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Do Business Ecosystems Differ from Other Business Networks?

The case of an emerging business ecosystem for digital real-estate and facility services

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Abstract. The concept of ecosystem emanates from ecology and subsequently has been broadly used in business studies to describe and investigate complex interrelationships between companies and other organizations. However, it is widely known that borrowing constructs from natural sciences to social sciences, or vice versa, can be problematic. For example, the use of the ecosystem concept outside its original domain has received criticism. To better understand the essence, applicability and boundaries of the business ecosystem concept, this study conducts a conceptual analysis of a set of concepts used to describe business networks. To this end, we analytically comparing business ecosystem with other prominent concepts, namely industry, population, cluster, inter-organizational network and value network. We then present an illustrative case of an emerging business ecosystem of digital services for real-estate and facility services and scrutinize the applicability of the focal concepts for our case. The results indicate a need for increased conceptual clarity when describing business networks. The results indicate a need for conceptual clarity when describing business networks. We conclude with a synthesis and discuss under what circumstances using the business ecosystem concept may add value for research and practice. The paper contributes to the business ecosystem literature by clarifying the similarities and differences between business ecosystem and other concepts used to describe business networks.

Keywords: business ecosystem, cluster, network, industry, value network, collective consciousness, digitalization, conceptual analysis

1 Introduction

The term ecosystem has diffused outside its original domain in natural sciences (Autio & Thomas 2014; Mäntymäki & Salmela 2017). In biology, an ecosystem, or ecological system, typically denotes a unit of biological organization made up of all the organisms in a given area, thus forming a “community”. Organisms within a community interact

with the physical environment so that the flow of energy leads to characteristic trophic structure and material cycles within the system (Odum 1966).

The specific focus of this paper is the use of the ecosystem metaphor in describing business networks (cf. Aarikka-Stenroos et al. 2017). The literature has coined concepts such as business ecosystems (Peltoniemi & Vuori 2004), innovation ecosystem (Oh et al. 2016), software ecosystems (Hyrnsalmi et al. 2016), service ecosystem (Vargo & Lusch 2010), product ecosystem (Frels et al. 2003), and platform ecosystem (Cecagnoli et al. 2013), to name but a few. The widespread use of the ecosystem metaphor implies that has been viewed to provide some value-added for researchers. At the same time, however, the use of ecosystem metaphor has also been criticized and the accuracy of the metaphor questioned (Oh et al. 2016; Hyrnsalmi 2015). Boulding (1956) holds that analysing tools, such as conceptualizations of organization need to be at the same level of the complexity with the phenomena in question. To foster this element, we apply Turunen's (2015) view of organizing which maintains that all conceptualization of are embedded in organizational consciousness which we take along in this paper.

The purpose of this paper is to understand (1) what is a business ecosystem and (2) how does the concept of business ecosystem relate to other similar concepts, including what role cross-organizational collective consciousness plays in the ecosystem concept. In this paper, we focus on five widely discussed concepts that have been used to describe business networks, i.e. groups of inter-connected organizations, namely industry, population, inter-organizational network, cluster and value network.

Based on our analysis we argue that concepts industry and population emphasize competitive relationships between firms, whereas an inter-organizational network and a cluster place more emphasis on collaboration. In this respect, an ecosystem is a more diverse concept, presuming both collaborative and competitive relationships, which generate intertwined awareness processes such as collective consciousness (Turunen, 2015), which draws on social sciences, particularly from psychology and sociology.

This study contributes to the literature by demonstrating that there is an overlap between the business ecosystem concept and other similar concepts. This is particularly so in the use of these concepts by practitioners. For researchers, our study shows a clear need for more fine-grained conceptual and theoretical analyses of the business ecosystem concept. We further conclude that additional scrutiny of the ecosystem metaphor and its value-added for theorizing and for managerial communication is needed.

The paper proceeds as follows: after the introductory section, we present a discussion of the business ecosystem concept. Thereafter, the present a set of related constructs used to depict business networks and analyse how they converge with, and diverge from, the business ecosystem construct. The paper concludes with a synthesis of the analysis and suggestion for future research.

2 The Business Ecosystem concept

The business ecosystem concept was coined by Moore (1993). His seminal article debates capability coevolution around innovation with distinct stages towards a shared future and accruable profit model of business ecosystem:

...a business ecosystem [...] crosses a variety of Industries [...], companies co-evolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations.

Every business ecosystem develops in four distinct stages: birth, expansion, leadership, and self-renewal – or, if not self-renewal, death. [...] While the centre may shift over time, the role of the leader is valued by the rest of the community. Such leadership enables all ecosystem members to invest towards a shared future in which they anticipate profiting together.” (Moore (1993, p. 76)

Moore (1996) further defines ecosystem as an economic community supported by a foundation of interacting organizations and individuals:

“ This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The business ecosystems are characterized by a large number of loosely interconnected participants who depend on each other for their mutual effectiveness and survival.” Moore (1996, p. 26)

In their business ecosystem conceptualization, Iansiti and Levien (2004, 8-9) put more emphasis on networks. Accordingly, an ecosystem is essentially as an analogy to describe modern business networks. They also acknowledge the using biological analogies in business literature can be a controversial issue and further argue that “the analogy between evolved biological systems and networks of business entities is too often misunderstood.” Iansiti and Levien (2004, 5). Authors further lament that their use of the term ecosystem is probably closer to the biological term community but they use the term ecosystem to highlight that they are discussing a complex system and working with a biological analogy.

Based on subsequent literature on business ecosystems, such systems appear to have at least three characteristic features:

1. Members of an ecosystem are highly interconnected. Interconnectedness refers to the fact that the success or failure of a member of an ecosystem affects the other members.
2. A business ecosystem often includes a keystone that “regulates ecosystem health” (Moore 1993 p.8). The keystone is typically an actor that is able to support and orchestrate the activities that take place within the ecosystem.
3. Ecosystems are complex systems (Peltoniemi & Vuori 2004). As described by Cowan (1994, 1), complex systems “contain many relatively independent parts which are highly interconnected and interactive.” Lewin in turn (1999) further laments that complex systems are systems whose properties are not fully explained by an understanding of its constituent parts. (Lewin 1999). Thus, complex systems can be informed by the process research (James, 1909; Tsoukas & Chia, 2002) of collective interaction (Kimble, 2008).

While the characteristic features of #1 and #3 are somewhat congruent, the second one raises a question: how can a complex, interconnected, system be regulated by one actor? This appears to be one of the internal tensions related to the concept of business ecosystem. On the other hand, co-operation in business ecosystem creates a common awareness that in turn helps to manage diversity and complexity.

In software business, the ecosystem concept has been used to depict business networks built around a key player such as Apple. The core of Apple's ecosystem is the App Store. For customers, the App Store is a software marketplace where Apple acts as a gatekeeper and trust provider. For application developers, such as providers of different mobile games, Apple provides the development tools and a distribution channel via its App Store. For Apple, the App Store is a means to generate additional revenue but also a mechanism to significantly extend its value proposition beyond hardware and the core software that is pre-installed in its products.

3 Comparison of industry, population, cluster, interorganizational network, value network, and business ecosystem

One way to seek a better understanding of the ecosystem is to compare it with other similar concepts used in prior research. In the following, we shall present and compare an ecosystem with five such concepts: industry, population, inter-organizational network, value network and cluster. While the first two assume relationships between firms as primarily competitive, the last three bring the collaborative relations into the surface.

3.1 Industry

Perhaps the most traditional concept used in describing and classifying companies' environment is industry. Generally speaking, an industry consists of companies or networks of companies that provide similar product or service offerings to same markets. Porter defines the concept industry as follows (Porter, 1980, p. 32):

“Structural analysis, by focusing broadly on competition well beyond existing rivals, should reduce the need for debates on where to draw industry boundaries. Any definition of an industry is essentially a choice of where to draw the line between established competitors and substitute products, between existing firms and potential entrants, and between existing firms and suppliers and buyers.”

The underlying theme in the concept is that competitive relations define borders for industry. Industries can be treated as entities, having attributes of their own. For instance, because of structural differences, some industries may be more profitable than others (Porter, 1980). The dynamics inside the industry is largely explained by forces of competition.

The idea of an industry as a competitive marketplace does not exclude collaboration completely, but it is seen as an exception, labelled with terms such as strategic alliances or co-opetition (Bengtsson & Kock, 2000, Hamel et al. 1989).

Industries are also complex systems, even if no collaborative relations are taken into consideration. For example, in hypercompetitive industries, companies need to rely on complex strategic manoeuvring in order to capitalize on new opportunities in the marketplace faster than their competitors (D'Aveni, 1994). However, as the industry players focus on their own competition, there does not emerge cross-organizational collaboration or collective awareness among industry players.

A company can belong to industries of different levels, for example game developers belong to game industry but on a more generic level also to software industry. When industry concept is applied to computer and mobile game providers, the emphasis is on competitive relations: game providers compete over same customers' (players') time and money. They also compete with other forms of current and future forms of entertainment. In the industry concept, platform providers like Apple are seen as distribution channel firms, whose negotiation power decreases profit margins of game providers. By leaving the collaborative relations behind, industry and industry analysis brings forth the competitive ones – which may be sufficient to explain many complex phenomena in the gaming industry.

3.2 Population

Population is a theoretical concept used in analysing variability of organizations over time (Hannan & Freeman, 1989). Here the classification of companies is based on a number of attributes, such as the size of the organization, organizational form, and strategy. As an example, small, family owned companies that focus on niche markets can be seen as one population.

The purpose of this classification is to explain variance and dynamics between organizations. Hannan and Freeman describe the approach as follows (Hannan & Freeman, 1989, p. 13):

“The population ecology perspective concentrates on the sources of variability and homogeneity of organizational forms. It considers the rise of new organizational forms and the demise of transformation of existing ones. In doing so, it pays considerable attention to population dynamics, especially the processes of competition among diverse organizations for limited resources such as membership, capital, and legitimacy.”

A basic assumption underlying the population concept is that competition in markets will favour those populations of companies that have the characteristics needed in new situations. Hence, “there are strong parallels between processes of change in organizational populations and in biotic populations” (Hannan & Freeman, 1989, p. 13).

Population ecology acknowledges that sometimes organizations form communities, i.e. organizations that collaborate with each other. Hence, survival could take place at the level of communities, rather than at the level of populations of similar companies.

This idea is not, however, included in the analysis. The power of population ecology is in explaining, why some populations of independent firms succeed in competition while others vanish.

Overall, population ecological models demonstrate, that complex phenomena behind birth and growth of new types of companies and demise of existing ones can be explained with competitive relationships. It can be concluded that those companies who can best leverage the ecosystem reap the best benefits.

In mobile and computer game business, an example of population is the emergence, growth, and typically also decline of a certain types of game developers. While the companies compete with one another, they also share the destiny of their competitors, in particular the ones which are most similar to them. The population ecology model explains, how new types of companies emerge to markets, thus causing existing companies to suffer from shrinking markets.

For example, the rapid growth and success of freemium games from game companies such as Supercell's Clash of Clans or King's Candy Crush Saga took markets from established game companies relying on traditional pricing. This may also have contributed to the birth of a new type of population: small and medium-sized game companies offering freemium games (cf. Koskenvoima & Mäntymäki 2015). Hence, by using long time frames, population ecology model explains many "ecology" type of phenomena – purely with competitive relations.

3.3 Inter-organizational network

Research on business networks or inter-organizational networks takes a completely opposite approach. Research focuses on such entities, where inter-relationships of companies are seen as predominantly collaborative. Because of a wide variety of collaborative forms, giving an exact definition for an inter-organizational network is difficult. Nevertheless, Provan, Fish and Sydow (2007, p. 482) provide the following characterization of an inter-organizational network:

"... we make no effort to try to offer an all-encompassing definition of an inter-organizational network. Rather, we focus instead on one specific type of network that has been frequently discussed but only infrequently researched, namely, a whole network consisting of multiple organizations linked through multilateral ties. A whole network is viewed here as a group of three or more organizations connected in ways that facilitate achievement of a common goal. That is, the networks we discuss are often formally established and governed and goal directed rather than occurring serendipitously" (Kilduff & Tsai, 2003).

A characteristic feature of an inter-organizational network is that it comprises several independent organizations. Like all groupings of organizations, also inter-organizational networks evolve, but such evolution can be treated as conscious and goal-directed. For example, Ring and Van de Ven (1994) have proposed a process framework that focuses on formal, legal, and informal socio-psychological processes by which parties jointly negotiate, commit to, and execute their relationship.

The idea of competition within a network is not completely absent. For instance, the governance processes described by Ring and Van de Ven (1994) need to ensure both efficient and equitable outcomes. They will also need to be able to deal with conflicts as they arise. While the concept of inter-organizational network does not deny conflicts of interest, the primary emphasis is on collaborative ties between individual organizations. This suggests that inter-organizational collaboration does not hit the potential which is available.

It is perhaps surprising; how few are the examples of software companies engaging in genuinely collaborative network relations that would involve three or more organizations. In computer and mobile games, collaboration between game companies and movie producers can, perhaps, be seen as an example of such a collaboration. Collaboration in open-source forums, or digital platforms, can sometimes fulfill some requirements of an inter-organizational network. But traditionally the relationships have been arms-length relations without shared governance or formal contracts.

3.4 Cluster

The term cluster emanates from the works of Michael Porter (1990) on nations' competitive advantage. Cluster has a strong conceptual linkage to industry as a cluster is a part or a representative of an industry (Porter 1990, Dayasindhu 2002, Tallman et al. 2004). Porter (2000, p. 16) defines cluster as follows:

“a geographically proximate group of interconnected companies and associated institution in a particular field, linked by commonalities and complementarities.” (Porter, 2000, p. 16)

The concept of cluster offers a vehicle to explain why large numbers of companies operating in a same market are concentrated on certain geographical locations. With the term cluster Porter (1990) refers to a phenomenon linked to geographic concentrations of national industries which origin from vertical or horizontal relationships between companies. Locality is considered a key characteristic of a cluster as companies in a cluster as companies in a cluster are often located in a single city or region (Porter 1990; Scheel 2002, Tallman et al. 2004). Cluster has a strong conceptual linkage to industry as a cluster is a part or a representative of an industry (see e.g. Dayasindhu 2002, Tallman et al. 2004).

Porter (1990) sees intense competition within a cluster as its main driving force as competition forces companies to increase the standard of their operations in order to remain competitive. Intense competition can be due to bargaining power of customers who may be interact with several companies within the cluster. These interactions in turn accelerate exchange of information and diffusion of innovations. Collaboration and interaction build up not only cross-organizational awareness but consciousness fields (Turunen, 2015) in the cluster.

In software business, physical proximity of companies operating in a certain field is almost a norm due to the positive network externalities. Silicon Valley is perhaps the best-known example of a geographical concentration of software companies. But there

are also other countries, like India, China, Russia, Ireland and Israel, who have strong concentrations of software development (Carmel & Tija, 2009). The emergence of gaming industry in Finland can also be seen as a good example of a cluster: Interest of capital investors, support from the government, and availability of programmers specialized (and interested) in games, are examples of cluster effect. While companies don't necessarily collaborate extensively (as they often are competitors), they still seem to benefit from the mere existence of other similar companies in the same region.

3.5 Value network

The value network concept emphasizes the intangible capabilities of the network. Normann and Ramirez (1993) maintain that business should not focus on the positioning the fixed set of activities along the value chain only but focus on the *value creating system* itself. While Normann and Ramirez addressed the systems view, Christensen and Roosenbloom (1995) set the stage for value network concept from the attacker's position in the competitive arena. According Christensen (2013, p. 54), value network extends beyond the product categories and focuses on the context i.e. the value network of a firm to excel on the competition. Christensen defines value network as a context of competitive arena on immaterial values:

"The collection of upstream suppliers, downstream channels to market, and ancillary providers that support a common business model within an industry. When would-be disruptors enter into existing value networks, they must adapt their business models to conform to the value network and therefore fail at disruption because they become co-opted." Christensen (2013, p. 296)

The boundaries of the value network are determined as a unique definition of the product performance and on the cost structure to meet the customer preferences, according Christensen (2013, p. 54).

While both Normann and Ramirez (1993) and Christensen (2013) focused on firms, Verna Allee's (2003) definition of value networks is applicable for any organizations, not only those on the competitive arena. She maintains that the key of the value network is the exchange of intangible assets between individuals, groups and organizations:

"A web of relationships that generates both tangible and intangible value through complex dynamic exchanges between two or more individuals, groups or organizations. Any organization or group of organizations engaged in both tangible and intangible exchanges can be viewed as a value network, whether private industry, government or public sector." (Allee, 2003, p. 268)

Allee emphasized the importance of revealing the hidden network patterns behind business processes with an analytical tool to define, map, and analyze the participants, transactions and tangible and intangible deliverables that together form a value network. As a result, value network can be seen as a conceptual tool to describe the social, technical and intangible resources between individuals, groups and organizations in

highlighting the context outside the firm boundaries. It is also a predictive tool to analyze and explain company performance (Christensen, 2013) in competitive landscapes, for instance to explain why well-established, large companies fail. The main contribution to the conceptual analysis is that value network moves away from the linear model, which the other concepts maintain. Individuals, groups and organizations negotiate of value constellations. Thus, they are due to transformations and disruptions which may put one backwards or aside of the linear time that accrues the from the past and the future of multiple members of the network. Thus, value network might face cyclical or other trajectories in addition to linear development.

Collective consciousness is accommodated in the value network. In fact, it becomes fostered in the interrelations between individuals, groups and organizations. Indeed, the contributors of value network concept mention the benefits of collective consciousness explicitly, such as Normann, (2001) and Allee (2003). For instance, Allee (2003:54) maintains that “collective consciousness provides a new transformative shift towards understanding the more complex layers of the system and new avenues for connecting together with other players” i.e. collaboration in the intangible areas of value creation.

For software business, advances in digital technologies, for example in sensor technology and Internet of Things (IoT) (cf. Mian et al. 2016) enable the creation of new value networks and business models for established, mature businesses and simultaneously challenges the existing logics for value creation.

4 Synthesis

We scrutinized the results from the literature and business cases and present them into a synthesis of our conceptual analysis of business ecosystem, industry, and population. We derive directly from the definitions described in the above sections. After that we provide a generic description of the applicability of a concept, which is not directly related to the definition. Table 1 below presents a synthesis of our conceptual analysis of business ecosystem, industry, and population.

The first and perhaps the clearest difference can be found in the ways of which the concept defines the group of companies that constitute the environment. As a result, the borders for an industry are defined by established and potential competitors (Porter, 1990), for population by variability and homogeneity of organizational forms (Hannan & Freeman, 1989), for inter-organizational network by multilateral ties between organizations (Provan, Fish & Sydow, 2007), and for cluster geographical proximity (Porter, 2000). An ecosystem can be seen as a large number of loosely interconnected participants from various industries, who depend on each for their mutual effectiveness and survival (Moore, 1996).

Concerning to the nature of ties, we find the concepts falling into three groups. In industries and populations, companies are connected primarily through competitive relationships (Hannan & Freeman, 1989; Porter, 1990). In inter-organizational networks, primary relationships between companies are seen as collaborative (Provan, Fish & Sydow, 2007). For clusters and ecosystems, ties can be both collaborative and compet-

itive. Within a cluster, organizations' competitive and collaborative regional relationships assist them in global competition (Porter, 2000). In value networks and in ecosystems, it is an explicit assumption that companies within work cooperatively and competitively (Moore, 1996).

Table 1. Concepts depicting business networks

	Industry	Population	Inter-organizational network	Cluster	Value network	Business ecosystem
Definition of group borders	Established and potential competitors; firm borders	Homogeneity of organizational forms; firm borders	Multiple organizations linked through multilateral ties; network borders	A geographically proximate group; distance border	Exchange of intangible assets between individuals, groups and organization; borders of experienced value constellations of network	Loosely connected firms who depend on each other for their mutual effectiveness and survival; an entity and a system with borders
Primary relationship between firms	Competition; including latent competition	Competition; among diverse organizations forms	Collaborative ties that facilitate reaching a common goal	Loose collaborative ties within a region that assist in global competition	Competition and collaboration in value creation	Competitive and collaborative ties
Sources of transformation and change	Selection through competition; large number of competitive factors; 'The best fit wins.'	Selection through competition; competition for limited resources; 'The strongest benefiter wins.,	Formally, established governance processes between network parties; 'The best networker wins.'	Selection of most viable regions through global competition; 'The strongest collaborator/adaptor wins.'	System's capacity to create tangible and intangible value constellations beyond product components. Ability to generate value from intangible resources. 'The best negotiator wins'	New products and customer needs incorporate the next round of innovations; 'The dominant player attracting contributors, such as platform player wins.'
Applicability	Explaining success and viability of individual companies	Explaining success and viability of populations of companies	Explaining evolution and success of inter-organizational networks	Explaining success of geographic regions	Explaining success and failures of companies and new products. Predictive analysis.	Explaining simultaneous evolution/disruption of markets and networks
Existing Business cases	Games industry	Supercell's Clash of Clans or King's Candy Crush Saga	Collaboration between game companies and movie studios	Silicon Valley; Seattle region	Hard disk manufacturer in 'Innovators dilemma'.	Apple, Amazon, Facebook. Alibaba

In terms of sources of transformation, competitive forces are central in the evolution of industry, population and cluster. Industry evolution is directed by several competitive forces (Porter, 1990), the growth and demise of populations results from competition over access to limited resources such as membership, capital and legitimacy (Hannan & Freeman 1989), and the destiny of regions is an outcome of global competition (Porter, 1990). At the opposite end, the evolution of inter-organizational networks are seen to result from negotiations that are formally governed and goal directed (Provan, Fish & Sydow, 2007). In between are ecosystems - and value networks-, where transformation is seen as contingent upon new customer needs and/or new product and service innovations, leading to reforms in ecosystems (Moore, 1996) with the distinction of value networks where reforms may be initiated in several parts of the network depending on the negotiated value (Allee, 2003).

Overall, a strength of the business ecosystem concept is that it acknowledges both collaborative and competitive relationships. Hence, the concept enables simultaneous analysis of transformation, both within networks but also in the markets where they operate. At the same time, however, the concept itself becomes more complex: Defining borders of an ecosystem is more difficult, because the relationships defining an ecosystem are manifold. Hence, the ecosystem lens can also lead to an overly complex view of reality, in particular if collaborative (or competitive) ties between companies are insignificant. Furthermore, business ecosystem concept provides the most opportunities to produce viable collective consciousness fields because many actors try to make sense of the larger system. However, on a conceptual level, an ecosystem draws on biology, as explained earlier, and consequently does not imply a term of collective consciousness. These consciousness fields focus attention and feed in mechanisms and opportunities for leveraging the complexity of the terrain. However, using the vocabulary of and drawing conceptually from natural sciences in social sciences may inhibit tapping the potential of the complexity present in e.g. the business cases presented above.

5 The case of an emerging business ecosystem for digital real-estate and facility services

In order to delineate the similarities and differences between the different concepts described above, the present an initiative that is aimed to become a business ecosystem for digital real-estate and facilities services.

The concrete activities within initiative take place under a industry-academia research and development program that is funded by Business Finland – The Finnish Funding Agency for Technology as well as the companies and universities participating the program.

The purpose of the program is to develop end-user services using IoT, sensor technology, face recognition, artificial intelligence etc. as well as to identify potential use cases and develop business models for these services. The activities within the project are divided into four thematic entities, titled well-being, intelligent restaurant, data-as-

services and empathetic building. The thematic entities are led by the companies participating the research program. Table 2. below contains a brief description of the network of participants.

Table 2. Description of the emerging business ecosystem

Dimension	Description
Definition of group borders	Participating institutions, companies, and research s, and financing institutions.
Primary relationship between firms	Collaborative and competitive ties. In the beginning of the endeavor, the relationships are intense and loose.
Sources of transformation and change	The collective platforms of sharing information, which engage partners of the network to challenge the old models and adopt new ones. High quality collective consciousness fields and working methods.
Applicability	Explaining collaboration of diverse organizations and individuals with partly shared and competitive/diverse motives. Business ecosystem a benchmark and desired end state. Ecosystem metaphor an important part of the discourse within the program participants.

When scrutinized through the different concepts used to describe business networks discussed in the prior sections, we see that certain concepts are more insightful to describe the emerging ecosystem for digital real-estate and facility services.

First, the industry concept does not apply directly very well, because the industry consortium comprises companies from both real estate and facility as well as ICT sectors. On the other hand, the industry concept has certain relevance in the early state of the program where the participating companies operate mostly based on the dominant logics of their respective industries.

The concepts highlighting the collaborate relationships between the players such as inter-organizational network, cluster and value-network have certain value in describing the relationships between the participants. The population concept in turn builds upon the assumption that the players homogenous which significantly limits the applicability of the population concept in our case.

The business ecosystem concept has certain fit to our case as the relationship between the players is essentially co-opetitive. On the other hand, at least in its current formative stage, there is no clearly dominant player that characterize an ecosystem.

As a result, we conclude that value network appears to have the best fit to our case in its present state. Value network does not assume the existence or emergence of a dominant player. The lack of a clear dominator may on one hand increase the need for additional negotiation and thus slow down the development activities. On the other hand, it forces the participants to articulate their needs and intentions and take responsibility of the course of action. Table 3. below provides a summary of the analysis.

Table 3. Applicability of different concepts to describe the emerging ecosystem for digital real-estate and facility services

Concept	Applicability	Description
Industry	Partial explanation power. Omits part of the system.	The program focuses on real estate and digitalization industries. The current stage of the affairs cannot be described accurately with the industry concept.
Population	Problems due to the ontological differences of the domains vs. biology and social sciences	Population does not apply to the Program except of strong and dominant players such as big firms or set up of coordination.
Inter-organizational network	Leaves out the heterogeneity of the actors i.e. organizations, for instance motives.	The players form a network and sub-networks. However, there is no strong mutual dependency (at the early stage of the program).
Cluster	Partial explanation power. Geography is not relevant.	The constellation of the players involved has no clear geographical dimension. The players represent different businesses (real estate, ICT)
Value network	Good explanation power. Does not accrue in explaining the system.	The dynamics of a value networks are to a certain degree visible. Participants collaborate and negotiate of value constellation. Interactions in the value network create collective consciousness.
Business ecosystem	Problems due to the ontological differences of the domains vs. biology and social sciences	Co-opetition between players. A dominant player is missing.

6 Discussion

Compared to the related concepts investigated here - industry, population, inter-organizational network, cluster, and value network - the concept of business ecosystem appears to enable the analysis of both collaborative and competitive relationships. The need for the concept is often argued on the basis that economy and competition has changed and collaborative arrangements are becoming increasingly significant due to globalization and digitalization.

Our analysis of the concepts suggests that all six concepts provide partially distinct perspective to and emphasis on business networks. We further pointed out the system complexity might be a relevant dimension to classify business networks. Using theoretical and conceptual tools that are can explain the research problem with a minimal complexity is generally considered a virtue in research. At the same time, however, overly simple tools and concepts are often insufficient in finding solutions for highly complex problems (Boulding, 1956). For example, inter-organizational collaboration generates different levels and qualities of attention (Teece, 2010) such as collective awareness and collective consciousness. This in turn, can accommodate dealing with highly complex levels issues and problems, including innovations, sustainability and ethics (Turunen, 2015). Therefore, managerial decision makers' tolerance to educate themselves on complexity may be worthwhile.

The same applies also to managers who are making strategic decisions. The key question in selecting a perspective is how significant collaborative arrangements are in a given industry. If collaborative arrangements are business critical, belonging to the right network(s) can make a difference. However, if barriers for leaving and joining ecosystems are low and multi-homing in several ecosystems in parallel is possible, the classical competitive industry perspective can be more valuable in strategic decision-making.

Our analysis implies that the ecosystem concept appears to fit particularly well to situations where there is a focal firm or platform leading the network (Iansiti & Levien 2004, Teece 2007, Autio & Thomas 2014). This is the case with global players such as Alibaba, Apple and Amazon where the network consists of a very large number of actors and is being led and coordinated by a single leading firm (cf. Hyrnsalmi et al. 2016). On the other hand, in the absence of a clear dominant player, tools and concepts such as value network that put emphasis on inter-organizational collaboration such as value network may offer more insightful descriptions. For instance, as stated by Allee, (2003), value network analysis can lead to profound shifts in perception of problem situations and mobilize collective action to implement change.

Like any other piece of research, this study suffers from a number of limitations. First, we focused only a limited set of concepts. Future research should thus incorporate e.g. platform and alliance in the analysis. Second, we have focused on business ecosystems on a general level. However, there are presumably different types of business ecosystems. Future studies could thus identify different types of business ecosystems.

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