In Search for the Core of the Business Ecosystem Concept:

A Conceptual comparison of business ecosystem, industry, cluster, and inter organizational network

Matti Mäntymäki and Hannu Salmela

Turku School of Economics, University of Turku, Turku
{matti.mantymaki, hannu.salmela}@utu.fi

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. Concepts that are transferred from other disciplines (and used both in research and in practice) can, however, be ambiguous and problematic. For example, the use of the ecosystem concept has been questioned in the literature. To better understand the potential ambiguities between the business ecosystem concept and other related concepts, this study presents a conceptual analysis of business ecosystem. We continue by analytically comparing business ecosystem with other concepts used to describe business relationships, namely industry, population, cluster, and inter-organizational network. 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 positioning the business ecosystem concept in relation to other closely related concepts

Keywords: ecosystem, business ecosystem, cluster, network, industry

1 Introduction

The term ecosystem has been widely adopted outside its original domain in biology. 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 1969).

The ecosystem analogy has been adopted in business studies. The literature has coined concepts such as business ecosystems (Peltoniemi & Vuori 2004), innovation ecosystems (Oh et al. 2016), software ecosystems (Hyrynsalmi et al. 2016), service ecosystems (Vargo & Lusch 2010) product ecosystems (Frels et al. 2003), to name but

a few. The widespread use implies that the ecosystem analogy has been viewed to provide value-added for research. At the same time, the use of ecosystem analogy has also been criticized (Oh et al. 2016; Hyrynsalmi 2015).

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. In the latter, we focus on four widely discussed concepts that have been used to describe a group of inter-connected organizations, namely industry, population, inter-organizational network, and cluster. Hence, we identified one definition for each concept from a seminal or otherwise widely cited article. Our central argument is based on the analysis of definitions. Concepts industry and population emphasize competitive connections 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.

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 ecosystem concept. Further research is also needed on the value-added of the use of ecosystem analogy, both in theory building and in practical use in management.

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 construct 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 first introduced by Moore (1993). According to Moore (1993, 76):

a business ecosystem […] crosses a variety of Industries […], companies coevolve 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." (p. 76)

Moore (1996, 26) defines ecosystem 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."

According to Iansiti and Levien (2004, 8-9), ecosystem is essentially as an analogy to describe modern business networks. Iansiti and Levien (2004, 5) 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 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).

While characteristic features #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.

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 to Related Concepts

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 four such concepts: industry, population, inter-organizational network and cluster. While the former two assume relationships between firms as primarily competitive, the latter two 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 doesn't exclude collaboration completely, but it is seen as an exception, labelled with terms such as strategic alliances or co-opetition (Bengtsson and 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).

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 and 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 and 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 and Freeman, 1989, p. xx).

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.

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:

"In this article, we make no effort to try to offer an all-encompassing definition of an interorganizational 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.

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."

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.

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 centres for software development (Carmel and 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.

4 Synthesis

Table 1 presents a synthesis of our conceptual analysis of business ecosystem, industry, and population. The first three rows (defining borders, nature of ties, and sources of transformation) are all somewhat directly derived from the definitions described above. The last row provides a generic description of the applicability of a concept, which is not directly related to the definition.

The first and perhaps the clearest difference can be found in the ways how the concept define the group of companies that constitute the environment. Borders for an industry are defined by established and potential competitors (Porter, 1990), for population by variability and homogeneity of organizational forms (Hannan and Freeman, 1989), for inter-organizational network by multilateral ties between organizations (Provan, Fish and 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).

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

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

Table 1. Summary of the conceptual analysis

	Industry	**Population**	**Inter-organizational network**	**Cluster**	**Business ecosystem**
Definition of group borders	Established and potential competitors	Homogeneity of organizational forms	Multiple organizations linked through multilateral ties	A geographically proximate group	Loosely connected firms who depend on each other for their mutual effectiveness and survival
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	Competitive and collaborative ties
Sources of transformation and change	Selection through competition; large number of competitive factors	Selection through competition; competition for limited resources	Formally established governance processes between network parties	Selection of most viable regions through global competition	New products and customer needs incorporate the next round of innovations
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 simultaneous evolution/disruption of markets and networks

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 and Freeman 1989), and the destiny of regions is an outcome of global competition (Porter, 1990). In the opposite end, the evolution of inter-organizational networks are seen as results from negotiations that are formally governed and goal directed (Provan,

Fish and Sydow, 2007). In between are ecosystems, where transformation is seen as contingent upon new customer needs and/or new product and service innovations, leading to reforms in ecosystems (Moore, 1996).

Overall, a strength of the business ecosystem concept is that it acknowledges both collaborative and competitive relationships. This brings an advantage that, at least in principle, 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 for an ecosystem is more difficult, because the relationships defining an ecosystem are manifold. Hence, it can also lead to a too complex view of reality, in particular if collaborative (or competitive) ties between companies are insignificant.

5 Discussion

Compared to prior concepts - industry, population, inter-organizational network, and cluster - the concept of ecosystem appears to provide a concept that enables 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 digitization.

Compared to the other concepts in our analysis, the ecosystem concept appears to fit particularly well to situations where there is one or a small number of leading firms in the network. This is the case with companies such as Apple and Amazon where the network consists of a very large number actors and is being led and coordinated by a single leading firm (cf. Hyrynsalmi et al. 2016).

From a research perspective, it is still important to note that all four perspectives can be seen as alternative ways to address phenomena in industries and business networks (Table 1). Researcher should choose a concept and theory that best explains the research problem. For science, complexity is not an end in itself. Rather, research should select a frame of reference that explains the phenomenon with minimal number of concepts. Using a too complex frame can lead to mystification of phenomena.

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 small and multi-homing in several ecosystems in parallel is possible, the classical competitive industry perspective can be more valuable in strategic decision-making.

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 corporate value network and alliance in the analysis. Second, we have focused on business ecosystems on a general level. Future studies could identify different types of business ecosystems.

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