation appropriability and network stability were found.

Concerning knowledge mobility, multiple interviewees stated there is no need for a common network goal, as the overall goal of improving the industry of sustainable energy is indirectly achieved. Furthermore, the interviewees mentioned they have their own goals they want to achieve, which do not necessarily have to be aligned with the goals of other actors. These interviewees state that a win-win collaboration is more important than having aligned goals. For example, one interviewee stated the following: *"It's really important when it comes to collaboration, some kind of win-win situation. […] don't necessarily need the shared goal. But it must be clear that it would benefit [the both of us]. [K]"* In regard of communication, the actors all mention a culture of cooperation, collaboration and high levels of trust. The interviewees mention this could be due to the Swedish culture, but it is also noted that it is very important to collaborate with the right partners that are also enthusiastic about the project at hand. Here also, the interviewees mention that trust mostly occurs based on functional competence. Specifically also, the interviewees mostly state that communication amongst partners is clear, transparent and open. Some state the high levels of bureaucracy to be an annoyance however, and state that contact with InnoEnergy can be confusing considering the various offices they have around Europe. Additionally, concerning the creation of new relationships, some interviewees emphasize that a difficult process of initializing a relationship with certain partners (for example, the accelerator program at InnoEnergy or the strict stage gate model used at a large company) builds a strong relationship, as the difficult initial steps require large amounts of commitment and time to overcome. This also makes it so that the partners use low formal communication methods as trust amongst partners is high. Some interviewees mention the use of an non-disclosure agreement in this regard to ensure information cannot leak. Furthermore, one high level manager at a knowledge institute notices that communication with industry partners is open and easy, but in the public sector this communication is constrained by politics, which constrains an honest and open conversation.

Regarding innovation appropriability, the interviewees mention that freeriding and leaking of information is either not present or not an issue. This is indicated by remarks such as: *"I'm sure there are [free riders].[…] Our main focus is to develop those platforms to have good cooperation with industry and researchers, that is what we focus on. […] if [free riders] benefit from what we've done, so be it. [AN]"* This due to the high levels of trust, commitment and involvement amongst the partners in

the ecosystem. Furthermore, in the thought of open innovation and communication sharing, various actors mention that they are indifferent whether information leaks out and might even encourage it to increase awareness of their product. In the case of low-tech innovations especially, it is mentioned that the difficulty lies in organizing and managing the different partners involved, rather than figuring out the technology. In the case of more high-tech innovations, some partners noted the use of IP protection to protect their technology, but also stated that no one knows their technology as well as they do. Furthermore, it is often mentioned that InnoEnergy employs a joint ownerships as value capture mechanism, as InnoEnergy is owns part of the companies. Also, one particularly important interviewee at InnoEnergy emphasized the need to focus on high Technology Readiness Level (TRL) projects, that are closer to being able to be commercialized, as InnoEnergy Sweden did not do this.

Concerning network stability, partners of InnoEnergy join the ecosystem for various reasons and through various means. Start-ups mostly look for funding, and the use of the network of InnoEnergy. In this regard, InnoEnergy is not yet positioned as European-wide network properly. Additionally, the smaller actors become part of InnoEnergy to gain some reputation and credibility, and find InnoEnergy either through recommendations or hear from them on fairs. Furthermore, specifically in the case of larger players in the network, they do not always see a need to become part of the network of InnoEnergy. InnoEnergy as of yet is not seen as a large player in the knowledge community industry, interviewees mention, and additionally the awareness and reputability of InnoEnergy is low. Here, one interviewee at InnoEnergy states that InnoEnergy can proactively build these relationships with large partners, as they are highly valuable, but that it takes a long time to achieve. Various interviewees mention that the value of large players in the network of InnoEnergy is paramount, as can be found in remarks such as: *"In order to reach the small start-ups, the small companies, you need to have the big shots on board. [AN]"* Also here, one interviewee at InnoEnergy mentioned the importance of having a small fee to be part of the network of InnoEnergy in order to ensure commitment to the project, and also states that emphasizing the specific value of operating on a European level is key. Moreover, several interviewees mention an initial base network, and specifically the inclusion of big companies, is important for more players to actively want to join the network: more players in the network increases the value of the network. A critical mass has not yet been reached in Sweden.

A summary of the influencing factors is given in table 4.1.1 below.

Influencing Factor	**Remark**
Knowledge mobility	Upsides: - Transparent, open and clear communication - IE is accessible - Trust amongst partners - Culture of collaboration - Win-win collaboration - TBB (Fair) Downsides: - No common network identity or aligned goals - Lack of a vision - Confusing who to contact/which department - Unclear what InnoEnergy is - Too much bureaucracy
Innovation appropriability	Upsides: - No freeriding or leaking of information - High trust and commitment

	Downsides: - Didn't focus high TRL technologies - No clear communication of value proposition - Difficult to connect start-ups with first clients
Network stability	Upsides: - Some variety of partners - Some influx of new start-ups Downsides: - Struggling a lot to create relationships with big partners - Not yet reached critical mass - Low awareness of InnoEnergy - InnoEnergy considered a small player

Table 4.1.1 Summary of up- and downsides of influencing factors of the internal ecosystem processes in Sweden.

4.1.2. Ecosystem Strategy

The following sub-questions to be answered concern the long term strategy InnoEnergy has for its ecosystem, and the perception of it by the partners. A common theme among all the interviewed CEOs of start-up companies is the reason for engaging in a partnership with InnoEnergy: funding. In the early, fuzzy years when starting a new company, the founders' main concern is financial survival. All five start-ups mentioned funding as main reason to engage in a partnership with InnoEnergy. Most of these start-ups did this by participating in the highway accelerator program InnoEnergy offers. This perception where InnoEnergy is most of all seen as investor is shared not only amongst the CEOs of the start-up companies, but also amongst other, larger actors in the network. These larger actors therefore mention they see no need to collaborate with InnoEnergy, as they don't require external investors to acquire more resources. These findings are supported by the interviewees done at InnoEnergy in Sweden. As of such, it is found that in the ecosystem of InnoEnergy in Sweden, the value proposition of the ecosystem and of InnoEnergy is not perceived similarly by InnoEnergy and partners in the network, or is not of particular interest to the partners of the network. Specifically also, a high level manager at InnoEnergy emphasized the need to focus on specifically high TRL (Technology Readiness Level) technologies, as these are ready for commercialization: *"Make your value proposition clear. That you're actually looking at the commercialization and later TRL stages instead of the research. [IE]"* This was not done properly however, the interviewee states, as they focused more on research and low TRL projects.

Additionally, several interviewees at start-up companies want to use the European-wide network of InnoEnergy to commercialize their products to a broader market. However, it was mentioned that this communication is somewhat confusing, as InnoEnergy Germany is used to address a broader market, whereas InnoEnergy Sweden is used for more administrative tasks concerning finance. Other partners did not consider this to be an important factor of InnoEnergy, stating that the network of InnoEnergy is not of high importance to them. The interviewees at InnoEnergy stated that the access to Europe can be of high value to some partners, and that InnoEnergy is the largest of its kind in this regard, giving large opportunities on a European level. This ecosystem that operates on a European level is a distinctly different type of ecosystem compared to an accelerator focusing on local companies, and should work as complementary to these local accelerators. As put by a high level manager at InnoEnergy: *"… position as a complement, where you can bring something extra to what the local players already do. That was one of the experiences we had in the beginning when we launched it in Sweden: we were*

definitely perceived as competitors. They were working against us, not helping us. […] With time, we could show that what we are bringing to the ecosystem is complementary. […] You need to be complementary and state that you are complementary. [IE]"

Specifically, it should be noted that mostly the large firms have or are developing specific strategies for their ecosystem partners, looking to form partnerships with specific partners that fit their strategic portfolio. The start-ups and SMEs noted that they attempt to form relations with partners as they need them.

A summary of the ecosystem strategy is given in table 4.1.2.

Influencing factor	**Remark**
Ecosystem Strategy	Upsides: - Focused more on lower TRL projects - Starts positioning as complementary to existing accelerators Downsides: - No early communicated ecosystem vision - No clearly communicated value proposition - No early communication of what InnoEnergy is - Only recently started focusing on late TRL projects - Originally positioned as competitor to local accelerators

Table 4.1.2. Summary of the up- and downsides of ecosystem strategy in Sweden.

4.1.3 Partner roles

The final sub-questions revolve around the roles partners can play in the ecosystem. In the ecosystem of InnoEnergy in Sweden, various partners play different roles and should be managed accordingly. Important here is the relevance of establishing connections with large companies, as they provide funding, networks, expertise and reputation. Interviewees at all levels mentioned the importance of connecting with large players, but also the difficulty of doing so as it is difficult to find the right people in a large company. The importance of finding the right person, and having personal chemistry with the person, to fill the role as broker and get the relationship rolling is not to be underestimated. As summarized by one interviewee*: "Some people you just get along with better. [SAF]"* Here also, building a strong and long-lasting relationship is important, where several interviewees mentioned the importance of setting long-term goals, and getting high commitment and involvement. The interviewees at InnoEnergy gave an initial estimate of 6-9 months in order to initiate a relationship with such a partner. Furthermore, it was mentioned at InnoEnergy that in Sweden they have failed to do this properly. An interviewee at a large company mentioned that in order for a relationship with InnoEnergy to grow, InnoEnergy would have to come with financially profitable projects to this large company and initiate this contact, as the company has enough projects at hand already and does not see the need to initialize more relationships.

Furthermore, having a university as partner is regarded as highly important by several interviewees. All start-up companies mentioned their origin lies in a research which originated at a university, indicating the relevance of the university in early stage development of new start-ups. Furthermore, it is difficult for universities to come in contact with the industry, but this connection is highly valued. This is mentioned by interviewees of several knowledge institutes. Fostering the relationship between industry and university is deemed as valuable, interviewees state. In this regard also, the triple helix model is often mentioned, in which the government is also involved in this collaboration. Here, the local government may play an important role in creating an environment for innovation to thrive.

A struggle start-ups experience is finding and connecting with the right customers. One CEO of a start-up company stressed the need to develop their product with the customer, being able to fine-tune their product to the customer's needs, but found it difficult to identify and connect with these partners. Some of these start-ups find these customers on fairs, such as the Business Booster organized by InnoEnergy, or different fairs. However, often even on these fairs it can still prove to be rather difficult to identify the right customer. Especially in the case of start-ups, the low credibility of the company makes it less attractive for larger companies to collaborate. Two start-ups noted they use the network of InnoEnergy to identify and connect with new customers, while the other partners mentioned they find other ways to do so. Some interviewees of start-ups mention a lack of proactivity from InnoEnergy in finding potential customers however. An interviewee at InnoEnergy however stressed the need to find and contact customers early, in order to identify their needs and adjust accordingly.

Finally, regarding who takes the role of a leader in the relationships or in the ecosystem, it is clear that these roles are not clearly divided amongst actors: only one actor mentioned they had to adjust to the other partners, whereas every other interviewee firmly stated they were the leading firm in negotiations. As of such, according to the interviewees, the ecosystem consists mostly of leading firms, not following firms.

A summary of the roles are given in table 4.1.3 below.

Role	Remark
Start-up	Role: - Need funding and a (European) network focused on this industry - Additionally gain free interns, credibility, and mentoring by joining the network - Provide to InnoEnergy: innovativeness, income, credibility through success stories Areas for improvement: - Don't help in connecting to first customer - Require more clarity from different InnoEnergy departments - Less bureaucracy
SME	Role: - Need mostly the (European) network, innovativeness through new projects, new interns - Provide to InnoEnergy: access to new partners, credibility, investment in market-ready technologies Areas for improvement: - Not enough proactivity in finding European partners - Better access to the network of IE
Large company	Role: - Co-Investor with InnoEnergy - Are close to other businesses - Provide to InnoEnergy: Funding, large networks, expertise, reputation and can be a first client for start-ups Areas for improvement: - Initiate relationships with (many) more large companies - Position InnoEnergy as different than only funding - Show value of InnoEnergy to large companies - Communicate a clear vision to these partners

Knowledge institute	Role: - Bring influx of new ideas for early stage development - Triple helix model is valuable, regarding the relationship between industry, university and the (local) government as an important factor for all parties to thrive. - Provide to InnoEnergy: start-up projects, technological expertise, access to a broad network of knowledge institutes and large partners, reputation Areas for improvement: - Initiate more relationships with knowledge institutes

Table 4.1.3. Summary of various ecosystem roles, their use in the ecosystem and areas of improvement in Sweden.

4.2 Findings Ecosystem Spain

Findings concerning the ecosystem of Spain are presented here. The order at which the results are presented are similar to the findings of the ecosystem of Sweden: first the findings on the internal ecosystem processes are presented, then the strategy InnoEnergy has for its ecosystem is given, and finally the findings on the roles in the ecosystem is given.

4.2.1 Internal ecosystem orchestration processes

Again, the first research sub-questions to be discussed concern the functioning of the internal processes of the ecosystem. Several findings concerning the three internal ecosystem processes of knowledge mobility, innovation appropriability and network stability were found.

Concerning knowledge mobility, several interviewees mention the importance of having a common ecosystem vision, even though the partners in the ecosystem are not working towards the same value proposition: *"… the vision, and the execution of the vision. The players inside need to believe in that and then make it happen. […] I believe in the ecosystem and the value of it. [IE]"* As of such, even though not all actors work towards the same value proposition, there is a vision that InnoEnergy wants to achieve amongst the partners of the network. Furthermore, also here the interviewees of various company types mention win-win collaborations to be essential. Additionally, the interviewees state that competitors still exist, but it has evolved from competition to 'coopetition', where competitors can still co-invest and share information with each other in order to gain insight in the latest trends. Also in Spain, the interviewees all mention a trusted, open and transparent relationship with other partners in their network. In this regard, the Spanish culture tends to be relational in nature according to various interviewees, which makes it easy to approach new partners. Being open, trusted and transparent is a relational matter in Spanish culture, interviewees mention. The interviewees state that communication often starts informal, and turns formal later on. The interviewees mention that the TBB fair of InnoEnergy is a great way to establish new relationships. Here, interviewees state meeting potential clients as big upside, as well as finding value in meeting other start-ups when running your own start-up. Specifically concerning larger partners, interviewees mention a trend towards opening up their businesses in order to stay innovative, making it easier to approach them these days. As downsides of communication with InnoEnergy, the interviewees of start-ups state the annoyance of bureaucracy at InnoEnergy, but mention there is no solution due to InnoEnergy using public money for funding: *"You can see that it is public money. […] I would expect more start-up friendly terms when you invest in a company. [FL]"* Furthermore, the interviewees of start-ups state a disconnect between InnoEnergy and co-investors, not using the same forms or communicating properly amongst each other. Whereas the interviewees state the team of InnoEnergy in Spain is accessible, transparent and enthusiastic about the ecosystem, some find it difficult to know who to contact in the company, and

find it hard to understand how the different departments of InnoEnergy function. Also, they find different performances of the various departments, and sometimes find that *there is a disconnect between these departments: "First of all, each unit is quite independent. Just because InnoEnergy Benelux made a deal with you, doesn't mean that InnoEnergy Iberia even knows. [FL]".*

Regarding innovation appropriability, interviewees of various roles state that freeriding and leaking of information is no problem, either due to the complexity of the field, the required commitment to the task, the use of IP or the ease of terminating a relationship with partners that are not committed. The importance of connecting clients to the start-ups is important, in order to actually turn a start-up into a profitable company according to both start-ups and new ventur*e creation specialists at larger companies: "… the most important thing for a start-up, well, getting the first customer and selling something and getting revenue. That's the best thing you can do. [ES]"* Contact with big partners is key here. Furthermore, various interviewees at InnoEnergy emphasize the need to focus on high Technology Readiness Level (TRL) technology start-ups, in order to have a higher chance of successfully capturing the value of the start-up, and capturing this value quickly. One interviewee from a large company speculates that the success of InnoEnergy in Iberia results from their capability to successfully launch various ventures in this sector, finding high TRL projects and linking them to the correct customers. Furthermore, it is often noted that InnoEnergy captures value by investing or by being a shareholder of a company. Concerning the access to the European market and to finding customers and partners for the companies that join the ecosystem, various interviewees of various roles state that InnoEnergy is not providing enough access to these partners, and state that IE lacks a sense of proactivity in this regard, making it difficult to sell products. This holds for SMEs and start-ups. Specifically also, it is noted that the resources InnoEnergy has to offer to its partners are not clear, as in which start-ups, companies or interns InnoEnergy has or has access to.

Concerning network stability, the non-negative growth rate of the ecosystem, it was found that also in the ecosystem of InnoEnergy in Spain partners join the ecosystem for various reasons and through various means. The start of a relationship is often informal and based on whether the people that start the relationship get along, according to several interviewees of various roles. As time progresses, these relationships can become more formal of nature. Start-ups here join mostly for funding and the network (specifically access to clients and to Europe), but also mention mentoring, free interns and credibility as important reasons for joining. Interviewees at SMEs mention InnoEnergy for mostly the network (access to Europe and to clients), but also to stay innovative by finding new projects to work on. Additionally, SMEs join the ecosystem for funding, reputation, and as stepping stone to other markets and investors. Interviewees at large companies on the other hand mention that they don't need funding or reputation from InnoEnergy, but can co-invest with InnoEnergy, gain access to new, cutting edge technologies to stay innovative, gain access to a European market and acquire highly educated students specific for the energy sector from the InnoEnergy education programs. Finally, the interviewees at knowledge institutes state they are mostly attracted to the ecosystem to bridge the gap between universities (students and academics) and the industry. Furthermore, they work together on academic courses, link several universities to encourage entrepreneurship (technical and business schools), create interns and new start-ups, and force companies to expand their horizon towards a more innovative view. Furthermore, in a more general sense of network stability, it is noted that a key critical mass of ecosystem partners is required for the ecosystem to automatically attract new partners, at which the influx of partners increases greatly, even to the point where partners should be actively constrained from entering the ecosystem at will in order to prevent the inability to maintain a relationship with all partners, according to a high level manager at one of the knowledge institutes who noticed this in a different ecosystem he helped construct. Here in Spain, it is mentioned that this critical mass has still not been reached. However, several large companies have been attracted and

the ecosystem is growing still. Here, an interviewee at InnoEnergy mentioned the importance of having a pipeline of potential partners to join the ecosystem.

A summary of the influencing factors is given in table 4.2.1 below.

Influencing Factor	Remark
Knowledge mobility	Upsides: - Transparent - Open and clear communication - IE is accessible - Trust - Clearly communicated ecosystem vision - Relational culture - Coopetition - Win-win collaboration - TBB (Fair) Downsides: - Don't know who to contact in IE - Lack of interaction between IE departments and between IE and different investors - Ambiguity on the value proposition of InnoEnergy - Too much bureaucracy
Innovation appropriability	Upsides: - No freeriding or leaking of information - High trust and commitment - Open innovation in big companies - Later on focused on high TRL projects - Large amount successfully started ventures Downsides: - Not enough access to big partners or effort to find first client for start-ups - Unclear what resources InnoEnergy has to offer or what contacts InnoEnergy has access to
Network stability	Upsides: - Great variety of partners - Pipeline of new potential partners - Some access to big companies - Influx of new partners Downsides: - Not yet reached critical mass - Somewhat struggling to find access to big partners

Table 4.2.1 Summary of up- and downsides of influencing factors of the internal ecosystem processes in Spain.

4.2.2 Ecosystem Strategy

Several remarks concern the strategy of InnoEnergy for the ecosystem, both as implemented by InnoEnergy and as perceived by its partners. It is emphasized by several interviewees at InnoEnergy to

focus on high TRL technologies, as these have higher chance of commercialization, and it is a niche market in the funding industry to be filled. Furthermore, these interviewees emphasize on the need to have a clear vision on the company, to believe in this vision, and to communicate this vision clearly to all partners in the network. This aids in finding partners that suit this vision, as well as allowing the partners and InnoEnergy to conjointly find ways on how to achieve this vision. Here, it is important to be flexible and adaptable when filling in how to achieve this vision. Having transparent, free, and easily accessible communication flows is necessary in this context, in order to build trusted relationships. Also, the interviewees state that it is key to present InnoEnergy as having access to a European-wide network, while staying specifically focused on accelerating the field of sustainable energy by investing in high TRL projects.

Interviewees at InnoEnergy Iberia mentioned that the early lack of clarity around their company slowed down the progress of the ecosystem, and it required the cutting off of relationships with partners that did not actually align with their true vision. One particular interviewee of a large company stated as soon as the interview started that an ecosystem approach is not the correct term to study InnoEnergy, later on stating that all factors of InnoEnergy are of low importance, except for the funding of high TRL start-ups: *"Yes, InnoEnergy can bring me in contact with other companies, but I do not value this. I could take other ways to get in touch. […] The main motivation for us is to get access to this funding [of high TRL projects]. […] Other partners are more or less the same. […] I'm not sure this is an ecosystem. [TEC]"* This specific sentiment is not shared with other interviewees, but some interviewees do state that the various departments European-wide being responsible for certain tasks makes it more difficult to know which department is responsible for which aspect of InnoEnergy (e.g. InnoEnergy Germany is responsible for some aspects of business development, but this is unclear). Some note the wide spread of InnoEnergy amongst various departments and the virtual nature that comes with this as reasons.

A summary of the ecosystem strategy in Spain is given below.

Influencing factor	**Remarks**
Ecosystem Strategy	Upsides: - Identified vision of InnoEnergy Spain which is a bit more clearly communicated to the ecosystem partners - Focus on high TRL projects - Positioned as European-wide ecosystem with focus on sustainability, thus complementary Downsides: - Early on a lack of clarity, slowing down progress - Still some partners that see InnoEnergy as only responsible for funding, so vision still not fully communicated - Lack of identity amongst InnoEnergy Europewide - unclear which InnoEnergy department is responsible for which aspects

Table 4.2.2. Summary of the up- and downsides of the ecosystem strategy in Spain.

4.2.3 Partner roles

The final sub-questions revolve around the roles partners can play in the ecosystem. Like in the ecosystem of InnoEnergy in Sweden, also in Spain various partners play different roles and should be managed accordingly. Here again the importance of establishing connections with large companies is emphasized upon, as they provide funding, networks, expertise, reputation and can be a first client

according to various interviewees of different companies. However, here it is mentioned that it may have been difficult to build a relation with a large company in the past, as of now the companies are opening up more and more to stay innovate and relevant in the changing field of sustainable energy. Here also, interviewees state that finding a person that can fill the role as a broker is important. In contrary to Sweden, here interviewees at InnoEnergy have mentioned they have succeeded in finding connections with some large partners, due to some financially profitable projects and due to a change in culture where large companies are opening up to stay innovative: *"I think many of them now are approaching the innovation challenge with an open innovation approach. And they know we have an ecosystem with a lot of small companies, it's interesting for them. [IE]"* One partner stated the mere value of InnoEnergy was their funding scheme, and also stated the influence of InnoEnergy on their company was weak. However, other large companies stated they found InnoEnergy to be highly valuable in the sense of being an access route to the European network, to talented master students and to find new project ideas and technologies. As of such, these aspects should be emphasized upon, along with a clearly communicated vision, when attempting to reach these large players.

Partnerships with knowledge institutes are regarded as highly important. Start-ups mentioned they originate from ideas coming from universities, and then participate in the highway program by InnoEnergy for commercialization. Additionally, interviewees at universities mention they are involved in the education programs of InnoEnergy. Furthermore, interviewees at both knowledge institutes and at InnoEnergy mention that InnoEnergy can provide a link between the universities and the industry, through both their own students and the students of universities. Specifically here, the interviewees at various knowledge institutes mention they have access to large networks of other institutes, but wish to be more intertwined with big industry partner. InnoEnergy can be a gateway for this purpose, gaining both large partners and knowledge institutes for their ecosystem according to these interviewees. In Spain, whereas some interviewees at InnoEnergy mention the need to involve municipalities and their government, other actors believe their government does more harm than good: *"If the politicians could influence our companies we would have been bankrupt years ago. [RB]"*

SMEs can provide a different value to the ecosystem compared to the other partners. Interviewees of SMEs state they don't need InnoEnergy for their reputation, and are already a running and profitable business. Although funding can still be important to them, mostly the network, access to Europe and new, innovative projects are valuable to SMEs according to the interviewees. In turn, they already have set up some sort of network on their own, which can be integrated in the network of InnoEnergy. Additionally, these SMEs are already profitable, so investments in them are relatively safe.

Start-ups often struggle mostly with finding funding and finding a first customer according to interviewees at InnoEnergy and start-ups. Connecting with this first customer is a key aspect InnoEnergy should focus on, however interviewees at start-ups mention this could be done better. InnoEnergy is considered an expensive funding source by them, but as they fill the gap of funding high TRL technologies they are still used as funding source. Additionally, the promise of providing a European-wide network focused on specifically the sustainable energy sector is an attractive aspect for start-ups to still join this highway program according to these interviewees. Additionally, they mention that free interns, credibility and mentoring are different reasons for start-ups to join the ecosystem of InnoEnergy. These start-ups and their success are important for InnoEnergy, both financially as they are shareholders, and for their reputation. Several interviewees have stated that InnoEnergy should use these success cases of start-ups that InnoEnergy accelerated to market to promote InnoEnergy. Furthermore, these start-ups are a key selling point for building relationships with other SMEs and large partners according to various interviewees, as they require innovative projects from start-ups to stay innovative: *"… because we were not really participating in innovation*

projects. This has been really interesting to us, to open up for us a new option of activity which we were not really considering. [PA]"

A summary of the partner roles in Spain is given in table 4.2.3.

Role	Remarks
Start-up	Role: - Need funding and a (European) network focused on this industry - Additionally gain free interns, credibility, and mentoring by joining the network - Provide to InnoEnergy: innovativeness, income, credibility through success stories Areas for improvement: - Somewhat hard to connect to first customer - Require more clarity from different InnoEnergy departments - Need more help on the business side - Less bureaucracy
SME	Role: - Need mostly the (European) network, innovativeness through new projects, new interns - Provide to InnoEnergy: access to new partners, credibility, investment in market-ready technologies Areas for improvement: - Not enough proactivity in finding European partners - Better access to the network of IE
Large company	Role: - Need innovativeness through new projects and cutting edge technologies, students from IE master programs, ability to co-invest in relevant start-ups - Are in the trend of opening their businesses to the outside world - Provide to InnoEnergy: A co-investor for start-ups, a first customer for start-ups, reputation, access to a large network of partners, companies for interns to work at, access to expertise, help with academics Areas for improvement: - Unclear who to approach in IE - Sometimes unclear what IE actually does - Hard to initialize a relationship
Knowledge institute	Role: - Bring influx of new ideas for early stage development - Academic expertise, also for InnoEnergy education programs and for technologies - InnoEnergy is the gateway between academics and industry

- Provide to InnoEnergy: start-up projects, technological expertise, intertwined education programs, access to a broad network of knowledge institutes and large partners, reputation

Areas for improvement:
- IE can be hard to grasp, too 'virtual' and lacks an overarching identity
- No trust in government, so working together with municipalities in this area is difficult

Table 4.2.3 Summary of various ecosystem roles, their use in the ecosystem and various areas of improvement in Spain.

4.3 Comparisons between Spain and Sweden

The ecosystem of InnoEnergy in Spain is considered to perform better compared to the ecosystem of Sweden, as big partners were attracted to the ecosystem. This has not yet been accomplished in the ecosystem of Sweden. Here, the differences as found in the results are outlined. A summary of the various influencing factors, the ecosystem strategies and the partner roles of both Spain and Sweden is given in Appendix E. The most notable findings when comparing the ecosystems are elaborated upon in this section. Specifically, this concerns the positioning and communication of a clear value proposition to the partners of InnoEnergy (ecosystem strategy), the different needs and gains of attracting specific partner roles, and the internal ecosystem orchestration processes.

There are several important findings when comparing between the ecosystems of Spain and Sweden, that have far reaching effects. The ecosystem of Spain has early on chosen to position themselves with a vision of a widely varied European-wide network, focused on accelerating the industry of sustainable energy by focusing on aiding high TRL projects. This vision was identified earlier on, and thereafter with the partners they had acquired filled in how to work towards this vision. In the earliest, fuzzy stages of InnoEnergy this was not yet made clear, and these times were not fruitful for InnoEnergy in Spain. Later on, the vision was made more clear, the right partners were more easily found and attracted to the ecosystem of InnoEnergy. On the contrary, the ecosystem of Sweden has not set and communicated a clear vision towards their partners. As of such, it is unclear to other partners in Sweden what InnoEnergy is and why they would need to be a part of the ecosystem.

This difference in vision leads to some unwanted influences on the functioning of both ecosystems. Attracting the wrong kind of partners (e.g. low TRL start-ups with high risk of failure, companies that do not belong to the sustainable energy sector) and then having to cut off these relationships, or being unable to contact valuable partners (universities, big companies) is more present in the ecosystem of Sweden compared to the ecosystem of Spain. The lack of clarity on the value proposition of InnoEnergy makes it hard to attract the correct partners, as they do not see a reason for joining. It is regarded as essential to have a variety of partners in the ecosystem that fill their own specific role, and in order to attract these partners some form of added value suited for this specific partner needs to be clear. In turn, when it clear what value these partners gain from joining the ecosystem, these partners can provide their value to the ecosystem as well. It can be seen that particularly big companies and knowledge institutes in Spain provide more value to the ecosystem and gain more out of the ecosystem than those in Sweden. In Spain, it is mentioned that big partners are likely to seek for innovative projects, new interns and students, or the ability to co-invest, compared to the big partners in Sweden which mostly seek to (co-)invest. Furthermore, knowledge institutes are more intertwined in the academic world of InnoEnergy in Spain by setting up academic courses together, as well as allowing InnoEnergy to be a bridge between the academic world and the industry. Additionally here, it is often

noted that positioning as complementary to the local accelerators by providing a European network and a network specific for sustainable energy is highly important, as InnoEnergy can avoid competition in this fashion and work together with these local accelerators. This was more prevalent in the ecosystem of Spain. Furthermore, in Spain the importance of having a pipeline of potential partners joining the ecosystem, in order to eventually reach critical mass, was emphasized upon by an interviewee at InnoEnergy. This critical mass has not yet been reached in either Spain or Sweden however. Also, considering the value capturing aspect, InnoEnergy in Spain is considered to be more successful than InnoEnergy in Sweden. The specific focus on high TRL start-ups and being more able to connect them to clients enables InnoEnergy in Spain to successfully commercialize more ventures, accumulating a better reputation and gaining more revenue in Spain.

Contrarily, the ecosystem of Spain does not seek to involve the government as much as the ecosystem of Sweden. This is attributed to a lack of trust in the government in Spain, compared to more trust in the government in Sweden.

The results show some similarities between the ecosystems as well. Concerning knowledge exchange in both ecosystems is based on trust, and communication is transparent, open and clear, and based on collaboration. However, it is said that in Sweden this comes from functional relationships (communication and trust is good when functional competence is present), compared to Spanish relational relationships (communication and trust because a partnership works on a relational level). Here also, most partners find the amount of bureaucracy to be an annoyance. Additionally, concerning innovation appropriability, it seems that freeriding and leaking of information is not really a problem in these ecosystems, partly due to IP protection, but mostly because of trust, and the complexity and commitment required to work in this field. Concerning network stability, both ecosystems have trouble attracting big partners (although Sweden has this to a much bigger extent than Spain), and have not yet been able to achieve critical mass. Furthermore, it can be found that in both ecosystems partners find that it is unclear which department of InnoEnergy is responsible for what aspect, that it is unclear who to contact at InnoEnergy and that communication amongst the departments seems to be lacking sometimes. This can cause confusion amongst partners on the transparency and accessibility of the company. Finally here, it seems that it is not always clear which resources InnoEnergy has to offer (e.g. interns, network, funding) to their partners.

The comparative case study was done in order to gain insight in how the ecosystems of InnoEnergy Sweden and InnoEnergy Spain work in practice, and to understand what aspects of the ecosystem is performing appropriately, and what is not working so well. Reflection on the practical findings using the theoretical background in order to derive ways for improvement and recommendations for the InnoEnergy Benelux is described in chapter 5, ‘Discussion’.

5. Discussion

5.1 Discussing the findings

The purpose of this study was to understand the endogenous factors that influence an ecosystem, and how to manage these endogenous factors during the construction and management of an ecosystem. In this research, a literature study was performed to gain insight in this matter (section 2), along with a comparative case study of the ecosystems of Spain and Sweden (section 4), using the qualitative approach of interviewing. The research question of this study, as formulated in section 1.3, is as follows:

"What ecosystem strategy can InnoEnergy employ in order to create and orchestrate an ecosystem in which the creation and capturing of value is stimulated in order for the ecosystem to be sustainable?"

In order to answer this question, several sub-questions were set-up as guideline. From a literary perspective, these sub-questions have been answered in chapter 2 and summarized in section 2.5. The research sub-questions concerning the practical perspective were answered in section 4. In this section, the practical and theoretical perspectives are integrated in order to draw a conclusion to the research question.

5.1.1 Internal ecosystem processes

The first research sub-question that will be discussed is the following:

"How do the internal processes in the ecosystem of InnoEnergy function?"

Considering the three internal processes of knowledge mobility, innovation appropriability and network stability (Dhanaraj & Parkhe, 2006), several interesting findings were made. For clarity reasons, in table 5.1.1 a summary of the internal processes and their influencing factors as found in the literature is given. Tables including the percentages of times interviewees mentioned a specific factor that influences an orchestration process as being important to that ecosystem is shown in Appendix D.

ORCHESTRATION PROCESS	INFLUENCING FACTORS
KNOWLEDGE MOBILITY	Knowledge absorption; network identification; interorganizational socialization; cooperation; commitment; trust; transparency; formality; effective listening, paying attention to others & being understanding
INNOVATION APPROPRIABILITY	Trust; procedural justice mechanisms; joint asset ownership; communication; commitment; cooperation vs competition; formality vs informality; freeriding; being fair and neutral towards all partners; entrepreneurial skills; communication of a clear vision
NETWORK STABILITY	Credibility; multiplexity; long-term goals; focal firm reputation, interest and motive; clear goal and vision; individual competences to persuade and influence new partners to join the network

Table 5.1.1. Summarization of influencing factors of orchestration processes.

Findings suggest that knowledge mobility is important for locating new clients and partners, finding new technological projects, exchanging expertise and expanding the network. Communication often happens openly and transparently, and collaborations are based on trust in both ecosystems. Trust in Sweden however has a different nature compared to trust in Spain, as in Sweden relational trust is more based on functional competence, whereas in Spain relation trust comes from relational

compatibility. Regarding innovation appropriability, it was found that joint ownership is a common practice to capture the value of the network: investing in start-ups and co-investing with different investors were the way relationships with start-ups were built. Also, it is important that bridging first customers to start-ups is key to capture the value in the network, which is difficult in the ecosystems of InnoEnergy. The ecosystem of Spain performed better in this regard, as they were able to commercialize more projects. Finally, regarding network stability it was found that being able to attract new partners, and to attract the right partners, is an invaluable asset to an ecosystem. Having incoming partners with a wide variety of roles (e.g. large company, start-up, knowledge institutes) was found to be key to the success of the ecosystem. The ecosystem of InnoEnergy Spain performs somewhat better in this regard compared to the ecosystem of Sweden, as Spain was able to attract big partners, which are highly valuable to the network. In the ecosystem of Sweden, this was not yet accomplished.

More specifically, concerning knowledge mobility, in the ecosystems of InnoEnergy the communication was often regarded as clear and transparent, and relationships are found to be based on commitment and trust. Choosing the right, committed partners is often regarded as a key aspect here. As presented in the findings section and as supported by data analysis in Appendix D, it is found that the influencing factors 'trust', 'cooperation', 'transparency', 'knowledge absorption', 'commitment', 'formality, 'interorganizational socialization' and 'network identification' have been found to be present in the data set regarding knowledge mobility in the ecosystems. Specifically here, 'trust', 'cooperation', 'commitment' and 'transparency' seem to be a requirement for a relationship to even manifest, or would otherwise be cut off. 'Knowledge absorption' in this matter helps specifically in gaining new (technical) expertise. The amount of formality changes as the relationship progresses, often starting informal and gradually becoming more formal as time progresses and agreements on the division of value are being made. 'Interorganizational socialization' is found to be an asset in finding new, innovative projects and finding potential clients. Furthermore, a clear network identification was found to be key to identify which partners are valuable to the ecosystem, and helps clear confusion amongst partners in the network. Both ecosystems seem to have relationships that are based on trust, cooperation, commitment and transparency, however it was found that the underlying cultural process is different. As stated in the findings, in Sweden, relationships have a more functional nature, and partners are more trusted when they are competent in their work. In Spain however, relationships are based on compatibility between partners: they want to be partners when they like each other.

Regarding innovation appropriability, it was found that often InnoEnergy uses shared ownership to capture some value that is being generated in the network. Furthermore, to capture the value that is generated in the network, it is highly important that high TRL projects are connected with a first customer. Findings suggest that these partners of high TRL projects and being able to connect them with the right partners is tightly linked to the communication of a clear vision. The ecosystem in Spain was able to execute this aspect of the ecosystem processes better than the ecosystem of Sweden, as the ecosystem in Spain was able to commercialize more start-ups. Sweden focused on lower TRL project instead. In both ecosystem it was found that partners are often committed to the projects, and are trusted members of the ecosystem. It was found that these partners are only acquired when they are trusted and committed, or are otherwise omitted. Finally, some partners speak of "coopetition", where some amount of collaboration occurs with competitors (knowledge sharing, co-investing). As presented in the findings section and as supported by the analysis as shown in Appendix D, the influencing factors 'trust', 'joint asset ownership', 'communication', 'commitment', 'cooperation vs competition', 'formality vs informality' and 'communication of a clear vision' concerning innovation appropriability were found in the ecosystems of InnoEnergy.

Finally, network stability was found to play a key role in forming a successful ecosystem. The ability to attract a wide variety partners, including big companies, is a key component of the success of the ecosystem of InnoEnergy in Spain. This follows directly from a clear vision that the team believes in. The ecosystem in Spain is able to attract this wide variety of partners, including big partners, by identifying and providing value to each partner. In Sweden, this was not as apparent due to a lack of network identity and being unable to identify and communicate what value InnoEnergy can deliver to these partners. Furthermore, the credibility that new companies gain by being part of the ecosystem and the reputation of InnoEnergy itself is a key factor to attracting new partners. Being able to attract partners and set long term goals with them is key. As shown in the findings and as supported by tables in Appendix D, the influencing factors of 'a clear goal and vision', 'credibility', 'focal firm reputation', 'interest and motive' and 'long term goals' were found in the ecosystem. Furthermore, the provision of the clear value of joining the ecosystem for a potential partner is essential in forming a new relationship. Additionally, it seems that commitment is an important factor to keep partners in the ecosystem. This commitment can be enhanced by a small monetary fee from InnoEnergy.

These findings suggest that these three internal orchestration processes do influence the innovative output of the network, providing further support for the model as proposed by Dhanaraj & Parkhe (2006), which was still lacking (Jacobides, Cennamo & Gawer, 2018). Furthermore, the findings are supported by Ritala, Armilla and Blomqvist (2009), who state that in order to promote knowledge mobility and innovation appropriability, the communication of a vision and trust is essential and find that open and transparent communication is highly valuable in an ecosystem. Additionally, the findings support earlier research that suggest that in order to attain network stability, ecosystem vision is a key factors (Ritala, Armilla and Blomqvist, 2009).

5.1.2. Ecosystem strategy

The subsequent research sub-question revolves around the strategy of managers at InnoEnergy for the orchestration of the ecosystem. Ecosystem strategy encompasses the long term plan of a focal firm concerning the ecosystem environment it is involved with. The sub-question is as follows:

What strategies do managers at InnoEnergy employ for the ecosystem they work in?

Concerning the ecosystem strategies that managers have employed for the ecosystem they are orchestrating, practical findings indicate that the strategy approach in the ecosystem of InnoEnergy in Spain was somewhat superior to that of the one in InnoEnergy Sweden. Specifically here, in Spain, after some time a vision was identified, and communicated to (potential) partners. This vision is the acceleration of the sustainable energy field, by setting up a European-wide network of involved partners in order to commercialize high Technology Readiness Level projects. This vision has three key components: the field of *sustainable energy*, a *European-wide* network, and commercialisation of *high TRL* projects. By focusing on the field of sustainable energy, InnoEnergy can identify clearly which partners are relevant to the ecosystem. Furthermore, by positioning InnoEnergy as a niche company in this field, they can provide better expertise on the matter compared to potential competitors. Additionally, by positioning themselves as European-wide network, they can be complementary to local players, and provide a distinct value to various kinds of partners in the ecosystem. Finally, by commercializing specifically high TRL projects, InnoEnergy fills a specific niche market, and has a higher chance of capturing the value of the project. InnoEnergy Spain communicated this vision more clearly, and was able to position themselves as complementary. The value they provide to the different partners is also more clear this way. In Sweden, struggles with forming partnerships arise due to the lack of this vision. Wrong start-ups were attracted (low TRL projects, or projects that were not entirely in the sustainable energy field), and difficulties arose in attracting big companies as they did not see a

real value in building this relationship with InnoEnergy. Furthermore, tapping into the European-wide network as partner from InnoEnergy in Sweden was regarded as difficult.

These findings shed new light on claims from Adner (2017), who states that in order to properly employ an ecosystem strategy the value proposition should be regarded as central component of the ecosystem, and to thereafter find partners that fit this value proposition. In this ecosystem however, the central component of the ecosystem is the ecosystem vision, rather than a common ecosystem value proposition. Furthermore, the results are similar to findings by Ritala, Armila and Blomqvist (2009) and Dhanaraj and Parkhe (2006), who state that a clear ecosystem vision is key for the promotion of knowledge mobility and innovation appropriability and for attaining network stability. Additionally, Dedehayir, Mäkinen & Ortt (2018) suggest that attraction of the right partners is essential in ecosystem birth phases in order to properly transition into later expansion stages, which was also found in this study.

5.1.3. Partner roles and their alignment

Finally, the final sub-questions revolve around the alignment of the roles partners play in the ecosystem and what roles partners actually play in the ecosystem. The corresponding research sub-questions are:

How are the interests of the partners in the ecosystem being aligned? What roles do the various partners play in the ecosystem and how do these roles allow InnoEnergy to create and capture value in the ecosystem?

Considering the alignment of interests of partners, it is found that the ecosystem does not follow one clear goal that at one point is achieved, but rather follows a general vision of accelerating the field of sustainable energy. As of such, relationships in both ecosystems are not made in order to achieve some joint value proposition, but are rather formed based on win-win collaborations. The alignment of partners in the ecosystem is enabled by clearly showing and providing the added benefit of joining the ecosystem to each different type of partner, which literature states is the main activity of an orchestrating firm (Adner, 2017). Followingly, these partners align their interest by working conjointly on several activity areas. As of such, the effectiveness of the ecosystem grows as more partners enter the network (reach critical mass), and specifically a wide variety of partners. The roles the various partners play in the ecosystem is thus intertwined with their interests. In this regard, start-ups and SMEs gain from the ecosystem by finding first clients, funding, expertise, reputation, and access to a big network, and they provide value by successfully selling their products and giving the ecosystem reputation when they become a success story. Big partners are looking to stay innovative, find new human capital by gaining access to new interns and students, gain access to a European-wide network, and gain the ability to co-invest. They provide reputability to the ecosystem, a large network, large amounts of resources and expertise, first clients for the start-ups and a way for academia to enter the industry world. Knowledge institutes provide expertise, a large network, reputation and students to the ecosystem. They seek to spin-off the knowledge they have acquired, to set up academic courses together, and need a bridge between the academic world and the industry. By clearly communicating the value the different partners gain and provide by contributing to the ecosystem, it becomes possible to attract these partners and align the interests of the various partners that are involved by working on projects together. A summary of the value the various partners roles can provide to other specific partners in the ecosystem, and thus also what value other partners gain by being part of the ecosystem, is provided in table 5.1.2. Notably here, the interactions between partners of the same role (e.g. start-up with other start-ups, large companies with other large companies) has not been analysed fully and is therefore not included. A specific table showing more clearly wat InnoEnergy gains from and provides to each partner in the ecosystem is given in table 5.1.3.

↓ Role that provides value	Role that captures value → START-UP	SME	LARGE COMPANY	KNOWLEDGE INSTITUTE	INNOENERGY
START-UP	-	- Innovative-ness - Latest trends	- Innovativeness - Latest trends	- Turn knowledge into real application	- Income - Success stories - Innovation
SME	- Funding - Network	-	-	-	- Income - Network
LARGE COMPANY	- First client	- Credibility - Collaboration	-	- Influence - Resources - Expertise	- Credibility - Income - Influence - Resources - Projects
KNOWLEDGE INSTITUTE	- Ideas	- Human capital	- Human capital - Latest trends - Knowledge - Network	-	- Ideas for start-ups - Education - Credibility
INNOENERGY	- Funding - Reputation - Network - Consultancy	- Funding - Reputation - Network - Human capital	- Funding - European Network - Access to innovation - Human capital	- Link between academics and industry - Aid with education	-

Table 5.1.2. Overview of the value the various partners provide and gain by being part of the ecosystem.

	Start-up	SME	Large company	Knowledge institute
InnoEnergy gains	- Income - Success stories Innovations	- Income - Network	- Credibility - Co-investment - Influence - Resources - Projects - Income	- Ideas for start-ups - Education - Credibility
InnoEnergy provides	- Funding - Reputation - Network - Consultancy	- Funding - Reputation - Network - Human capital	- Funding - European network - Access to new innovations - Human capital	- Bridge between academics and industry - Aid with education programs

Table 5.1.3. Specific overview of where InnoEnergy gains and provides specific value.

Specifically here, the overview on different ecosystem roles and their activities during ecosystem genesis as provided Dedehayir, Mäkinen & Ortt (2018) (see figure 5.1.1) is not entirely supported in this ecosystem. The overview provides various roles that can be fulfilled in the ecosystem, making it a

valuable asset. However, it is clear that one actor in the ecosystem can fill various roles as provided in this overview, making the practical usability of the overview unclear (e.g. InnoEnergy is both the ecosystem leader as the sponsor, large companies can be both a user and an ecosystem leader). Additionally, no support for the specific activities during specific phases of the shaping of the ecosystem is found. For example, at all times are partners attracted and linked to the ecosystem, is value being created and captured, are the resource flows orchestrated, is expertise being given, and is knowledge being generated.

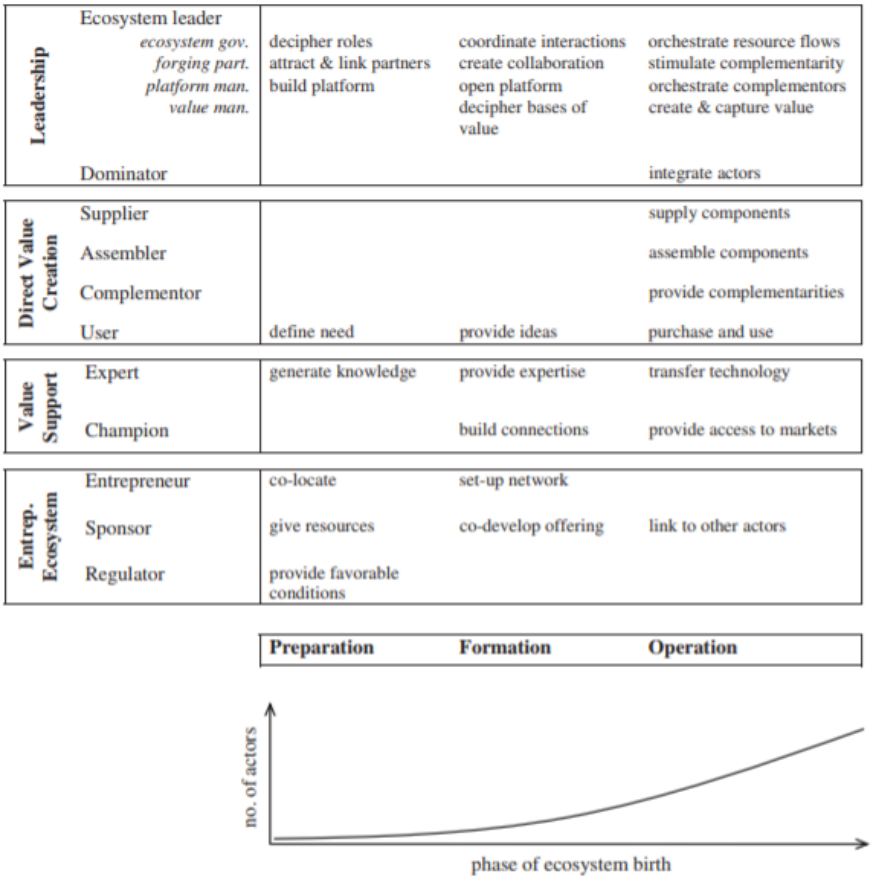

Figure 5.1.1 Roles and activities in an ecosystem during the early phases of ecosystem development (Dedehayir, Mäkinen & Ortt, 2018).

5.2 Conclusion

5.2.1. Answering the research question

The research question of this study is as follows:

"What ecosystem strategy can InnoEnergy employ in order to create and orchestrate an ecosystem in which the creation and capturing of value is stimulated in order for the ecosystem to be sustainable?"

Based on a theoretical review and a comparative case study, it was found that InnoEnergy should focus on three aspects: the overall *strategy* InnoEnergy has for the ecosystem, the *roles* the various partners can play, and the management of the *internal processes* of the ecosystem. These aspects are intertwined with each other. An overview of these findings is provided in figure 5.2.1, with the arrow indicating the relation between these aspects. These three aspects and their relations are now

discussed, along with specific recommendations for InnoEnergy. The specific recommendations are derived from practical findings in this study.

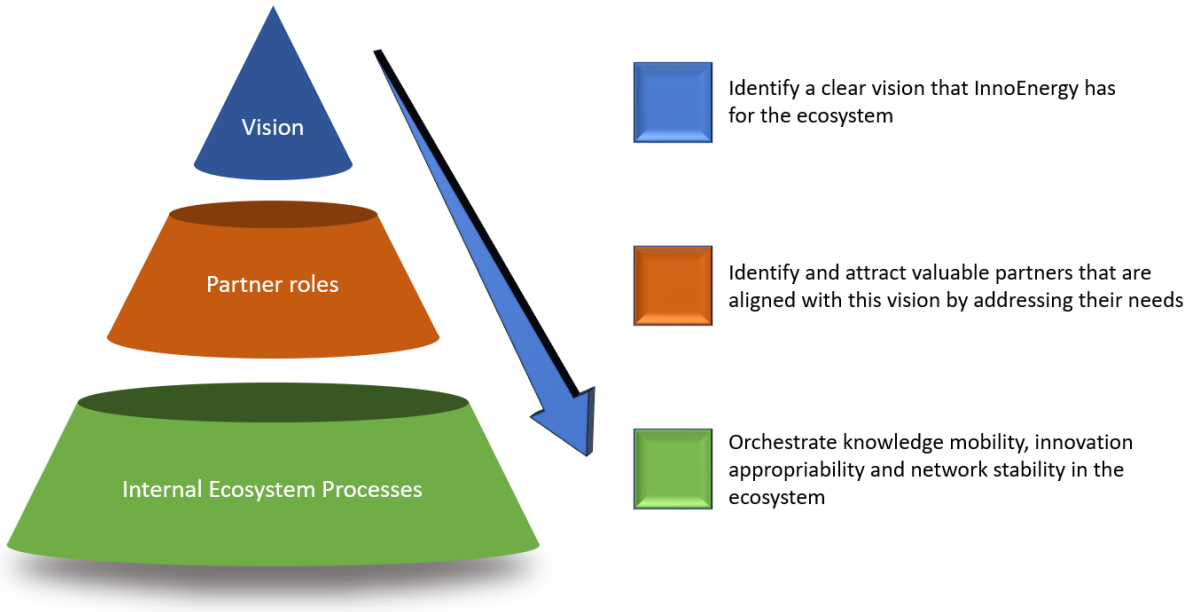

Figure 5.2.1. Overview of the concluding findings.

1. *Identify a clear vision that InnoEnergy has for the ecosystem.*

Considering the overall strategy InnoEnergy has for the ecosystem, practical findings suggest it is paramount for InnoEnergy to first identify a clear vision for the ecosystem. Here, it was found that the vision of the ecosystem should be positioned specifically around three aspects: the field of *sustainable energy,* a *European-wide network,* and the commercialization of *high TRL projects.* This vision allows InnoEnergy to identify, select and attract the appropriate partners that are able to contribute to the ecosystem of InnoEnergy based on the *field of sustainable energy*. Also, it allows InnoEnergy to be positioned complementary to local accelerators and provide distinct value to partners by focusing on a *European-wide network*. Furthermore, InnoEnergy is able to commercialize projects quicker and with higher chance of success by focusing on the commercialization of specifically *high TRL projects.* The vision InnoEnergy has for the ecosystem should be clearly communicated to the partners in the ecosystem. The perceived network identity by partners in the ecosystem should be aligned with the vision InnoEnergy has in mind for it.

2. *Identify and attract (potential) partners and the specific value these partners provide to and require from the ecosystem.*

By having identified a clear vision of the ecosystem, the right partners and the right partner roles that are in alignment with this vision can be identified and attracted. Furthermore, due to the clear positioning of the ecosystem of InnoEnergy, a distinct value when joining the ecosystem can be provided to each potential valuable partner. Table 5.1.2 shows an overview of where specifically each partner role can provide value to other partners in the ecosystem, and what each partner role could want from the ecosystem, as was found in practical findings. A different overview is provided in figure 5.2.2, showing where a specific overall partner role can create or capture value. The needs a partner has and benefits a partner provides should be considered for each partner specifically in order to

identify whether this partner is valuable to the ecosystem and, if so, how to attract this partner. Specifically, InnoEnergy should identify valuable partners in alignment with the vision, and attract a wide variety of these partners in the various partners roles by the specific needs these partner have. By doing so, the interests of the partners can be aligned properly (i.e. being able to connect a partner value need with a different partner value supply). Here, the relation between the identification of a clear vision and the identification and attraction of (potential) partners becomes clear: the clear vision enables the identification and attraction of these partners, and consequently allows the alignment of these partners.

3. *Orchestrate the internal ecosystem processes: knowledge mobility, innovation appropriability and network stability.*

Thirdly, InnoEnergy should properly orchestrate the three internal ecosystem processes. The orchestration of these processes is enabled by having a clear ecosystem vision and having the correct partners in the ecosystem. For each internal ecosystem process, a recommendation is given, based on both practical findings and theoretical findings. An overview of this is shown in table 5.2.1. for network stability it was found that being able to identify the needs of the various partners in the network and finding a way to meet these various needs is key to attracting new partners. A strong network identity is key to finding these new partners and to show them what specific value the network of InnoEnergy can provide. Concerning innovation appropriability, specifically the link between start-ups and large companies was found to be important, as large companies can be first clients for start-ups. Concerning knowledge mobility, enabling trust, openness and clarity amongst partners is key. Finally, concerning the roles the various partners play in the ecosystem, it should be noted that each type of partner has a different value proposition, and thus a different interest for joining the network. They also provide distinct values to the network. As of such, each type of partner should be managed according to their interest, and aligned with other partners that might benefit from that relationship in a win-win setting.

By doing so, InnoEnergy will be able to attract a wide variety of partners that are necessary for the ecosystem to thrive and for InnoEnergy to be able to create and capture the value that is generated in the ecosystem.

INTERNAL ECOSYSTEM PROCESS	RECOMMENDATION	KEY FACTORS FOR SUCCESS
KNOWLEDGE MOBILITY	Build relationships based on trust, with open and clear communication.	- Attract *committed* partners in alignment with the ecosystem vision - Form relationships informally that turn into formal relationships later - Ensure the right partners are attracted that are trusted, make sure communication amongst partners is open and transparent
INNOVATION APPROPRIABILITY	Capture the value in the ecosystem by commercializing specifically high TRL projects	- Invest only in *high TRL* projects - Connect start-ups early on with first clients (often big industry partners) - Align demands of partners in the network with supply by other partners in *win-win collaborations* - *Differentiate* from local competition

NETWORK STABILITY	Attract a wide variety of partners by identifying and showing the specific benefit a potential partner can gain by joining the network.	- Ensure the *right partners* are attracted, coherent with the vision of the ecosystem - Communicate *distinct value* InnoEnergy's ecosystem can offer to each partner - Use big partners and success cases to boost InnoEnergy's *reputation*

Table 5.2.1. Overview of the internal ecosystem processes, corresponding recommendations, and key factors that influence successful implementation of the recommendation.

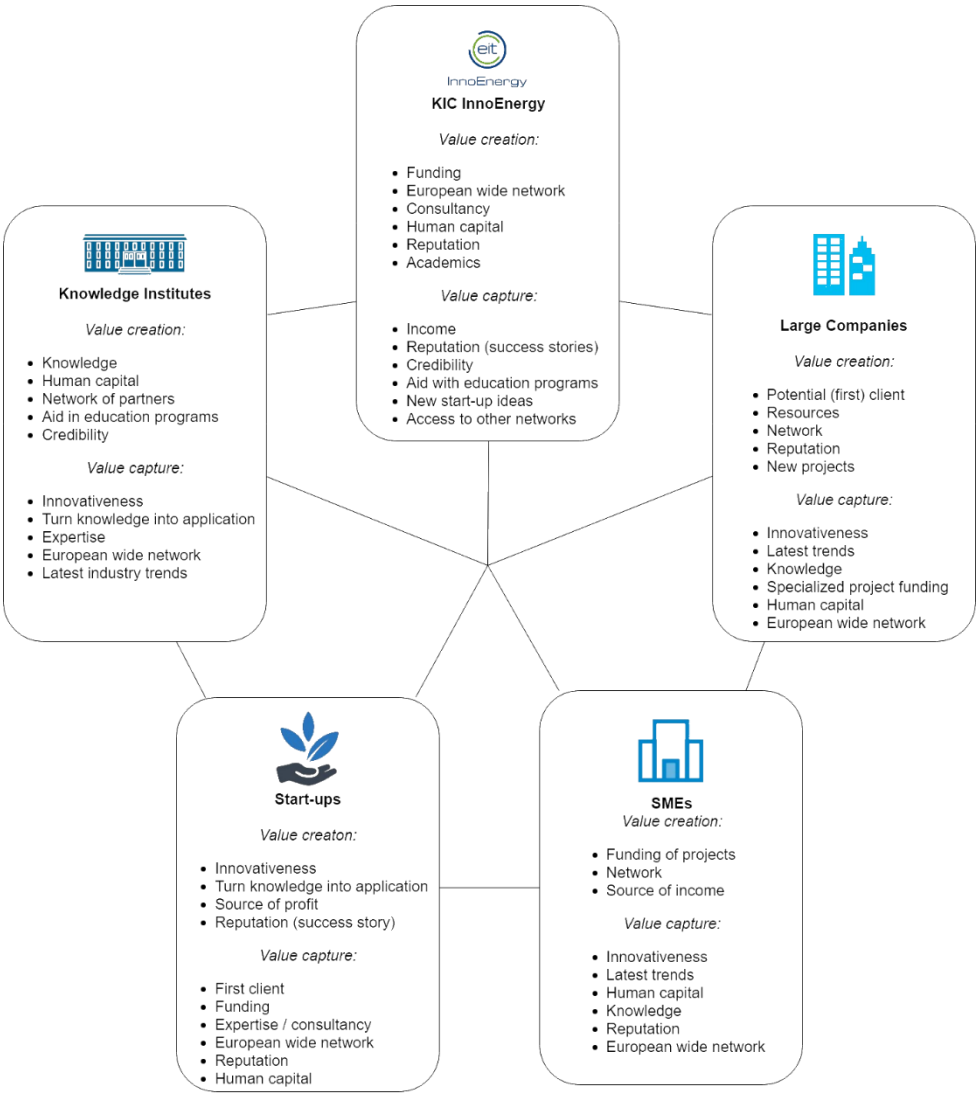

Figure 5.2.2. Overview of value that is captured and created by various partner roles in the ecosystem of InnoEnergy.

5.3 Implications

5.3.1. Theoretical implications

This study has some theoretical implications for the field of ecosystem theory. First of all, support was found for the need to define the ecosystem around a central vision that the focal firm is trying to deliver (e.g. Ritala, Armila and Blomqvist, 2009). This enables the focal firm to identify which partners

to attract, and which partners are not valuable to the ecosystem. Compared to findings Adner (2017) present, who finds that a central value proposition is required to define the ecosystem around, this study finds that an identified ecosystem vision can be used to form an ecosystem around as well. As of such, the study shows some indications for the possibility of combining the ecosystem-as-structure approach as defined by Adner (2017) and the ecosystem-as-affiliation approach, as there are similarities concerning the placement of a vision of an ecosystem and the value proposition as central in an ecosystem-as-structure approach. Furthermore, this study finds that having a clear ecosystem vision clarifies the roles various partners play and how they create and capture value in the ecosystem, which in turn clarifies the interests of the various partners. This allows for alignment of partners in the ecosystem that have conjoined interest, in order to build win-win relationships. Particularly also, having a clear vision in mind for the ecosystem is important in order to clearly communicate the value the ecosystem can deliver. As of such, this research proposes that not only is identifying a clear vision for the ecosystem just important, it is a prerequisite for the ecosystem to be properly orchestrated. Secondly, support for the model by Dhanaraj and Parkhe (2006) was found, that proposes the existence of three internal ecosystem processes that can be managed. All three processes were present in the ecosystems that were examined in this study, and no indication for potential other processes that were not discussed were found. No concluding support however was found for the overview of roles as provided by Dedehayir, Mäkinen & Ortt (2018). The roles of the ecosystems as found in this study were more intertwined with each other as one partner could take on various roles in the ecosystem, and the specific activities were not bound to a certain phase of the ecosystem, making this overview of the roles of the ecosystem of little use.

Furthermore, on a macro-level, the type of ecosystem InnoEnergy has does not fit the types as identified by Jacobides, Cennamo and Gawer (2018). The identified ecosystems are the innovation ecosystem, which revolves around a single innovation (e.g. the electric car), the platform ecosystem, which provides a platform for complementors to contribute on and is often found in software technologies (e.g video game platforms), and business ecosystems, which revolve around a central firm (e.g. Apple). On first sight, the business ecosystem seems most fitting to the type of ecosystem InnoEnergy has constructed, however there is one distinct difference between the ecosystem that InnoEnergy has created compared to other business ecosystems: InnoEnergy itself does not provide any end value to a customer but functions as orchestrator of the ecosystem solely, and therefore does not orchestrate the ecosystem around a central value proposition but around a vision to stimulate an entire industry. For example, the ecosystem of Apple is a business ecosystem, and exists to enable Apple to market their high-end technologies (e.g. suppliers, logistics). InnoEnergy does not set up its ecosystem to provide for InnoEnergy solely, but sets up the ecosystem for a vision: the acceleration of the field of sustainable energy. This difference originates from the fact that EIT and KIC InnoEnergy is founded from public, European money. This distinct difference is important, as the actors in the ecosystem are not dependent on the other actors in the ecosystem for their own survival (as is the case in for example the ecosystem Apple has set up: without Apple the actors in the ecosystem cannot survive). Also, InnoEnergy as orchestrating firm does not initially hold a position of power, influencing the way InnoEnergy can attract and influence partners of the ecosystem. As of such, I propose a fourth type of ecosystem: the industrial ecosystem, defined as “an ecosystem revolving around a central industry, where collaborating firms in the ecosystem are aligned in a way to accelerate the progress of the entire industry.”

5.3.2 Practical implications

This study has some practical implications for managers seeking to construct an ecosystem. First of all, the study finds that the identification and communication of an ecosystem vision or goal is highly important to shape a general network identity. This vision or goal can be used to shape an overall

ecosystem strategy: it is not merely an aspect of the ecosystem but a key enabler for ecosystem construction. It allows the orchestrating firm to identify and connect with relevant partners. Furthermore, the vision allows the orchestrating firm to identify how partners provide value to the network, and which partners are still required to join the network as some essential part of the value chain is missing. Having a wide variety of partners is essential in this regard (e.g. big industry partners, SMEs, suppliers, universities, and so on). It is important to clarify the various interests and goals of the different partners, as it allows the focal firm to attract these partners by showing how the ecosystem addresses their needs. This enables win-win collaborations to arise amongst partners in the ecosystem. Moreover, having a clear strategy and the ability to attract the correct partners and to identify the value these partners provide allows for the internal ecosystem processes of knowledge mobility, innovation appropriation and network stability to result in higher output of the network.

5.4 Limitations and future research

As with any study, this study also has some limitations that need to be taken into account when interpreting the results. Firstly, the research methodology involved a qualitive method of interviewing to analyse the ecosystem. Although various measures were taken in order to ensure validity and quality of this study, the method is prone to personal interpretation, which is both the strength and weakness of this method. Specifically, the research provides little insight in specific relationships and their strengths, and is not easily generalizable to other ecosystems. Additionally here, the deductive part of the study only shows the amount of interviewees that found a particular aspect of an internal process to be important. This provides an indication for what actually is important in an ecosystem and how well this is being managed, but should not be considered a definitive measurement; a quantitative analysis would shed more light on this aspect. Furthermore, not all partners in the ecosystem reacted to the request to participate in this study. There might be a reason why partners did not respond to this request that could influence the results of this study (e.g. a bad relationship with InnoEnergy). Additionally, mostly partners that are still part of the network were interviewed. As of such, the study shows no insight in why some partners leave ecosystems, and could be prone to survivor bias (Elton, Gruber & Blake, 1996). This also means that there is little insight gained in why partners might leave the ecosystem.

This study shows various interesting ways future research could advance the field of ecosystem theory. First of all, although this study has provided further support for the internal ecosystem processes of an ecosystem, no quantitative analysis has been performed. An interesting study would be capturing these processes using quantitative data, and analyse whether and to what extent these factors influence each other and the network output. This quantitative study could gather data that is not based on perception of actors in the ecosystem, but rather use objective data. Furthermore, this study has emphasized the importance of having a variety of partners in an ecosystem that fill a great variety of roles. The study provides some insight in what these partners do and how the various partner provide value to the network, but it has not been captured in an overarching overview suitable for all ecosystems. A future study could examine the specific roles in different ecosystem types and provide a usable overview of which partners and activities are required in order for the ecosystem to thrive. Furthermore, future scholars could look to integrate various theoretical lenses with the ecosystem lens to get a broader understanding of the mechanisms at hand, such as Actor-Network theory or Teamwork. Specifically teamwork literature could be an interesting perspective to take on the relationships that form between partners in an ecosystem, and how the ecosystem processes correspond to findings in the field of teamwork. Finally, this study found a gap in the types of ecosystem that have been analysed in the field of ecosystem theory: the industrial ecosystem. Future researchers could examine the specific differences concerning the different types of ecosystems in this field, including ecosystems similar to the one of InnoEnergy.

6. Tool Design

In order to present the findings of this study in a concise manner to high level managers of InnoEnergy Benelux, a tool was designed. The tool consists of a brochure containing specific recommendations for constructing the InnoEnergy ecosystem in the Benelux. The aim for the tool is to provide quick insight in the concluding results of the study with specific recommendations for InnoEnergy. As of such, the results had to be condensed into a small amount of space.

Figure 5.2.1 provides an overview on the findings of the study, and is used as basis for the lay-out of the brochure. The three aspects are then shortly elaborated upon. Specific recommendations for the orchestration processes are given in a condensed table at the bottom (see table 6.1). The next page is aimed at providing insight in specifically the value creation and value capturing mechanisms of the various roles in the ecosystem. As figure 5.2.2 provides a clear overview on this aspect, it is displayed on the next page of the brochure. Furthermore, on the backside of the brochure my contact information is given in case managers at InnoEnergy require more information on the matter.

Knowledge mobility	**Build relationships based on trust, with open and clear communication:** Attract committed partners in alignment with the ecosystem vision. Form relationships informally that could turn into formal relationships later.
Innovation Appropria-bility	**Capture the value in the ecosystem by commercializing specifically high TRL projects**: Connect start-ups early on with first clients (often big industry partners). Align demands of partners in the network with supply of other partners in win-win collaborations. Differentiate from local competition.
Network Stability	**Attract a wide variety of partners by identifying and showing the specific value a potential partner can gain by joining the network:** Communicate distinct value InnoEnergy's ecosystem can offer to each partner. Ensure the right partners are attracted, coherent with the vision of the ecosystem. Use big partners and success cases of start-ups to boost InnoEnergy's reputation

Table 6.1. Condensed version of table 5.2.1.

The final tool is displayed on the next two pages. The first page shows the front and back of the brochure, the second page the content.

Who I am

Hello! My name is Koen Direks, a graduating master student at TU/e Eindhoven in Innovation Management. I wrote my master thesis on the subject of ecosystem orchestration for InnoEnergy.

In this brochure you will find an overview of the practical recommendations that were found in my study. Feel free to contact me for questions or feedback. Details can also be found in the thesis report.

Contact me

E-mail: k.j.w.direks@student.tue.nl

Phone: +31642886203

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RECOMMENDATIONS FOR

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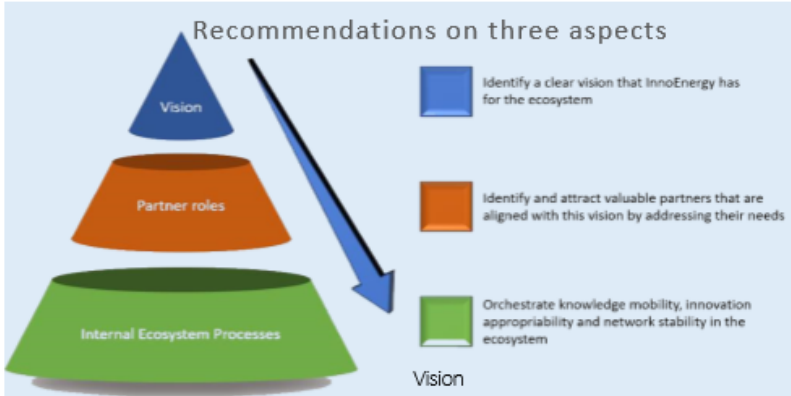
ECOSYSTEM CREATION

- a short overview -

InnoEnergy

TU/e



Vision

Position the ecosystem on three aspects: a *European-wide network*, the field of *sustainable energy*, and the commercialization of *high TRL projects*. This vision allows InnoEnergy to provide distinct value to each partner role, to have higher chance of commercialization, to attract a wide variety of committed and valuable partners and to differentiate itself from local competition.

Partner attraction and role alignment

Identify the specific value partners provide to and require from the ecosystem. By being positioned clearly, a distinct value when joining the ecosystem can be provided to each potential partner, giving them a clear reason to join the ecosystem. It also becomes clear how to align the various partners in order to create win-win collaborations. An overview of the specific value certain partner types could deliver can be found to the right.

Internal Ecosystem Orchestration Processes

There are three internal ecosystem processes that influence the output of the network. Proper management of these processes is enabled by communication of a clear vision and proper partner role alignment. Specific recommendations are as follows:

Knowledge mobility	**Build relationships based on trust, with open and clear communication:** Attract *committed* partners in alignment with the ecosystem vision. Form relationships informally that could turn into formal relationships later.
Innovation Appropria-bility	**Capture the value in the ecosystem by commercializing specifically *high TRL projects***: Connect start-ups early on with first clients (often big industry partners). Align demands of partners in the network with supply of other partners in *win-win collaborations*. *Differentiate* from local competition.
Network Stability	**Attract a wide variety of partners by identifying and showing the specific value a potential partner can gain by joining the network:** Communicate *distinct value* InnoEnergy's ecosystem can offer to each partner. Ensure the right partners are attracted, coherent with the vision of the ecosystem. Use big partners and success cases of start-ups to boost InnoEnergy's *reputation*.

OVERVIEW OF POTENTIAL VALUE CREATION AND VALUE CAPTURE BY EACH PARTNER TYPE

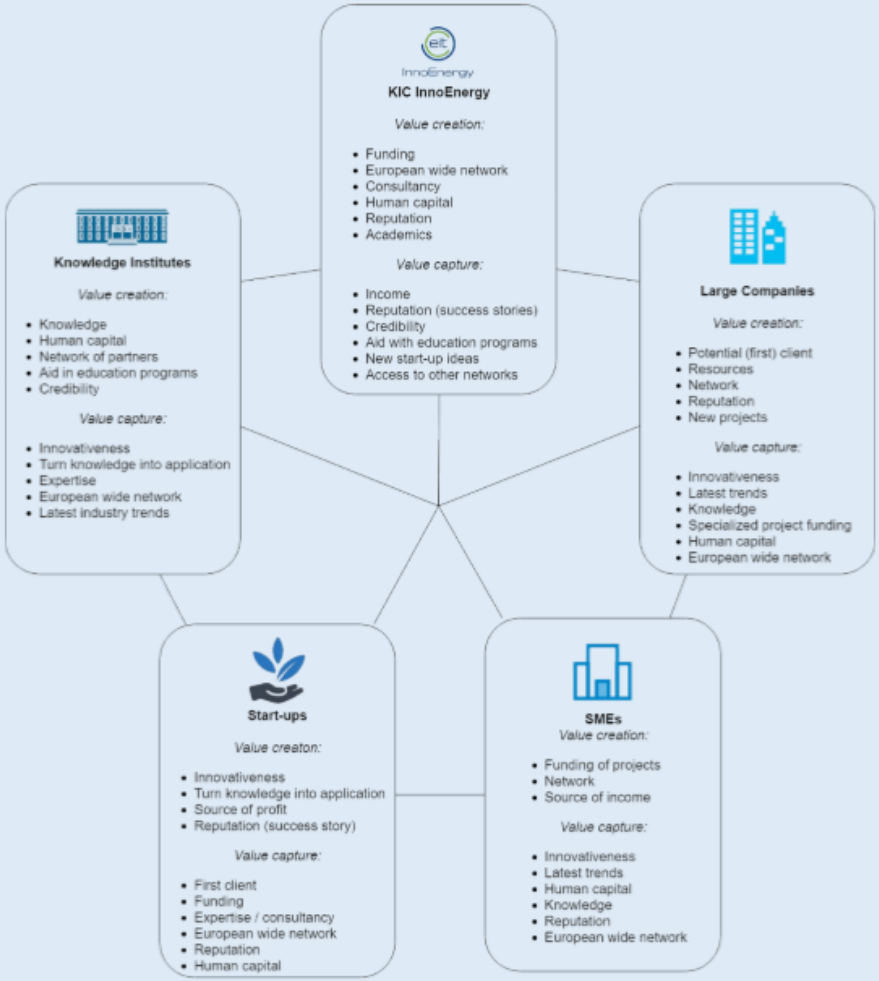


Figure 6.1. Final tool providing an overview of the recommendations as found in this study.

References

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

Adner, R. (2017). Ecosystem as structure: an actionable construct for strategy. *Journal of Management*, *43*(1), 39-58.

Adner, R., & 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), 306-333.

Anderson, R. (2007). Thematic content analysis (TCA). *Descriptive presentation of qualitative data*.

Azzam, J. E., Ayerbe, C., & Dang, R. (2017). Using patents to orchestrate ecosystem stability: the case of a French aerospace company. *International Journal of Technology Management*, *75*(1-4), 97-120.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, *13*(4), 544-559.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.

Chesbrough, H. W. (2006). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.

Dedehayir, O., Mäkinen, S. J., & Ortt, J. R. (2018). Roles during innovation ecosystem genesis: a literature review. *Technological Forecasting and Social Change*, *136*, 18-29.

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

den Hartigh, E., Tol, M., & Visscher, W. (2006, October). The health measurement of a business ecosystem. In *Proceedings of the European Network on Chaos and Complexity Research and Management Practice Meeting* (pp. 1-39).

Elton, E. J., Gruber, M. J., & Blake, C. R. (1996). Survivor bias and mutual fund performance. *The review of financial studies*, *9*(4), 1097-1120.

Heiman, B. A., & Nickerson, J. A. (2004). Empirical evidence regarding the tension between knowledge sharing and knowledge expropriation in collaborations. *Managerial and Decision Economics*, *25*(6-7), 401-420.

Hoang, H., & Yi, A. (2015). Network-based research in entrepreneurship: A decade in review. *Foundations and Trends® in Entrepreneurship*, *11*(1), 1-54.

Hurmelinna-Laukkanen, P., Olander, H., Blomqvist, K., & Panfilii, V. (2012). Orchestrating R&D networks: Absorptive capacity, network stability, and innovation appropriability. *European Management Journal*, *30*(6), 552-563.

Iansiti, M., & Levien, R. (2002). Keystones and dominators: Framing the operational dynamics of business ecosystems. *The operational dynamics of business ecosystems*.

Iansiti, M., & Levien, R. (2004). Strategy as ecology. *Harvard business review*, *82*(3), 68-81.

Iansiti, M., & Richards, G. L. (2006). The information technology ecosystem: Structure, health, and performance. *The Antitrust Bulletin*, *51*(1), 77-110.

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

Jack, S., Moult, S., Anderson, A. R., & Dodd, S. (2010). An entrepreneurial network evolving: Patterns of change. *International Small Business Journal*, *28*(4), 315-337.

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*.

Loch, C. H., DeMeyer, A., & Pich, M. (2011). *Managing the unknown: A new approach to managing high uncertainty and risk in projects*. John Wiley & Sons.

Martinez, M. A., & Aldrich, H. E. (2011). Networking strategies for entrepreneurs: balancing cohesion and diversity. *International Journal of Entrepreneurial Behavior & Research*, *17*(1), 7-38.

McIntyre, D. P., & Srinivasan, A. (2017). Networks, platforms, and strategy: Emerging views and next steps. *Strategic Management Journal*, *38*(1), 141-160.

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods*, *1*(2), 13-22.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, *16*(1), 1609406917733847.

Pauwels, C., Clarysse, B., Wright, M., & Van Hove, J. (2016). Understanding a new generation incubation model: The accelerator. *Technovation*, *50*, 13-24.

Pellinen, A., Ritala, P., Järvi, K., & Sainio, L. M. (2012). Taking initiative in market creation–a business ecosystem actor perspective. *International Journal of Business Environment*, *5*(2), 140-158.

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

Ritala, P., Hurmelinna-Laukkanen, P., & Blomqvist, K. (2009). Tug of war in innovation–coopetitive service development. *International Journal of Services Technology and Management*, *12*(3), 255-272.

Ritala, P., Agouridas, V., Assimakopoulos, D., & Gies, O. (2013). Value creation and capture mechanisms in innovation ecosystems: a comparative case study. *International Journal of Technology Management*, *63*(3-4), 244-267.

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

Sivasubramaniam, N., Liebowitz, S. J., & Lackman, C. L. (2012). Determinants of New Product Development Team Performance: A Meta-analytic Review.*Journal of Product Innovation Management*, *29*(5), 803-820

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, *28*(13), 1319-1350.

Williamson, P. J., & De Meyer, A. (2012). Ecosystem advantage: How to successfully harness the power of partners. *California management review*, *55*(1), 24-46

Appendices.

Appendix A. Interview scheme.

Interview Questions Ecosystem Partners

Color scheme interview questions for:

1. A *former* InnoEnergy ecosystem partner
2. A *current* InnoEnergy ecosystem partner
3. A *potential* InnoEnergy ecosystem partner

Introduction

1. Ask for recording
2. Explain research, ensure the research is anonymous

Company general

1. What is your role in the company?
2. What is the value proposition of your company?
3. Who are your clients?
4. Why/when/how was this company established?
5. Where are your headquarters located?
6. How big is the company (total FTE?)
7. (if applicable) What year did you become a partner of InnoEnergy?

Current ecosystem

1. What is the value proposition/common goal of the ecosystem your company is in?
2. What are you contributing to the ecosystem?
    - How does InnoEnergy profit from it?
    - What are the benefits for your clients?
    - What are the benefits for other partners?
3. What are the benefits for your company to be in that ecosystem?
4. Do you experience freeriding in the network *(businesses not contributing as much as they should)*? Also, do you experience that information leaks out of the network that should not have leaked? Is there a mechanism in place to stop this from happening?
5. How do you contact other partners in your network? How do you know which partners to contact?
6. Can you communicate easily and freely with partners in your network?
7. How often do you communicate with partners in your network? Do you talk to partners in your network to gain access to new information? Do you share information of your own?
8. Is this communication guided in any way (meetings, knowledge sheets, easy access to partner information...)?

Ecosystem partner alignment

1. What do you perceive as the goal of the network? What is it that you want to achieve? What do you want to get out of the ecosystem? Do you feel the interests of the partners in the ecosystem are aligned?
2. Would you consider yourself a leading firm in this ecosystem or a follower? As in, do you make the choices and demands, or do you agree to terms of other firms that have greater influence?
3. What behaviour do you use to contact and manage the partners in the ecosystem? Do you have a strategy for the ecosystem in mind?

Partnership with InnoEnergy

1. How strong is your relationship with InnoEnergy & other partners?
2. What type of partnership is it? (Platinum, gold, owning assets, etc. if not answered already)
3. What preceded this partnership? How did it come to this? (Events, contacted – What year?)
4. How does your company contact InnoEnergy? *(mail, events, calling, personal)*
5. How often does your company exchange information with InnoEnergy *(Meetings, etc.)*
6. What kind of information do you exchange? *(intellectual property, new innovations)*
7. What do you create with InnoEnergy, what is the outcome of your partnership? *(Spinoffs, if not answered already)*

Development of the Ecosystem

1. Did you experience any struggles or opportunities with regard to your partnership with InnoEnergy in the past? (e.g. Elections, Crises, Brexit, bankruptcy, switch of board, new teams, internal politics, etc.) What strategy did you use to overcome this?
2. *What was the reason to discontinue partnership with InnoEnergy?*
3. *What would be the reason to engage in a partnership with InnoEnergy?*
4. Did you ever run into struggles or opportunities with regard to other partners/the entire ecosystem? What strategy did you use to overcome this?
5. Why are you still part of the network (*e.g. reputation, resources/information, long-term goals,reciprocity…*)?
6. How strong do you feel the relations with your partners are *(commitment, trust, satisfaction)*?
7. How does the current way of thinking (culture) in your country influence (enable or constrain) the ecosystem and your partnerships with InnoEnergy?
8. How does the market and user relations influence (enable or constrain) the ecosystem and your partnership with InnoEnergy?
9. How do the current policies/current political system influence (enable or constrain) the ecosystem and your partnership with InnoEnergy?
10. How does the incumbent industry (enable or constrain) the ecosystem and your partnership with InnoEnergy?
11. How does the current science/knowledge base (enable or constrain) the ecosystem and your partnership with InnoEnergy?
12. How do you see the future of your ecosystem? With or without InnoEnergy?

Appendix B. Company description

Short description of the partners contributing to the company and the corresponding person that was interviewed. Abbreviations are used in order to ensure anonymity of the participants.

B.1 Companies and contact persons in Sweden

AN: AN is a platform for research projects, aimed at supporting the local region. By combining the industry, academia and society, the AN offers projects at a national and international level. Additionally, here several cooperative projects are facilitated by having a broad network and by being highly competent on specific areas. The interviewed person is a high level director at AN.

E.: E. is large multinational company, offering electric utility services in over 30 countries. With a revenue of over €37 billion, E. was ranked high on the 2017 Fortune 500 list. The contact person interviewed is a senior in business development. E. collaborated with InnoEnergy and MB in a project revolving around converting biomass into energy.

GM: GM is a small Swedish start-up company that invents, develops and sells novel Graphene-based nanocomposites materials and services. Their mission is to deliver world-changing graphene hybrid materials with the potential to change the world. The interviewed person is a high level manager GM and researcher at a university.

InnoEnergy: InnoEnergy needs no further introduction in this report. At InnoEnergy in Sweden a total of two high level managers and directors were interviewed.

K: K is a university specialized in Technology and Engineering based in Sweden. The contact person is a high level manager of strategic partnerships, responsible for development efforts locally at K and is involved in coordinating a national networks of all universities.

MB: MB is a small start-up company in Sweden, looking to culture and harvest ascidians from the sea, looking to find several environmental and economic benefits by cultivating a renewable energy source, harvesting new low-cost nutrients and by using the rest product as valuable nitrogen fertilizer. MB collaborated with E. and InnoEnergy, amongst others, in this project. The contacted person is a high level manager at MB.

NV: NV is a company initiated in 2016, and has currently grown to a larger company with over 150 employees. NV's aim is to make a more sustainable future by facilitating a transition of society towards high quality, green batteries. The interviewee at NV is a high level manager who has been part of NV from the start and coordinates public funding in general.

SDAB: SDAB is a small company aimed at developing and distributing a technology that purifies water. The interviewee is a high level manager at SDAB.

SIM: SIM is a start-up that revolutionizes the servo motor. By bringing down the production cost greatly, simplex motion can offer a high quality solution for a lower price. The company originated as a university project. The interviewee is a high level manager at SIM.

SWT: SWT is a Swedish start-up registered January 2018, specialized in the development of low pressure, low cost, efficient water desalination systems. Although the company has only been registered for about a year, the technology has been in development for over 12 years. The interviewee is a high level manager at SWT and has been involved with the development since 2016.

SAE: The SAE cultivates algae, and uses these algae to clean water, produce organic biomass and extract nanomaterials. These can then be used for various applications, ranging from solar panels to

cosmetic applications. The research for this project originated in 2014 and the company was formed officially in 2016. The interviewee is a high level manager at SAE.

B.2 Companies and contact persons in Spain.

AEI: AEI is an SME concerned with the development of a range of solutions related to the generation of electricity from waste heat. By using high-tech advances in the field, AEI aims to reduce the CO2 footprint of the industry. The interviewee at AEI is a high level manager at AEI, involved since the start of the company.

C: Being the first largest unlisted Spanish group in the sector of infrastructure and engineering, C is one of the largest companies in Spain with a turnover of €1080 million and over 7700 employees. The interviewee at C is a high level manager of the innovation department, and is part of projects where InnoEnergy is involved.

ED: ED is one of the major players in the energy sector in Iberia. They have a total revenue of over €15,746 million and employ over 12000 employees. The interviewee at ED is a high level manager at ED Ventures, a corporate venture capital arm of ED that is involved with InnoEnergy.

ES: ES is a global knowledge institute located in Barcelona, having a business and law school. ES provides high level education and research programs. The interviewee is a high level manager involved in the business school of ES, an aids in running the educational programs at InnoEnergy.

FL: FL is a start-up involved with blockchain technology, aiding companies in matching the origin of renewable energy production to the consumption in real time. The interviewee at FL is a high level manager.

InnoEnergy: InnoEnergy needs no further introduction in this report. At InnoEnergy in Spain a total of four high level managers were interviewed.

IR: IR is the Catalonian Institute for Energy Research, and was created with the objective of creating a more sustainable future for energy consumption. The manager is a high level manager at IR involved with the partnership with InnoEnergy.

MD: MD Corporation is the embodiment of the co-operative movement in Spain, and is committed to the environment, competitive improvements and customer satisfaction in the region. It has over 74000 involved people and a revenue of over €12110 billion. The interviewee is a high level manager at MD and is involved in new business creation.

ORC.: ORC is a start-up by and for scientist, building economic and eco-friendly technologies for biogas upgrading. The interviewee is a high level manager at ORC.

PA: PA is a representation of manufacturers of high class technologies, focused on naval aspects, railways and power. The manager is a high level manager at PA.

RB: RB is a start-up that has developed an innovative method for repairing batteries. The interviewee is a high level manager at RB.

TEC: TEC is one of the largest energy companies in Spain, with over 1400 employees and an income of over €100 million. The interviewee is a high level manager involved with new venture creation at TEC.

U.: U., the polytechnic university of Catalonia, is the largest engineering university in Spain. Based in Barcelona, the university provides high level education programs in the technological fields. The

interviewee is a high level project manager involved with various projects involving all KIC sectors, including InnoEnergy.

Appendix C. Inductive, thematic content approach

Node	*Descriptor*	*Illustrative Quote*
Benefits for InnoEnergy	Remarks concerning what InnoEnergy gains by forming a relationship with a partner	*"They are part owner and they got shares of the company. They got 10% of the company."*
Benefits from InnoEnergy	Remarks concerning what a partner gains by forming a relationship with InnoEnergy	*"I would say we mostly participated in the highway program for funding"*
Overall ecosystem strengths	Remarks concerning the strengths of the ecosystem	*"You are more in an informal relation and sometimes there is where the real information of how things will move forward."*
Overall ecosystem weaknesses	Remarks concerning the weaknesses of the ecosystem	*"We still do not have the partner base that we want."*
Value creation by company	Remarks concerning how a partner creates value that is useful for the overall ecosystem	*"We sell all kinds of batteries […] for electric mobility, we also do manufacturing."*
Value capture by company	Remarks concerning how a partner captures value by being part of the ecosystem	*"So, we were approved and we got the grant from the Swedish Energy Agency."*
Ecosystem strategy	Remarks concerning the overall strategy InnoEnergy has for the ecosystem	*"[The Swedish ecosystem] is very much geared through lower TRL and research."*
Freeriding	Remarks concerning freeriding in the ecosystem	*"If we see that there are freeriders, we typically… we end up terminating the partnership in a non-official manner. If we do not see the effort from the other partner […], we just stop talking."*
Leadership vs Follower	Remarks concerning whether a partner is a leader or a follower	*"In the InnoEnergy project, we were the leader, definitely."*
Collaboration amongst partners	Remarks concerning collaboration between partners of the ecosystem (not InnoEnergy)	*"It is very difficult for a small company to get in contact with such a large company."*
Collaboration with InnoEnergy	Remarks concerning collaboration between a partner and InnoEnergy	*"With InnoEnergy, [communication] is pretty easy because they are close people to us and I think that counts for everyone."*
Network Attraction	Remarks concerning how a partner got attracted or would be attracted to the ecosystem	*"I think someone took us to InnoEnergy. […] In this case, we went to a program called boostway I think. We were selected in that program."*

C.1. Overview of thematic content approach used in this study.

Appendix D. Orchestration processes present in each ecosystem

Orchestration Process	*Influencing Factor*	*% Mentioned as present and important in ecosystem (n = 13)*
Knowledge Mobility	Knowledge absorption	46%
	Network Identification	15%
	Interorganizational Socialization	46%
	Cooperation	54%
	Commitment	46%
	Trust	46%
	Transparency	54%
	Formality	54%
	Effective Listening	0%
	Paying attention to others and being understanding	0%
Innovation Approprability	Trust	46%
	Procedural Justice Mechanisms	0%
	Joint asset ownership	38%
	Communication	54%
	Commitment	46%
	Cooperation vs competition	30%
	Formality vs informality	54%
	Freeriding	0%
	Being fair and neutral towards all partners	0%
Network stability	Entrepreneurial Skills	31%
	Communication of a clear vision	31%
	Credibility	54%
	Multiplexity	0%
	Long-term goals	46%
	Focal firm reputation	62%
	Interest and motive	30%
	Ecosystem goal and vision	31%
	Individual competences to persuade and influence new partners to join the network	0%

D.1 Orchestration processes as found in the ecosystem of Sweden

Orchestration Process	*Influencing Factor*	*% Mentioned as present and important in ecosystem (n = 15)*
Knowledge Mobility	Knowledge absorption	33%
	Network Identification	27%
	Interorganizational Socialization	53%
	Cooperation	40%
	Commitment	53%
	Trust	53%
	Transparency	40%
	Formality	27%
	Effective Listening	0%
	Paying attention to others and being understanding	0%
Innovation Approprability	Trust	53%
	Procedural Justice Mechanisms	0%
	Joint asset ownership	40%
	Communication	40%
	Commitment	53%
	Cooperation vs competition	20%
	Formality vs informality	20%
	Freeriding	0%
	Being fair and neutral towards all partners	0%
Network stability	Entrepreneurial Skills	20%
	Communication of a clear vision	40%
	Credibility	40%
	Multiplexity	0%
	Long-term goals	27%
	Focal firm reputation	47%
	Interest and motive	27%
	Ecosystem goal and vision	40%
	Individual competences to persuade and influence new partners to join the network	0%

D.2 Orchestration processes as found in the ecosystem of Spain

Appendix E. Comparison tables of Sweden and Spain

Influencing factor	Sweden	Spain
Knowledge mobility	Upsides: - Transparent, open and clear communication - IE is accessible - Trust amongst partners - Culture of collaboration - Win-win collaboration - TBB (Fair) Downsides: - No common network identity or aligned goals - Lack of a vision - Confusing who to contact/which department - Unclear what InnoEnergy is - Too much bureaucracy	Upsides: - Transparent - Open and clear communication - IE is accessible - Trust - Now, clearly communicated vision - Relational culture - Coopetition - Win-win collaboration - TBB (Fair) Downsides: - Don't know who to contact in IE - Lack of interaction between IE departments and between IE and different investors - Sometimes unclear of the value proposition of InnoEnergy and what InnoEnergy actually is - Too much bureaucracy
Innovation appropriability	Upsides: - No freeriding or leaking of information - High trust and commitment Downsides: - Didn't focus high TRL technologies - No clear communication of value proposition - Difficult to connect start-ups with first clients	Upsides: - No freeriding or leaking of information - High trust and commitment - Open innovation in big companies - Later on focused on high TRL projects - Large amount successfully started ventures Downsides: - Not enough access to big partners or effort to find first client for start-ups - Unclear what resources InnoEnergy has to offer or what contacts InnoEnergy has access to
Network stability	Upsides: - Some variety of partners - Some influx of new start-ups Downsides: - Struggling a lot to create relationships with big partners - Not yet reached critical mass - Low awareness of InnoEnergy - InnoEnergy considered a small player	Upsides: - Great variety of partners - Pipeline of new potential partners - Some access to big companies - Influx of new partners Downsides: - Not yet reached critical mass - Somewhat struggling to find access to big partners

Ecosystem Strategy	Upsides: - Recently changed towards higher TRL projects - Starts positioning as complementary to existing accelerators Downsides: - No vision - No clearly communicated value proposition - No communication of what InnoEnergy is - Only recently started focusing on late TRL projects - Is considered mostly for funding reasons - Originally positioned as competitor to local accelerators	Upsides: - Clearly communicated vision - Focus on high TRL projects - Positioned as European-wide ecosystem with focus on sustainability, thus complementary Downsides: - Early on a lack of clarity, slowing down progress - Still some partners that see InnoEnergy as only responsible for funding - Lack of identity amongst InnoEnergy Europewide - Still difficult to grasp what InnoEnergy exactly is

E.1 Influencing factors and their findings in both ecosystems

Role	Sweden	Spain
Start-up	Role: - Need funding and a (European) network focused on this industry - Additionally gain free interns, credibility, and mentoring by joining the network - Provide to InnoEnergy: innovativeness, income, credibility through success stories Areas for improvement: - Don't help in connecting to first customer - Require more clarity from different InnoEnergy departments - Less bureaucracy	Role: - Need funding and a (European) network focused on this industry - Additionally gain free interns, credibility, and mentoring by joining the network - Provide to InnoEnergy: innovativeness, income, credibility through success stories Areas for improvement: - Somewhat hard to connect to first customer - Require more clarity from different InnoEnergy departments - Need more help on the business side - Less bureaucracy
SME	Role: - Need mostly the (European) network, innovativeness through new projects, new interns - Provide to InnoEnergy: access to new partners, credibility, investment in market-ready technologies Areas for improvement: - Not enough proactivity in finding European partners - Better access to the network of IE	Role: - Need mostly the (European) network, innovativeness through new projects, new interns - Provide to InnoEnergy: access to new partners, credibility, investment in market-ready technologies Areas for improvement: - Not enough proactivity in finding European partners - Better access to the network of IE
Large company	Role: - Co-Investor with InnoEnergy - Are closed to other businesses - Provide to InnoEnergy: Funding, large networks, expertise, reputation and can be a first client for start-ups Areas for improvement: - Initiate relationships with (many) more large companies - Position InnoEnergy as different than only funding - Show value of InnoEnergy to large companies - Communicate a clear vision to these partners	Role: - Need innovativeness through new projects and cutting edge technologies, students from IE master programs, ability to co-invest in relevant start-ups - Are in the trend of opening their businesses to the outside world - Provide to InnoEnergy: A co-investor for start-ups, a first customer for start-ups, reputation, access to a large network of partners, companies for interns to work at, access to expertise, help with academics Areas for improvement: - Unclear who to approach in IE

		- Sometimes unclear what IE actually does - Hard to initialize a relationship
Knowledge institute	Role: - Bring influx of new ideas for early stage development - Triple helix model is valuable, regarding the relationship between industry, university and the (local) government as an important factor for all parties to thrive. - Provide to InnoEnergy: start-up projects, technological expertise, access to a broad network of knowledge institutes and large partners, reputation Areas for improvement: - Here, it is regarded as difficult to initialize a relationship with knowledge institutes	Role: - Bring influx of new ideas for early stage development - Academic expertise, also for InnoEnergy education programs and for technologies - InnoEnergy is the gateway between academics and industry - Provide to InnoEnergy: start-up projects, technological expertise, intertwined education programs, access to a broad network of knowledge institutes and large partners, reputation Areas for improvement: - IE can be hard to grasp, too 'virtual' and lacks an overarching identity - No trust in government, so working together with municipalities in this area is difficult

E.2 Roles of partners in the ecosystems