Value creation and capture mechanisms in innovation ecosystems: a comparative case study

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Abstract: This study focuses on value creation and capture in innovation ecosystems. It presents and discusses the findings from a qualitative, comparative case study on two European-led innovation ecosystems from the ICT and aerospace and defence sectors. The purpose of the research is to explore the tangible and intangible mechanisms related to how leading firms may facilitate value creation and capture in this context. In particular, we focus on mechanisms related to the building phase to help to attract and gather relevant stakeholders, and on the management phase to help maintain and realise the business goals of all ecosystem participants. We also discuss the differences between the case industries concerning the effectiveness and usage of such mechanisms. Overall, the research findings provide new evidence on the facilitating initiatives, underlying mechanisms and structures that are related to the leading firms’ orchestration of innovation ecosystems.

Keywords: innovation ecosystem; value creation; value capture; ICT sector, aerospace and defence sector; case study.

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This paper is a revised and expanded version of a paper entitled ‘Value creation and capture in innovation ecosystems – a comparative case study’ presented at 2012 R&D Management Conference, Grenoble Ecole de Management (GEM), France, May 2012.
1 Introduction

Due to the dispersed nature of specialised knowledge and the networked nature of technology development, firms cannot successfully pursue research and development (R&D) and innovation activities sourcing knowledge solely in-house. Consequently, a paradigm shift has taken place from in-house producer-led innovation towards collaborative innovation and R&D (Chesbrough, 2003; Baldwin and Von Hippel, 2011; Sala et al., 2011). Echoing this development, the concept of business ecosystems (Moore, 1993; Iansiti and Levien, 2004), and more recently innovation ecosystems (e.g., Adner, 2006; Adner and Kapoor, 2010) have emerged to shed light on how firms are increasingly interdependent in their business and innovation activities. Value is more often co-created within a network of companies including collaboration and competition in different or even same markets (e.g., Brandenburger and Nalebuff, 1996; Möller and Rajala, 2007). Thus, it has become clear that value is no longer created in isolation – and neither is it associated only with technological developments as focus shifts towards total business solutions. In this context, leading firms have a central role in ensuring the alignment of their innovation ecosystems towards desired business and technological objectives (Dhanaraj and Parkhe, 2009).

According to Adner and Kapoor (2010), the strategy and the innovation literature have traditionally dealt with the innovation challenges that are mainly faced by the focal firm, rather than the whole ecosystem. In addition, the current network literature has been criticised on overemphasising value creation over value capture (Lavie, 2007; Adegbesani and Higgins, 2010). On the other hand, the economics and strategy literature have been more strongly focusing on bargaining over value capture (Porter, 1980; Teece, 1986; Brandenburger and Nalebuff, 1996). Therefore, the literature is currently lacking an integrated understanding on the mechanisms for value creation and capture in the innovation ecosystem context.

To deal with the aforementioned research gap, existing literature already provides some conceptual and case-based understanding of how innovation ecosystems are built and managed/orchestrated (e.g., Dhanaraj and Parkhe, 2006; Ritala et al., 2009, 2012). However, the literature still lacks systematic evidence of how leading firms can facilitate both value creation and capture in their ecosystems. We suggest that understanding both of these issues simultaneously i.e., value creation and capture) is important in finding out how markets are created, and how various actors may realise their common and own business objectives in this context. This study aims to contribute to this research gap by carrying out an in-depth comparative dual case study from two European-led ecosystems. In particular, this study focuses on the initiatives the leading, or focal, or orchestrator, firm(s) can take – as well as the mechanisms and structures that can be utilised – to ensure value creation and capture among the members of their innovation ecosystems.

The study starts with the discussion of the theoretical background, leading to the formation of the conceptual framework. After this, methods and data collection are discussed. This is followed by the description of the results of two innovation ecosystem cases. The study ends with an in-depth discussion of the results, comparison of the cases, and presentation of the theoretical and practical implications.
2 Theoretical background

2.1 The evolution of inter-firm collaboration and innovation activities

Research in inter-firm collaboration has evolved from supply chain discussions towards non-linear innovation perspectives of inter-firm networks and communities (Assimakopoulos, 2007), eventually contributing to the ongoing discussions on business and innovation ecosystems. In the 1980s, individual firms were much more autonomous than today, and, for this reason, the emphasis was on integrating and improving efficiencies within ‘the four walls’ of the manufacturing firm. Such initiatives included several firm-specific processes such as business process reengineering (Towers, 1994). However, these types of processes started to become standardised, and during the 1990s, firms began looking at new ways to gain competitive advantage. Supply chain management and related technologies such as just-in-time (JIT) manufacturing (see e.g., Beamon, 1998) were such initiatives that led to working more collaboratively with key suppliers, customers and distributors in order to improve overall process efficiencies. In this case as well, competitive advantages could be achieved, but again they were eroded due to the relative commonality of supply chain management practices.

During the last two decades, practitioners and academics have been investigating even more intensive cooperation frameworks among customers, suppliers, and other types of partners – entitled as the fifth generation of ‘network’ innovation (Dodgson, 2000; Rothwell, 1992). Today, firms engage in strategic partnerships and alliances that have both elements of collaboration and competition, and which can be formed and dissolved depending upon market evolution in very short periods of time (see e.g., Gulati et al., 2000; Möller and Rajala, 2007). At the same time, the evolution of new product development (NPD) processes has also refocused from the sole optimisation of internal resources and external factors across the value chain towards collaborative and open innovation (e.g., Cagan and Vogel, 2002; Chesbrough, 2003; Aziz et al., 2005; Agouridas et al., 2004; Baldwin and Von Hippel, 2011). In fact, the focus in NPD has shifted from strong technological development at any cost to flexibility and speed of development under strong resource constraints. Echoing this, various types of industries increasingly engage into collaborative relationships, ranging from optimised supplier management to extended enterprises and, finally, to innovation ecosystems which is the focus of our study.

Operating in the context of innovation ecosystems poses not only opportunities, but also major challenges. In this context, to deliver successful end-user value innovations, every element in a family of complementary innovations must succeed (see e.g., Adner, 2006). This provides a host of challenges related to technical difficulties, cultural and geographical distances, and differences in the participants’ goals. Thus, we suggest that there is underlying complexity in innovation ecosystems concerning the value creation and capture, which is even more pronounced in high-technology and complex business environments. Aerospace, for example, features the development of complex systems with long lifecycles that require not only numerous suppliers and partners for their development but also for their support and upgrades. Furthermore, a recent study of the NPD process in a leading European semiconductor firm did show the importance of managing complex knowledge flows in distributed and non-linear network architecture (Assimakopoulos and Chapelet, 2011). To tackle such issues, we focus in this study on...
the concept of innovation ecosystems and examine how firms can operate in this context to create and capture value. The key concepts are elaborated in the following section.

2.2 Key concepts

The concept of business ecosystem was originally coined by Moore (1993), who defined it as consisting of co-evolving interdependent and interconnected actors: customers, agents and channels, sellers of complementary products and services, suppliers, and the firm itself. The idea of an ecosystem comes from ecology (see also Iansiti and Levien, 2004), where organisms are interdependent in their actions and they co-evolve over time within a certain natural environment. This resonates well in modern-day business environments, where organisations increasingly collaborate to reach their own and mutual objectives. Recently, the vocabulary associated with the concept of business ecosystems has been adopted in the fast moving industries such as fast moving consumer goods (FMCG), electronics and information and communication technology (ICT). It is worth noting that the terminology of business ecosystems has been particularly spread in the ICT industry due to its networked and interdependent nature [see e.g., Fransman (2007) on the ‘symbiotic’ nature of relationships among ICT actors and Fransman (2008), on the role of policy in driving ecosystem development through technology and organisational innovation].

The term innovation ecosystem is a more recent, mainstream concept discussed widely in academia and industry. In certain cases, it refers to clusters (physical or virtual) of innovation activities around specific themes (e.g., biotechnology, electronics, pharmaceutical and software). In other cases, the concept refers to business ecosystems formed around challenging and commonly shared business objectives by seeking their satisfaction through innovation-driven goals (see e.g., Adner, 2006; Adner and Kapoor, 2011). The latter case is the one used for the purposes of this paper; in line with this, ‘we view an innovation ecosystem as a business ecosystem, which aims at creating and capturing value from innovation activities (related to either technological or business/entrepreneurial innovation)’.

Value creation and capture (the latter is referred to as ‘value appropriation’ by some sources) are both needed in various types of innovation networks, consisting of both collaborative and competitive actors (Dhanaraj and Parkhe, 2006; Ritala and Hurmelinna-Laukkanen, 2009). In an innovation ecosystem context, value creation refers to the collaborative processes and activities of creating value for customers and other stakeholders. Value capture, on the other hand, refers to the individual firm-level actualised profit-taking; that is, how firms eventually pursue to reach their own competitive advantages and to reap related profits (for further discussion on value creation and capture; see e.g., Lavie, 2007; Adegbesani and Higgins, 2010). Value capture can also be common to some extent either when firms purposefully work towards capturing value together (e.g., through a separate legal entity) or, for example, when an unplanned business opportunity emerges as a consequence of their collaboration. However, as noted by Ritala and Hurmelinna-Laukkanen (2009), value capture is predominantly considered as an individual firm-related activity.
2.3 Building and managing innovation ecosystems

Managing a firm’s partnerships, alliances and networks is considered today as a key organisational capability (e.g., Blomqvist and Levy, 2006; Ritala et al., 2009) and many organisations have dedicated departments for this purpose (Agouridas et al., 2001; Dyer et al., 2001). Thus, there has been increasing interest in both practice and academia to find ways to manage business and innovation ecosystems (Adner, 2006; Dhanaraj and Parkhe, 2006; Iansiti and Levien, 2004). The literature presents various frameworks examining how innovation and business ecosystems are built and managed. They propose mainly two types of insights in this context:

1. those that help to analyse the phases in the lifecycle of ecosystems
2. those that help to analyse the ecosystem management mechanisms, capabilities and practices.

In the following, we discuss both types of frameworks.

Concerning the lifecycle of ecosystems, a seminal article by Moore (1993) suggested five phases: birth, expansion, leadership, self-renewal, and death. Faber (2001) suggested that the formation and development of collaboration can be represented as repetitive sequences of three main phases:

a. execution
b. evaluation
c. adjustment.

Doz (1996) on the other hand, proposed a conceptual framework of the evolution of collaboration in NPD that treats collaboration as a learning process. According to his study, successful projects were highly evolutionary and went through a sequence of interactive cycles, or learning, evaluation and adjustment.

Concerning the management of innovation ecosystems, the literature is still in an emergent phase, building and evolving on work published in the areas of collaborative settings, innovation, and NPD. For instance, Doz (1996) suggested that leading actors need to develop and apply ‘ecosystem coaching’ capabilities. Later on, Dhanaraj and Parkhe (2006) developed a view on ‘innovation orchestration’, where the building and management mechanisms of innovation ecosystems are divided to management categories concerning knowledge mobility, innovation appropriability and network stability (see also Ritala et al., 2009). In addition, some authors have suggested particular styles of managing ecosystems. Iansiti and Levien (2004), for instance, suggested that a leading firm may pursue a so-called ‘dominator’ strategy, where it is the holder of the relevant assets and thus the undisputable centre of its ecosystem, or a so-called ‘keystone’ strategy, where the company is a more flexible part of a diverse ecosystem, proactively and collaboratively developing, leveraging and sharing knowledge, capabilities and value.
2.4 Conceptual framework

Based on the aforementioned perspectives on lifecycle phases and management of innovation ecosystems, we suggest that mechanisms affecting value creation and capture could be roughly divided to the two main phases of building and managing innovation ecosystems. It should be noted that there are also phases related to the relationships between the actors before the ecosystems are built, ending or termination phases, as well as the phases that take place among the actors after the ecosystem has dissolved. In this study, we explicitly focus on the mechanisms that take place during the existence of the ecosystem, and thus these phases are outside the scope of our study.

The ecosystem building mechanisms are seen as facilitating and defining the premises of value creation and value capture, and the ecosystem management mechanisms are seen as of helping to maintain, realise and deploy opportunities for value creation and capture. Thus, there is a notable difference in the connotations between the two mechanisms. In particular, the building phase refers to the early phases of innovation ecosystem where the initial set of actors is starting to appear and the premises of eventual value creation and capture are being explored and formed. On the other hand, the management phase of innovation ecosystems concerns the maintenance and coordination of an established ecosystem with already recognised key actors, and here the value creation and capture mechanisms are more concrete.

As the building phase precedes the management phase, it will provide the framework to what value can be created and identify the actors that can capture a portion of that value. After these issues have been identified and they start to stabilise, the building phase begins to transform into the management phase (there are naturally no strict limits to this; and this transition could be treated as a continual process also sometimes going back and forth).

Both building and management phases may involve several types of mechanisms to coordinate how value is created and captured. In general, within an ecosystem context, these include both tangible and intangible mechanisms and structures (see e.g., Fjelstad et al., 2012). Both are certainly needed – as there is increasing evidence in that concrete, tangible mechanisms and relational, intangible mechanisms complement each other (Blomqvist et al., 2005). For example, in terms of NPD, one often-utilised approach is that of systems engineering and integration (SEI) (Blanchard and Fabrycky, 1998, Honour, 2003). However, such perspective is limited in addressing ‘soft issues’ (Checkland, 1981; Agouridas et al., 2004), and thus also principles from the soft systems methodology (SSM) should be used (see e.g., Checkland and Scholes, 1999). In another context, researchers have suggested that there is value in using both contractual and relational governance mechanisms to deal with various phases of collaborative R&D settings (Olander et al., 2010). Thus, to examine both types of mechanisms, we focus on both tangible and intangible mechanisms.

Figure 1 outlines the conceptual framework of this study, and its components will be discussed in more detail in the following sections.
### 2.4.1 Building innovation ecosystems – facilitating the premises of value creation

From the innovation and NPD point of view, ecosystem building mechanisms relate to designing the value-creating process itself, as well as the structure and mechanisms supporting it. Traditional collaborative NPD projects are typically challenged by poor guidelines and integration for supplier involvement. To improve NPD processes in this regard, collaborative work environments, integration of design and manufacturing, and concurrency of project activities to distinguish between efficient and inefficient NPD projects have been suggested as solutions (Swink et al., 2006; Aziz et al., 2005; Melvor and Humphreys, 2004). In this context, several mechanisms for facilitating the premises of value creation in innovation ecosystems have been identified. The tangible mechanisms mainly include structures that connect and attract participants together, such as forums, associations, and concrete get-togethers (Pellinen et al., 2012; Ritala et al., 2012). Intangible mechanisms are partially complementary to the tangible ones as they may (or may not) take place through such structures. These include, for example, the gathering and attraction of ecosystem participants (Dhanaraj and Parkhe, 2006), the initiatives taken by leading actors (Pellinen et al., 2012), clear communication of a common vision and building trust among the parties (Ritala et al., 2009).

### 2.4.2 Building innovation ecosystems – defining the premises of value capture

While the building phase is naturally more focused on creating value, some tangible and intangible mechanisms have been identified that also help facilitate the premises of eventual value capture. The tangible mostly refer to setting up contractual frameworks to
guide early plans concerning firm-specific innovation appropriability (Dhanaraj and Parkhe, 2006). This may involve, for example, specifying which intellectual property is owned and used by the actors, or defining the rights to utilise the upcoming results (see e.g., Olander et al., 2010). The intangible ones involve taking into account the motivation of each actor early on, which helps to solve some potential conflicts later on, as well as create a vision for the initial business goals of different actors (Ritala et al., 2012).

2.4.3 Managing innovation ecosystems – maintaining value creation

In general, the management mechanisms helping to maintain value creation in innovation ecosystems are concentrated on keeping the network up and running, as well as ensuring the longer-term competitiveness of the network.

Tangible mechanisms related to this are quite similar as in the building phase, but they are more stable and determined as the network evolves (Möller and Rajala, 2007). These include again formal structures (such as contracts and schedules), platforms, forums, and other arenas that maintain the possibilities for participants of the ecosystem to create value (Ritala et al., 2012; Fjelstad et al., 2012).

Intangible mechanisms, however, may become even more pronounced over time. Inter-firm and inter-personal trust, in particular, is often acknowledged as an important, and even as the most critical, success factor in collaborative settings (see e.g., Blomqvist and Levy, 2006). Trust is seen as a complementary governance mechanism to contracts, and it is needed to reduce the risk of partners’ opportunistic behaviour (e.g., Blomqvist et al., 2005; Zaheer and Venkatraman, 1995). Since it is impossible to foresee future partners’ behaviour and events, affection-based trust is inevitable to resolve upcoming new problems that nobody has thought beforehand. Indeed, in the innovation ecosystems context, it has been found that affection-based trust increases the chance of technological success by stimulating openness and joint problem solving, and by reducing the need for opportunism and conflict (Faber, 2001). According to Bstieler (2006), trust in the context of NPD can be modelled as an outcome of elements that are expected to either promote or have a detrimental effect on building trust. Trust is not something that can be mandated but rather it is the outcome of gradual, coherent and consistent effort over time (Bstieler, 2006). Other important intangible mechanisms are constant open communication and maintaining a common vision over time, by ‘coaching’ the ecosystem participants (Doz, 1996; Ritala et al., 2009). Combined with inter-firm and inter-personal trust, these mechanisms can help to maintain network stability and knowledge sharing over time (see e.g., Dhanaraj and Parkhe, 2006).

2.4.4 Managing innovation ecosystems – realising value capture

In the management phase, the value capture-related mechanisms can be considered as more concrete and strictly defined than in the building phase. They are also more contract-based than those related to value creation, even though they also share similarities in terms of facilitating structures (e.g., forums where these issues take place and structures where participants communicate). Tangible mechanisms that help maintain value capture opportunities involve, for instance, common guidelines, contracts, and IPRs concerning profits and appropriability (Dhanaraj and Parkhe, 2006; Ritala et al., 2009). Intangible mechanisms relate to ensuring the understanding and communication of different actors’ business goals and needs (Ritala et al., 2012).
3 Methods and data collection

3.1 Research design

We utilise a multiple-comparative case study, where two European multi-national firms and their innovation ecosystems are used to gain new insights of the research phenomenon. This type of inquiry is especially suitable for contemporary and explorative settings (e.g., Yin, 2003) such as ours. The research approach is qualitative, due to the emergent nature of the phenomenon of value creation and capture in business and technology ecosystems. One of the firms is a globally operating ICT manufacturing and services firm, and the other one is a systems integrator in aerospace and defence (A&D). Both cases reflect on the central positions these firms play in co-creating value and orchestrating their innovation ecosystems.

3.2 Data

To achieve in-depth insights on the topic, our investigation pursues data triangulation for both of the case companies. The primary data comprises interview data from the leading firms, but also participant observation data, and additional secondary internal documents and publicly available materials. Concerning the ICT ecosystem case, the primary data consists of three semi-structured interviews conducted with the three key persons within the leading ecosystem company that took between 1.5–2 hours, as well as several shorter phone interviews (duration about 0.5 hours per interview) conducted to clarify issues which were left open or needed enquiry. The themes of the semi-structured interviews were related to general information about the ecosystem and its actors, as well as the key theoretical constructs of this study, including the role of the leading firm in the ecosystem, the benefits and challenges of ecosystem approach to the leading firm in comparison to a traditional supply chain approach, the selection criteria of ecosystem members, the tangible/intangible governance mechanisms of collaboration, as well as concrete mechanisms and strategies on value creation and value capture used by the focal firm and the ecosystem members. Various types of secondary data were used as well, including workshop presentations and press releases. In the case of the A&D ecosystem, semi-structured interviews were conducted with three top management executives in charge of innovation ecosystem related activities. A total of eight stand-alone interviews were conducted with the executives, which lasted a total of 11 hours (Executive 1: 4 one-hour interviews, Executive 2 (3 one-hour interviews), Executive 3: 1 one-hour interview. These interviews followed the same interview guide as the ICT ecosystem interviews. Other primary data consist of anecdotal evidence based on the experience of one of the authors. Secondary data consists of publicly presented and internal innovation management documents.

3.3 Case description

In the case of ICT manufacturing and services firm, we concentrate on a certain portfolio of mobile positioning service and technology offerings, which are currently in early market growth phases. In this case, an innovation ecosystem is being formed around key technologies and services and the related actors in the value network. The main actors are the mobile technology and service firms providing the platforms for the offerings, the
customers who are the potential adopters of those services (including large retail firms and infrastructure owners, as well as the individual users that are the end customers), as well as the suppliers of the required infrastructure. The role of the case firm is in building and leading the ecosystem towards innovation adoption, de jure and de facto standards, diffusion among different actors and eventual commercial success. This case represents an archetypal ecosystem approach in the ICT sector, in that a diverse types of actors are required to be involved in order to get the ecosystem working, and the different actors are very interdependent [see examples of ICT ecosystems in e.g., Gueguen (2009), Pellinen et al. (2012) and Ritala et al. (2009)]. For instance, a representative of the ICT manufacturing and services firm said about the nature of their ecosystem that “…in particular all the actors are dependent on each other and thus there might be disturbances that are unpredictable”, when compared to the traditional type of buyer-supplier or value chain relations.

Table 1 Description of the two ecosystems under study

<table>
<thead>
<tr>
<th>ICT ecosystem</th>
<th>Aerospace and defence (A&amp;D) ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leading actor</td>
<td>Mobile technology and service firm (leading actor)</td>
</tr>
<tr>
<td>Key actors</td>
<td>Other mobile technology manufacturing firms (including competitors); Infrastructure manufacturers; Adopters of technology (large retail firms, public infrastructure owners, etc.); end customers</td>
</tr>
<tr>
<td>Nature of technology</td>
<td>Mobile positioning services and devices, and related infrastructure</td>
</tr>
<tr>
<td>Industry nature</td>
<td>Fast moving; winner-take-it all; high network externalities</td>
</tr>
<tr>
<td>Role and goals of building an innovation ecosystem (i.e., main benefits)</td>
<td>Ensuring the creation of a new market using a new technology; a possibility for a de-facto standard</td>
</tr>
</tbody>
</table>

In the case of the A&D firm, we concentrated on the area of aeronautics (airframes dealt with as integrated systems and/or platforms) for civil and military markets. In this case, innovation ecosystems are formed around emerging capabilities gaps and/or risk-sharing initiatives of the leading A&D firm (systems integrator). This case represents an archetypal collaborative development approach in transition (i.e., paradigm shift), in that the whole A&D industry is moving from advanced supply chain management practices (e.g., suppliers incentivisation and risk-sharing) towards the adoption of open innovation practices covering not only technological but also business development (e.g., services development) areas. The already existing innovation ecosystems of this case are characterised as ‘emerged’. This is opposed to ‘purposely-built’, as these ecosystems have been predominately formed and evolved around established supplier chain
relationships (e.g., established mindset of subcontracting either for long-term or short-term horizons and cost reduction/optimisation). The evolving role, and challenge, for the focal A&D firm of our case, is its demonstrative transition from subcontracting and risk-sharing to partnering and to so-called opportunity-sharing mindsets during the very early phases of business development (also referred to as business nursery). From the literature point of view, the challenge is the further development and establishment of keystone activities (Iansiti and Levien, 2004).

4 Analysis of value creation and capture in innovation ecosystems

4.1 Ecosystem building mechanisms

4.1.1 ICT ecosystem

The role of standardisation of key technologies was seen as fundamental part of building the premises of value creation and capture in the ICT ecosystem in the first place. In doing this, the leading firm has adapted an open role towards other participants in terms of pushing the key technologies towards standardisation in an open and inclusive manner. In fact, some of the key technologies were originally developed by the leading firm itself, but a decision was made to not make them proprietary and rather to maximise the impact of them through open standardisation approach. The principle was that there need to be many actors involved using the technology from early on and towards commercialisation. Furthermore, by using publicly promoted standardised technology, the leading firm could also ensure that there were no risks related to adapting an outside proprietary technology – for them or for other ecosystem members (e.g., it was acknowledged that infrastructure owners would be resistant to adopt a technology that only works on the devices of one mobile device manufacturer). The adopted perspective represents an open ecosystem-building approach, rather than proprietary single firm and tight vertical integration. The idea behind this is, according to the firm representative, that “the smaller piece of a big cake is bigger than the original size of the cake altogether”. Furthermore, it was suggested that solutions around an excessively tight consortium structure might eventually end up being too small to ensure the expected market penetration levels. However, it was also recognised that some complementary technologies that enable differentiation remain proprietary (for the leading firm as well as for the other key actors), helping to ensure eventual value capture.

In addition to the standardisation work, a parallel industry consortium (representing a tangible structure) was setup to even more concretely promote the actual solutions towards several stakeholders. In this, a key issue is that all the relevant actors representing various positions of the value chain need to be involved early on. To achieve this, the leading firm put very strong emphasis on openness and communication from the very beginning. This included putting in place public pilots showing the potential benefits of the technology to other potential supply chain actors such as infrastructure owners that can utilise positioning services to create value for their customers. This also included proposing concrete plans for setting up an industry ecosystem, which they sent to a large group of potential ecosystem members. These plans included concrete (i.e., tangible) legal documents concerning NDAs, as well as the potential ecosystem value capture stakes. The representative of the ICT firm emphasised that this was their own opinion,
and they were very open to any other opinions concerning the legal or other collaboration principles. The early phases also included hosting joint meetings where common principles were further discussed. Such model was seen the best way to ensure rapid market creation with large enough support from various types of actors. The risks related to this approach, however, embrace the complexity naturally involved with multiple actors with various types of needs, strategies, and interdependencies. For instance, there are questions whether all involved actors are committed enough, and whether the business benefits can be ensured for different individual actors as well.

The role of ‘coopetition’ was also seen as of paramount importance in the ecosystem building phase in ensuring the premises of value creation. The ICT firm suggested that involving key horizontal actors in addition to vertical ones is important in ensuring the vitality and growth potential of the ecosystem: “…in order to get enough users, all the relevant competitors must be involved”. This could be seen through the open knowledge sharing approach by the focal firm, as well as in the attempts of building an industry consortium. This became visible, for example, in mobile industry conferences, where the leading firm openly promoted the standardisation process and the industry consortium set-up plans, and any competitor was treated as equally potential collaborative partner.

4.1.2 A&D ecosystem

In the context of the A&D firm, new partners are usually innovative SMEs. To motivate existing partners but also to attract new ones, the A&D firm has been exploring various ways of providing ‘good hosting conditions’ including the organisation of brainstorming sessions with a number of invited SMEs as well as supporting the establishment and sustainable development of aerospace clusters. A widely-stated difficulty faced by the A&D firm was, generally speaking, to give the SMEs the business perspective that fits to their business perimeter and planning horizon (i.e., financial strength and timing of revenues). This is usually a key factor why the SMEs are not motivated to join the ecosystem call of the focal A&D firm and eventually run away. This was shown to be a major concern for the focal A&D company as all its initial efforts to provide hosting conditions and stimulate a value creation setting could be effectively lost. Taking this into consideration, the focal A&D firm has been in continuous search of finding ways to satisfy the needs of promising SMEs (especially the ones operating outside the A&D sector) which cannot be ‘patient’ (i.e., wait for 10 years to have some revenues due to lifecycle issues in A&D, including certification of new products). To this end, the A&D firm has been developing and testing a new approach to generate and establish cooperation agreements that clearly demonstrate short-term (e.g., through specific quick win projects) as well as long-term benefits (e.g., development of common vision through joint business model prototyping) for the participating partners/SMEs. It was identified that a key element of these agreements has been both the determination of how a collaboration might evolve (e.g., through the establishment of a joint venture) as well as the form of potential exit strategies of the participants (e.g., IP issues); the latter was seen as rather challenging task when considering the passion of the SMEs for their IP as well their usual risk-averseness.

The importance of managing coopetition relationships in establishing a business ecosystem has been well recognised within the A&D firm. In fact, coopetition in A&D is not something new. For long and especially since early ’90s, the A&D industry has been evolving in such a way that risk-sharing approaches, realised in the frame of extended
enterprises, have eventually led to the emergence of competing networks than competing enterprises alone. In such context, A&D firms have been used to operate with certain companies concurrently either as a partner and/or as a competitor depending on the project (extended enterprise) they belong to. However, it has to be acknowledged that such coopetition relationships have not been necessarily proactively managed by the A&D firm, as their nature depends on the partnership agreement (e.g., commercial or product development) in place. That is to say, nowadays the challenge for the A&D firm, in its effort to build and manage business ecosystems, lies not only on the proactiveness required to manage such relationships but also on managing the open and social nature of such relationships. As a consequence, the nature of these relationships certainly expands beyond the traditional business clauses and heavily depends on the non-tangible factors that are not described in partnership agreements (e.g., development of trust and partners’ reputation and credibility).

4.2 Ecosystem management mechanisms

4.2.1 ICT ecosystem

The management phase of the ICT ecosystem is structured around an industry consortium, which includes all the key actors of the ecosystem, and through which both tangible and intangible mechanisms are conducted.

The management mechanisms helping to maintain and realise value creation were under constant development due to the nature of the growing and developing ecosystem. Some of them were more emerging and trial-like, while some were more established which can be identified here. First, frequent meetings with ecosystem members were held, which helps in creating stability for the emerging industry ecosystem around joint value creation goals. Second, another issue was to push the promotion of key technologies and related standards forward by the leading firm, and also to involve the relevant actors in the same initiative. Both of these mechanisms were conducted through an industry consortium with over 20 members from the key companies of the ecosystem, representing all types of actors in the value chain (including mobile device manufacturers, semiconductor manufacturers, mobile location service firms, application providers and other telecommunication and technology firms). The rationale for this consortium was to tie the actors together around a joint purpose, and to create a public image for the technological initiative around the technologies and business models involved. The eventual consortium set-up also included almost all of the key competitors to the leading firm, some of which were included early on and some a bit later. This inclusion was seen to help assure that there is wide enough horizontal coverage for other value chain members to attach to, and therefore to ensure market creation and growth. For customers, this should provide a wide array of different solutions; and for suppliers a wide array of potential customers. The existence of coopetition tensions was recognised and accepted by all competing actors that were involved, and it affected the scope of knowledge sharing and interaction which took place between them. This was not seen to distract joint value creation; however, since the actors acknowledged that they can be ‘partners in some fields, and competitors elsewhere’.
Table 2  Summary of innovation ecosystem building mechanisms in both cases

<table>
<thead>
<tr>
<th>Mechanisms helping to ensure value creation</th>
<th>ICT Ecosystem</th>
<th>A&amp;D Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation to industry conferences and openly pushing the key ideas forward</td>
<td>• Participation to industry conferences and openly pushing the key ideas forward</td>
<td>• Provide hosting conditions (ranging from hosting brainstorming sessions to facilitating the development of aerospace clusters)</td>
</tr>
<tr>
<td>Submitting a draft version of common principles of ecosystem’s goals to potential participants</td>
<td>• Submitting a draft version of common principles of ecosystem’s goals to potential participants</td>
<td>• Communicate long-term win-win business prospects through jointly developed cooperation agreements (including shared exit strategies) around a common vision</td>
</tr>
<tr>
<td>Facilitating the building of an industry consortium</td>
<td>• Facilitating the building of an industry consortium</td>
<td>• Internal innovation labs through internal organisation managing transversal innovation activities between business units</td>
</tr>
<tr>
<td>Explicitly open communication toward all the parties (including competitors)</td>
<td>• Explicitly open communication toward all the parties (including competitors)</td>
<td>• External innovation labs through participation in forums and establishing formal agreements with academic institutions</td>
</tr>
<tr>
<td>Crafting a common vision for the ecosystem</td>
<td>• Crafting a common vision for the ecosystem</td>
<td>• Business model prototyping and coaching as means of exploring new value horizons.</td>
</tr>
<tr>
<td>Ensuring all the important horizontal actors are involved</td>
<td>• Ensuring all the important horizontal actors are involved</td>
<td>• Joint legal agreements on ownership of foreground IP (individual or common) based on agreed contributions prior to starting collaborative activities</td>
</tr>
<tr>
<td>Conducting public pilot cases with various supply chain members where the technology and services are used</td>
<td>• Conducting public pilot cases with various supply chain members where the technology and services are used</td>
<td>• Common commercial exclusivity practices as means to ensure individual value capture for SME partner(s) (e.g., time limited commercial benefits and/or commercial benefits on certain geographical territories)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanisms helping to ensure value capture</th>
<th>ICT Ecosystem</th>
<th>A&amp;D Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint legal agreements on the relative share of IPRs and other intellectual property which is created</td>
<td>• Joint legal agreements on the relative share of IPRs and other intellectual property which is created</td>
<td>• Establishment of ‘mediation’ rules in case of conflict (including arbitration bodies and ecosystem self-mediation)</td>
</tr>
<tr>
<td>Taking into account the differences in the goals of various actors early on</td>
<td>• Taking into account the differences in the goals of various actors early on</td>
<td>• Manifestation of strong partnerships (common interests and vision) through legal entities (e.g., joint ventures)</td>
</tr>
<tr>
<td>Collaboration contracts and commonly-agreed-on principles</td>
<td>• Collaboration contracts and commonly-agreed-on principles</td>
<td>• Business model templates as means of providing coaching and clarity of value capture amongst all partners</td>
</tr>
<tr>
<td>Keeping complementary technologies proprietary in addition to the openly shared and standardised ones</td>
<td>• Keeping complementary technologies proprietary in addition to the openly shared and standardised ones</td>
<td>• Business model templates as means of providing coaching and clarity of value capture amongst all partners</td>
</tr>
</tbody>
</table>

In terms of value capture, the ICT firm noted that there are some mechanisms that could facilitate this at the level of individual firms. For instance, the representatives of the ICT firm suggested that even though coopetition was involved, they would be able to tap into
potential market opportunities quickly and to differentiate. This is an issue which would help the firm to ease competition concerns for all parties involved. In fact, the risks of coopetition were not seen as too high at this phase, since the main benefit for all the competing firms was to adapt the same key technologies, which they could use in their own businesses to capture value.

4.2.2 A&D ecosystem

The mechanisms employed by the focal A&D firm in its efforts to maintain and realise value creation predominantly originate from its mature learning curve on supplier management. It was acknowledged that the main challenge for the focal firm has been the extension of its supplier relationships beyond 1st tier in such a way that 2nd and 3rd tier suppliers could be effectively and efficiently involved. In other words, advanced supply chain management usually involves risk-sharing contractual agreements and collaborative projects at the 1st tier layer. Product requirements as well as risk are then cascaded downstream in a manner that is mostly out of the focal company’s control (as this is a responsibility of the relevant 1st tier contracted partner). However, when operating in an ecosystem setting, a focal firm needs to establish and nurture relationships with its partners no matter of their value chain positioning in the frame of a common collaborative project. This has resulted in a major challenge for the A&D firm as it effectively means that the A&D firm not only has to manage its existing, traditional supply chain relationship with its 1st tier partners, but to also identify and employ effective means to reach its 2nd and 3rd tier partners without disturbing its business relationships with its 1st tier partners.

The organisation of exchange meetings and the participation in exchange forums (through more or less tangible/formal or intangible/informal structures) feature as the most prevalent, simple and effective means used by the case focal firm for engaging either with its existing supply chain partners or with its new ones. This has been the main vehicle for improving its social behaviour by demonstrating in action its willingness to treat its suppliers as partners (as opposed to mere sub-contractors) and pass the message throughout the ecosystem. At this point, it has to be acknowledged that a perpetual challenge to the focal firm is to improve its internal coherence throughout the timeline of a project. That is to say that during the lifecycle of the project the focal department/person that usually represents the firm may change, due to changes in the organisational structure. In addition, anecdotal evidence has indicated that usually the further downstream on the project the more the message initially transmitted gets diminished. For example, whilst the business development team of the focal company may identify a number of partners with whom an ecosystem could be built to pursue opportunities in a given business area, the procurement department may not approve these partners as in most cases the criteria it uses are the same applied for selecting sub-contractors. Eventually, this exposes the focal firm to inconsistency, albeit with no purpose, in its behaviour and consequently has an impact on its social behaviour; i.e., how SMEs might perceive it and therefore express their willingness to engage in collaborative endeavours with the focal firm.

In terms of value capture, our findings indicate that there are quite explicit means for managing the activities involved. For example, common commercial practice exclusivity agreements are usually put in place to secure that the focal case firm would safeguard its potential first mover competitive advantage in key business areas. In the same spirit,
common commercial practice agreements on market access characterised by geographical
territories seemed to be an effective manner on finding among partners common grounds
of satisfaction for value capture. In addition, our findings indicate that in the case of very
clearly-targeted business opportunities and strong partnership spirit and potential, the
creation of legal entities was the preferred way of managing value capture among
partners. The means outlined above for managing value capture are considered also as the
minimum set of traditional tools to manage commercial and developmental coopetition
relationships between the focal firm and its partners. Since the focal firm is in the process
of developing and testing its approach to building and managing business innovation
ecosystems other new generation tools that will constitute the main means for also
managing intangible aspects of coopetition are expected to be developed and applied
(e.g., collaborative business model prototyping).

Table 3  Summary of innovation ecosystem management mechanisms in both cases

<table>
<thead>
<tr>
<th>ICT Ecosystem</th>
<th>A&amp;D Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanisms helping to maintain and realise value creation</strong></td>
<td><strong>Mechanisms helping to maintain and realise value capture</strong></td>
</tr>
<tr>
<td>• Participating in frequent joint meetings through an industry consortium with the key ecosystem members</td>
<td>• For existing supply chain: Challenge on how to go beyond 1st tier supplier relationship and effectively involving 2nd and 3rd tier players</td>
</tr>
<tr>
<td>• Promoting the technology and the solutions through the industry consortium</td>
<td>• Regular knowledge exchange meetings/events (formal or informal)</td>
</tr>
<tr>
<td>• Promoting development and adoption of key technologies and related standards</td>
<td>• Improving social behavior of the company and improving internal coherence</td>
</tr>
<tr>
<td>• Develop cooperation agreements with clear exit strategies (agility of cooperation)</td>
<td>• Common commercial exclusivity practices on certain geographical territories</td>
</tr>
<tr>
<td>• Differentiation in the growing markets to ensure individual share</td>
<td>• Creation of legal entities to facilitate value capture as a result of strong partnerships and clear business targets</td>
</tr>
<tr>
<td>• Fast lead time to markets due to complementary technology and business capabilities (from key actor perspective)</td>
<td>• Support SMEs to access new markets (enlarge their business perimeter in terms of mission/activities covered)</td>
</tr>
</tbody>
</table>

To conclude, as with building an ecosystem, one major challenge in managing both value
creation and capture activities lies in the significant time lag concerning each partner’s
business planning horizon. In other words, there are gaps in business planning between
large-scale companies – they look the implementation of the work they do with SMEs
usually in long-term (e.g., in their next big programme which might be in 5–10 years) – and the planning of SMEs (their planning horizon is shorter as they need to
generate revenues and profits earlier, e.g., in 2 years’ time and not in 5–10 years).
Anecdotal evidence indicated that another emerging trend has been for the focal case firm to try to support its SME partners to access totally new markets by enlarging their business perimeter in terms of the missions and activities covered. This parenting behaviour of the focal firm could be seen in view of accelerating the timing of the revenue stream for its partner SMEs and mediating therefore the time lag involved in capturing value from the actual collaborative project engaged in the first instance.

5 Discussion and conclusions

This study has put forward a comparative case study on two innovation ecosystems in two different industries – ICT and A&D. We have especially focused on the tangible and intangible mechanisms a leading firm can use in innovation ecosystems to facilitate and ensure value creation and capture not only for the focal firm, but also for the whole ecosystem. In general, we found that both firms pursued to effectively build and manage, in other words, orchestrate (Dhanaraj and Parkhe, 2006; Ritala et al., 2009) their innovation ecosystems. The ICT ecosystem was following quite closely the keystone strategy approach where the leading firm pursues to facilitate the interaction between diverse actors of the ecosystem to create value (Iansiti and Levien, 2004), whereas the leading firm in the A&D ecosystem has been continuously developing and establishing keystone characteristics.

In both cases, the building mechanisms related to value creation were mostly connected to facilitating and motivating intangible and tangible mechanisms such as joint forums, meetings, and labs through which common vision and goals were communicated. The value capture mechanisms in the building phase were much related to pre-planned contractual and relational frameworks (e.g., contacts, agreements, plans) of each actor’s potential share of the outcomes. In the management phase, the value creation-related mechanisms were mostly connected to maintaining knowledge sharing and collaboration through established structures (such as consortiums or projects), as well as maintaining the promotion of the technologies and solutions involved. The value capture mechanisms in the management phase were related to the differentiation and segmentation of each actors’ share of the value, in order to ensure the competitiveness for the whole ecosystem (e.g., with the help of contracts or individual business models). There were also many specific features in the two ecosystems that provide interesting implications. These are discussed in the next section.

5.1 Ecosystem building and management mechanisms – a comparative view

We found interesting differences between the cases that should be further discussed here. In the case of ICT ecosystem, the leading firm was found to actively facilitate the building of the ecosystem in terms of gathering all the relevant actors into negotiations and pushing the key technologies and solutions forward on other fronts. These activities were done to ensure the premises of value creation altogether, since without the various ecosystem members involved the services could not have a possibility to eventually break through to intensely competed end-customer markets. In these issues, the major challenge was to involve enough major actors in the ecosystem quickly enough to build the ecosystem and eventually create the markets. Value capture issues were also considered at the level of both the individual firm and the overall ecosystem, and concrete discussion
about the goals of each actor took place. The mechanisms for managing the ecosystem were moving towards formally (meetings, IPR agreements, formal project teams) and informally (informal relationships between people) coordinated structures.

In the case of the A&D ecosystem, the results suggest that the whole industry (including the leading firm) is transforming towards open collaborative structures that would allow the creation and maintaining of innovation ecosystems. The challenge for the focal A&D company is to more purposefully seek and facilitate collaborative settings as means to secure long-term value creation and the risk mitigation of its high level investments. In other words, the challenge is to further develop and establish its keystone strategy characteristics (Iansiti and Levien, 2004) whilst taking into consideration the conservative and risk-averse mindset that characterise the A&D sector in general. In fact, although firms in A&D sector have traditionally been characterised as risk-averse due to the huge capital expenditures involved, they have increasingly developed innovative product and service offerings under risk-sharing contractual schemes. However, it has to be acknowledged that such schemes relate more to advanced supply chain management than innovation ecosystems. The reason is that they actually refer to the realisation of already decided programmes and hence seek for optimisation of risk mitigation in terms of manufacturing costs and lead time. There is a need to invest more in collaborative, ecosystem activities at the very early phases of product and business development where capital expenditures are significantly lower and there is space for refining business ideas through advanced prototyping activities (Schrage, 2000). Thus, the A&D sector has to take a leap step towards adopting a collaborative business model prototyping mentality that will eventually contribute to both operating more comfortably under the open innovation paradigm and increasing the probability of success of future programme capital expenditures (i.e., reducing exposure to risk). To accomplish development in this regard, it has been acknowledged within the leading firm that the transition should deal with trust, building long-term relations, managing IPR effectively, and operating comfortably in coopetition settings.

As seen from the results, there were many differences between the examined cases, even though in both cases innovation ecosystems were seen as the lifeline for the focal firms. The different maturity levels found in their pursued strategies are related to industry differences in terms of complexity, speed of change, and other factors regarding the business and technology environment. Specifically, differences in industry clockspeeds (Fine, 2000), dynamic capabilities structures (Eisenhardt and Martin, 2000), and technological regimes (Kim and Lee, 2011) may explain many of these differences. In terms of the ICT sector, the time was clearly of the essence for all of actors involved, and the focus was to get technology and business solutions to the markets as fast as possible with as large an ecosystem member base as possible. The leading firm sought to act along this environment, as it has adopted an open and inclusive approach to ecosystem development. In terms of the A&D ecosystem, there has been some mismatch between the slower moving large firms and innovative SMEs. This puts more pressure on the leading A&D firm in terms of ecosystem management mechanisms, where there is an increasing need to move towards similar practices encountered in the ICT sector ecosystem. Nonetheless, some industry-related differences will remain; for example, with regard to more focused ecosystems with smaller number of players, and more tangible rules for value creation and capture.
5.2 Theoretical implications

As a general finding, the leading firms employ both tangible (i.e., concrete, contractual) and intangible (i.e., relational) mechanisms in building and managing innovation ecosystems. The tangible mechanisms mostly related to contracts concerning collaboration and IP issues, as well as formal structures enabling collaboration. Indeed, tangibility does matter in terms of creating a concrete space for ecosystem activities and actors to come together, but also to ensure the ‘rules for the game’. In terms of intangible mechanisms, the role of the leading actor in creating a common vision and engaging in various types of initiative-taking was seen very important in both cases. This is in line with recent discussions of the importance of leading actor’s resources, leadership, and activities in business and innovation ecosystems (e.g., Fjelstad et al., 2012; Pellinen et al., 2012; Ritala et al., 2012). Another focal issue for the vitality of innovation ecosystems was the number of actors involved, which has been seen to promote the role of direct and indirect network effects in creating value for the customers (Pellinen et al., 2012). This was especially visible in the ICT case due to the special industry characters involved.

While pinpointed some central mechanisms that are explicitly tangible or intangible, it should be noted that they are most often intertwined. For instance, in industry forums and consortia (ICT case) or innovation labs (A&D case), both tangible and formal structures as well as intangible facilitating mechanisms are in play. Thus, as suggested by earlier research (e.g., Blomqvist et al., 2005), these mechanisms are complementary rather than supplementary, and using them together will bring significant value in innovation context.

One interesting finding in both of the cases supported the role of coopetition in value creation and capture. In the ICT ecosystem, this was seen as the prerequisite for ensuring the width and variety of value creating base of companies, and in the A&D ecosystem coopetition was seen as an intensifying phenomenon that had to be handled with and managed properly. These findings support the recent discussion of the focal role of coopetition in creating value in innovation settings (e.g., Gueguen, 2009; Ritala and Hurmelinna-Laukkanen, 2009; Gnyawali and Park, 2011).

Combined, the results suggest that orchestrating value creation and capture in innovation ecosystems requires more than simply mastering collaborative capabilities by the focal organisation as required for NPD. One main differentiator is that in traditional collaborative settings, the focal and leading organisations are seeking to optimise the performance of their business models through purposeful engagement of external parties, whereas in the case of building and managing innovation ecosystems the focal organisations are seeking to create unprecedented, difficult to copy and imitate value propositions founded on innovative business models, opportunity-sharing (versus risk-sharing) and purposeful nurturing of long-term partnerships (i.e., demonstrating keystone qualities). To this end, the maturity of symbiotic relationships developed in a given ecosystem (Fransman, 2007) and the level of trust developed can be considered as key success factors in innovation ecosystems. In the A&D ecosystem case, timely, reliable and adequate information exchange was seen as essential for reaching high levels of trust ([supporting the findings of Bstieler (2006)]. In addition, evidence from the ICT ecosystem also indicates that trust at the organisational and individual level are important, and that effective practices in contracting and IPRs can complement this [as suggested in Blomqvist et al. (2005)].
5.3 Managerial implications

The study has provided a broad repertoire of practical results in terms of ecosystem building and management. Interestingly, while the industries are quite different, many of the mechanisms are similar, but their usage and effectiveness vary. In general, it was observed in the A&D ecosystem case that the industry is still evolving from subcontracting to extended enterprise operations. Thus, the industry is not as mature in managing cross-enterprise collaborative innovation settings (i.e., during the fuzzy front end) to the same extend as in the ICT case, where the ecosystem type of collaboration was more familiar way of operating. Thus, the most compelling challenges for A&D companies are not of technological nature but rather of managing and facilitating the collaborative innovation between many partners (as opposed to just suppliers) being spread across the world and facilitated through business model prototyping. To this end, it might be well expected from leading companies to provide financial and human resources to their partners as a way of creating ‘good’ hosting conditions for, as well as facilitating their membership in innovation ecosystems created in response to the launch of new programmes. These initiatives, combined with open communication, could facilitate innovation ecosystem building and management in the A&D sector. The same issues are also important in the ICT sector, but in addition to these the network externality related issues take much stronger role. This means ensuring broad horizontal and relevant vertical actor involvement to create new solutions that are actually adopted throughout the markets.

5.4 Limitations and further research possibilities

The study includes limitations related to its qualitative nature. While we discussed innovation ecosystems in two different industries, the results may not apply in completely different settings. However, we believe that the results provide interesting implications to further study value creation and capture in various types of industries and settings. Further research could also employ quantitative methodologies to examine, for instance, which types of ecosystem building and management mechanisms are most valuable and effective from the perspective of ecosystem members. Furthermore, the study focused on the value creation and capture mechanisms in the building and management phases of the ecosystem. However, other phases before and after ecosystem existence could also be included in future studies. For instance, studies to investigate and discuss the exit of various actors from an ecosystem, or of an event leading to the dissolution of the whole ecosystem could be interesting. Finally, while we decided to examine the ecosystems from the leading actor perspective, and not to define the boundaries in distinct manner, future studies could take a more focused approach to, for example, a certain set of actors within the whole ecosystem to get more in-depth view about the processes and interactions taking place.

Acknowledgements

The authors would like to thank the staff and managers from both organisations who facilitated, and contributed to, the data collection phase. Special thanks are due to
Patrice Commin and Gregor Dirks for aptly sharing their expertise, insights and network entry points.

References


Value creation and capture mechanisms in innovation ecosystems


