The Complexity of Value-Creating Networks:

Multiplicity, Heterogeneity, and Contingency

Purpose: The purpose of this paper is to provide a conceptual analysis of the literature on different kinds of value-creating networks; to provide a new conceptual framework of value-creating networks given their inherent nature of complexity in terms of multiplicity, and heterogeneity.

Design/methodology/approach: The paper takes a critical review of the relevant literature, 29 contributions being identified in a search of three major databases and a range of other published work for the broader perspective, illustrated by real-world examples from ten case studies.

Findings: Central dimensions of different kinds of value-creating networks are identified and a model incorporating their contingencies in the form of technology, market, and firm contextual factors is delineated.

Research limitations/implications: The theoretically and empirically grounded conceptualization of linkages between contextual factors and the constitution of different categories of value-creating networks is based on a limited number of articles and cases. However, it can serve as a starting point for the development of a formal contingency model of value-creating networks.

Originality/value: This structured and critical review contributes to the literature on value-creating networks, by developing a contingency model as a basis for future studies and current management strategy. The paper provides a novel theoretically and empirically grounded conceptualization of complexities and contingencies of different categories of value-creating networks, and as such contributes to our understanding of the dynamics of value-creating networks. The

concept of network logic is introduced into the research discourse regarding value-creating networks.

Keywords: Network, service, system, ecosystem, value constellation, contingency, technology

Category of the paper: Conceptual paper with empirical illustrations

Introduction

It is no news that organizations don't exist in isolation but act relative to customers, suppliers, partners, and competitors. The way organizations interact with several others has been studied over decades and from several different perspectives (see, e.g., Baker, 1992, Cook and Emerson, 1978, Ford, 1980, Ford and Håkansson, 2006, Gulati, 1998, Håkansson and Ford, 2002, Morgan, 1989). The interest in various network perspectives on business has not diminished but instead the topic seems to experience a reawakening and concepts such as ecosystems (Moore, 1993, Moore, 1996), service system (Mele and Polese, 2011, Spohrer et al., 2007), viable systems (Barile et al., 2012), and several others, are discussed widely in contemporary research. In recent times, there has been a resurgence in interest in ecosystems-type networks which are described as broad networks of loosely interconnected and interdependent actors (Iansiti and Levien, 2004, Moore, 1993, Williamson and De Meyer, 2012).

The development of this literature is highly relevant taking into consideration the challenges firms meet in dynamic and complex business landscapes. However, in order to make research applicable from a managerial perspective, a clear conceptualization of various forms of networks and their properties still needs to be developed. For instance, it is not sufficiently clear what the different categories of networks stand for and how different kinds of networks are different from each other. It also seems that many authors are more interested in calling the audience's attention to a specific kind of network than delineating relevant dimensions for networks and looking at networks from a more general and fundamental perspective. We agree with Ritter and Gemünden from 2003 in that the literature on networks is fragmented (Ritter and Gemünden, 2003). Although there has been a significant knowledge

expansion in recent years, it is possibly even more evident today that an analysis and synthesis of extant research needs to be done. This is where this paper intends to contribute, by means of a critical review of the literature. More specifically, this review contributes to the literature on value-creating networks, by developing a conceptual framework as a basis for future studies and current management strategy. In this paper, value-creating network is used as an umbrella concept and covers a wide range of networks, systems, and constellations that co-create value. The limitations of previous conceptualisations are highlighted and illustrated by real-world examples from different industries, as the departure point for development of our own reconceptualization.

Scope and coverage of literature review

To generate a valid overview and critique of the literature, it is necessary first to identify the relevant elements of a value-creating network, as the template for the review. A meta-review of existing review papers (Anderson et al., 1989; Johne and Storey, 1998; Croom et al., 2000; Perea y Monsuwe´ et al., 2004; Edvardsson et al., 2005; Nordin and Agndal, 2008; Nordin and Kowalkowski, 2010) provided a useful selection.

First, we analyse what the literature has to say about the characteristics of different kinds of networks and systems: that is, definitions and description of their central dimensions. Second, we search for the suggested drivers and enablers of networks of various kinds: that is, the antecedents of different kinds of networks. Third, the outcomes of networks are the final focus of our critical review. Together, these dimensions - characteristics, antecedents and outcomes - provide a perspective on the literature that is both general and comprehensive, embracing a broad spectrum of issues related to causes, substance, and results. By looking at these aspects of the

networks literature it is possible to identify common patterns and limitations in the literature. Real-world examples from ten case studies, including 35 interviews with senior managers from different industries - construction industry, banking, fashion, education, chemistry, IT, and management consulting - illustrate our arguments (pseudonyms have been used in this paper to protect the anonymity of the companies and the involved participants).

To locate the literature specifically relevant to value-creating networks, we searched the Proquest, Emerald, and Business Source Premier databases for papers in English in academic journals. A purpose-designed list of keywords drove the search, i.e. network, system, ecosystem, and value constellation. Lists of references in the selected papers were scanned to identify more potential relevant sources. Since our purpose was to develop the understanding of central dimensions of value creating networks rather than conducting a complete review of the literature, a selection among the identified papers was made, based on the relevancy of their contents for our purpose. The overall outcome was a collection of 29 sources considered relevant to our purpose. These key sources were used as the raw material for our reconceptualization and are listed in the Appendix, Table AI. The search and review were not limited to any particular industry or market, even though most of the papers are primarily concerned with business markets and industries with a high technology focus. It is nevertheless conceivable that keyword searching missed some relevant papers that deal with networks but use different terminology. It may also have excluded some recent publications not yet cited in the existing literature.

Characteristics of different kinds of networks

Several different definitions and variants of networks were found in the reviewed literature. Table I summarises the definitions and characteristics presented

or implied in that literature. The remainder of this section elaborates on those extracts, and discusses inferences that may be drawn from these.

To begin with, may authors use the concept of network and Ojasalo, for instance, define it as "relationships between multiple firms that interact with each other" (Ojasalo, 2004). A network is generally seen as a general concept, while other concepts are variants of networks. Hence, some authors add a prefix to more clearly specify the kind of network they are referring to, e.g., a "business network" which is defined by Ritter, Wilkinson and Johnston as "self-organizing systems, in which order emerges in a bottom-up fashion from the local interactions taking place among firms in the relationships in which they are involved" (Ritter et al., 2004). Apart from the addition of a prefix to the core concept, these authors and many others emphasize that a [business] network has certain central characteristics, such as its emergent (Ritter *et al.*, 2004), self-organized, or evolving (Ojasalo, 2004) nature. This characteristic is also emphasized by authors connected to the Markets-as-Networks approach, who do not view networks as a priori structures to be imposed on organizations but instead consider them as structured by the enactment of selective ties and relationships between autonomous actors (McLoughlin and Horan, 2002). Interestingly, these features are quite often presented as if they were universal to all organizations and networks, or at least for all organizations on industrial markets which were the empirical ground from which the industrial marketing perspective once grew (see, e.g., Wilkinson, 2001). In practice, however, these characteristics are only partly true. By way of illustration, it can be questioned if the network of companies such as Alpha, an IT consulting firm we studied, is self-organized, given their dependence on Microsoft and their products. While characteristics such as these may give the impression of some sort of harmonious and voluntary development of the network,

there are often actors that influence their development more than others, in this case Microsoft. Nevertheless, business ecosystems are often described as "coevolving" (Basole, 2009, Williamson *et al.*, 2012), or "spontaneously sensing" (Vargo and Lusch, 2011) systems. (Kim et al., 2010). Regardless of terminology used, emergence seems to be a central feature of networks/systems for many authors, emphasizing the complexity of management and the growth of the networks. This characteristic is closely related to the "connectedness" of networks emphasized by, e.g., authors belonging to the Markets-as-Networks tradition (McLoughlin *et al.*, 2002), meaning that different relationships are influenced by each other in the network. Network "embeddedness" on the other hand is a slightly more general concept and can be defined as the degree to which firms within a network are connected through direct interactions and information exchange and dependent on various spatial, social, political, technological and market structures, for instance (Granovetter, 1985, Halinen and Törnroos, 1998). High network embeddedness means that a network has enduring, interconnected ties while low embeddedness means a sparse network with few connections (Echols and Tsai, 2005).

In contrast to the majority of the reviewed research, Möller and Rajala (2007) focus on networks that are intentionally developed, so called "strategic networks" or "value nets" While they admit these networks are of a peculiar kind, they constitute an interesting and highly relevant contrast to many of the other conceptualizations. Beta, for instance, a property development company we studied, evidently attempts to develop their partner network for clear strategic purposes to establish themselves as a supplier in the Chinese mining business. While their network indeed contains features and connections that have grown gradually without an explicit purpose, many links

are developed consciously and for very specific purposes, e.g., with the Chinese government and Chinese partners.

Other authors add the prefix service and, e.g., Gebauer and colleagues (2013) characterize service networks as "loosely coupled", something which is also emphasized as a characteristic of business networks by some authors, e.g. Ritter and colleagues (Ritter *et al.*, 2004), and for business ecosystems (Iansiti *et al.*, 2004). We propose that these features, i.e. emergence, connectedness, embeddedness and loosely coupled, should be regarded as independent network properties existing on a continuum rather than being universal and fixed. Based on what we have seen in our research, some links within networks are highly regulated by written contracts, such as those where one actor contracts channel partners for the delivery of their products and services or in the case of manufacturing subcontracting, for instance.

Size is also mentioned by several authors. In particular, a business ecosystem seem to be associated with this dimension and is described as "a huge network of actors" (Battistella et al., 2012), "a large number" of participants (Iansiti *et al.*, 2004), or "many companies working together". Size is, however, a complicated dimensions since it is generally difficult say exactly where and why a network ends, who it is that determines its "true" boundaries, and from which perspective this should be done (cf. Anderson et al., 1994). What is more, it is surprisingly difficult to clearly see the differences between ecosystems and networks in most descriptions. While definitions of "traditional" ecosystems, e.g., "an ecological community together with its environment" (Tansley, 1935), clearly include the environment in the concept, definitions of business ecosystems are usually more focused on the various organizational actors and their network. As such, it is not easy to see the added value of the metaphor. Indeed, authors such as Barile and Polese emphasize that ecosystems

are "'conditioned' (or positively influenced) by a variety of technological, economic, political, and social influences that determine that relationships that develop among them" (Barile and Polese, 2010, p. 24) but essentially an ecosystem is delineated as a network of actors without it's environment.

Most authors confine themselves to describing and discussing one specific kind of network, apparently seeing it as homogenous and with a specific set of features, e.g. loose coupling. Sometimes the heterogeneity of the network is emphasized, e.g., by Williamson and De Meyer (2012) who define ecosystems as a networks constituted by many types of actors connected by many kinds of relationships. A few authors instead distinguish between different kinds of networks. For instance, Koenig (2012), distinguish four different ecosystems from each other depending on type of interdependence (reciprocal or pooled) and control (centralized/decentralized), where the latter dimension may be equalled to the concepts of intentional or emergent. Comparatively few authors acknowledge the inherent heterogeneity of many networks, with different kinds of couplings, different kinds of actors, and different kinds of evolution mechanisms, etc. If we take the example of the educational company Gamma for instance; evidently they are connected to a number of external actors of different kinds and through different sorts of relationships. Their relationships with external technology firms and applications such as Facebook and Twitter are certainly very different in comparison with those with external lecturers and clients. Different links in the networks have different characteristics depending on their purpose, power relationships, and other factors. Characterizing a whole network as "loosely coupled" for instance is thus often a simplification.

Take in Table I

To sum up, the dimensions of the various value-creating networks mentioned in the literature are many and partly overlapping. Essentially, they belong to the following core dimensions:

1) Degree of embeddedness (Echols *et al.*, 2005, Granovetter, 1985, Halinen *et al.*, 1998).
2) Type of interconnection, e.g.., tight or loose (e.g., Iansiti *et al.*, 2004, Orton and Weick, 1990)
3) Number of actors (e.g., Battistella *et al.*, 2012, Kim *et al.*, 2010)
4) Type of (inter)dependence between actors in the network (e.g., Koenig, 2012)
5) Type of control, e.g., centralized and intentional or decentralized and emergent (see, e.g., Koenig, 2012, Möller *et al.*, 2007, Ritter *et al.*, 2004)
6) Type of service provision, e.g., symbiotic or separate (e.g., Basole, 2009, Vargo *et al.*, 2011)
7) Degree of diversity, e.g., homogeneous or heterogeneous, in terms of actors, types of relationships, etc. (Williamson *et al.*, 2012)

Antecedents

Several of the reviewed papers mention one or several antecedents, that is drivers or enablers of different kinds of networks, although a few have this as their main focus. With drivers is here meant antecedent conditions in a company's internal and external environment that drive towards a specific form of network. Enablers on the other hand are factors or conditions whose presence help organizations to achieve

certain goals, such as developing and working in accordance with some kind of a network structure (cf. Frödell, 2011). Table X and Y summarises these implied factors, where drivers are the external factors that justify the existence of the network and enablers are factors that make the networks possible.

The *drivers* mentioned include an increased demand in general (Basole, 2009) and, more specifically, an *increased complexity in terms of customer needs and wants* and the attendant need to collaborate with actors with *complementary knowledge* (Brusoni and Prencipe, 2001, Rohrbeck et al., 2009, Williamson *et al.*, 2012). Williamson and De Meyer, for instance, argue that customers' *increasing demand for complex solutions* makes collaboration necessary. While they do not back up the existence of such trend with any figures, there has been an intensive interest in the concept of solutions in the academic literature (e.g., Gebauer *et al.*, 2013, Jacob and Ulaga, 2008, Matthyssens and Vandenbempt, 2008, Nordin and Kowalkowski, 2010, Nordin et al., 2013, Storbacka, 2011, Tuli et al., 2007) and there is some empirical evidence for this development towards more complex offerings such as integrated solutions (Agndal et al., 2007). This trend seems to apply in many industries, including telecommunications (Davies, 2004), furniture (Nordin *et al.*, 2013), and the construction industry (Brady et al., 2005) where our case of the property development company Beta clearly illustrated the need for collaboration when it comes to managing large infrastructure projects. Another often mentioned driver is the *increased volatility* in many industries, and the rapid change which requires strategic flexibility. Such flexibility, it is argued, can be achieved by organizing in the form of networks where knowledge is distributed among several organizations (Basole, 2009, Normann and Ramirez, 1993, Williamson *et al.*, 2012). This was also emphasized indirectly by some of our respondents, e.g., a respondent from the educational

company Gamma who said that "we cannot do the work ourselves. It's not a one man's show and we need to collaborate with, e.g., equipment suppliers. We have shared goals and do this together". Some authors emphasize that the economy has changed and become more global in its nature, with all actors and resources being increasingly interconnected (Normann *et al.*, 1993, Vargo *et al.*, 2011), logically leading to the emergence of various kinds of networks.

In essence, the drivers mentioned in the reviewed literature can be grouped into the following interrelated factors that drive network formation:

1) Market contextual factors, addressing changing market conditions, volatility of business environments, global competition, changing markets, and shorter product life cycles leading to increased uncertainty requiring flexible structures (e.g., Iansiti et al., 2004, Kim et al., 2010)
2) Knowledge, i.e. the lack of internal knowledge and the need to use knowledge being distributed over several actors (e.g., Brusoni et al., 2001, Rohrbeck et al., 2009)
3) Customer factors, i.e. increasingly complex customer needs leading to knowledge being distributed over several actors (e.g., Basole, 2009, Williamson et al., 2012)

Take in Table II

Some articles mention *enablers* of various kinds of networks, with technology and more specifically information technology being a frequently mentioned enabler allowing for efficient coordination of different actors and activities (Basole, 2009,

Battistella *et al.*, 2012, Gawer et al., 2012, Kim *et al.*, 2010, Normann *et al.*, 1993, Vargo *et al.*, 2011, Williamson *et al.*, 2012). If we look at the clothing community Delta we studied, for instance, the nature of their whole business builds on the collaboration of various actors dispersed globally, facilitated by the internet. Such organizations could hardly have existed without the internet. Technological developments and a fall in the cost of developing and using various kinds technologies for communication and coordination of dispersed capabilities and knowledge is thus often emphasized as the central factor that both drives and enables different kinds of value-creating networks. A few authors also mention culture, and specifically how companies nowadays are more open for collaboration than they were a couple of decades ago (Koenig, 2012). Obviously this has paved the way for different kinds of networks. Capabilities in a more general meaning is something that is addressed by Gebauer and colleagues (2013), distinguishing between dynamic and operational capabilities needed to form and utilize networks for service provision.

Take in Table III

The mentioned enablers can be grouped into three categories:

1) ICT, including the internet and other digital technologies and standardised platforms (e.g., Normann et al., 1993, Williamson et al., 2012),
2) Culture, i.e. the openness for collaboration (e.g., Koenig, 2012, Vargo et al., 2011)
3) Operational and dynamic capabilities needed (e.g., Gebauer et al., 2013).

Outcomes of different kinds of value-creating networks

Table 4 summarizes perspectives mentioned in the literature on the outcomes of different kinds of networks. The most frequently mentioned outcome of a network is that it leads to some kind of value. It can be about customer value or value for the companies involved in the network. For instance, some authors (e.g., Ordanini and Parasuraman, 2012, Vargo et al., 2011) mention that value can be "co-created" by the network actors. Others are not so specific but raises basically the same thing, e.g. that a business ecosystem can create values that not company could achieve alone (Kim et al., 2010). Although there is nothing wrong with these ideas, in our opinion, a clearer division and explanation would have been appropriate. Value is a multifaceted concept and while the literature reviewed generally seems to relate it to benefits rendered from the network for customers, it seldom clarifies if it concerns reduced costs, improved functionality, or something else. Some authors are more specific and a notable example is Corsaro and Ramos (2012) who distinguish between rationalization (efficiency) effects and development effects (effectiveness) of networks. Others stress that adaptability can be increased by different actors organising themselves into networks. In loosely coupled systems in particular, a situation in which elements of the network are responsive but retain evidence of separateness and identity, adaptability is said to be an important outcome (Brusoni et al., 2001, Orton et al., 1990). Such networks are also said to be persistent internally (Orton et al., 1990), i.e. with the ability to maintain the core of their inner workings unchanged in spite of external changes.

Take in Table IV

In essence, the outcomes mentioned in the literature can be grouped into the following categories:

1) Adaptability, i.e. the ability to adapt to different kinds of changes or disruptions to enable long-term survival (e.g., Iansiti et al., 2004, Vargo et al., 2008)
2) Persistence, i.e. the ability to continue in spite of external changes (e.g., Orton et al., 1990)
3) Effectiveness, i.e. value co-creation or value co-production (e.g., Vargo et al., 2011)
4) Renewal, i.e. innovation and learning (e.g., Brusoni et al., 2001, Iansiti et al., 2004)
5) Efficiency (e.g., Corsaro et al., 2012).

A reconceptualization of value-creating networks

The three aspects of networks reviewed, discussed and critiqued in the previous sections can be integrated into the conceptual framework shown in Figure 1.

Take in Figure 1

This reconceptualization is intentionally somewhat simplified, since it presents a relatively complex system characterised by intricate interactions between different aspects of value-creating networks. It includes the sometimes conflicting views of different authors concerning what constitutes a network, and it also embraces different kinds of networks/systems/etc. Though we do not present the relationships between the different aspects of value-creating networks as propositions, the bold-

face links indicate correlations. For instance, different types of antecedents are expected to have different degrees of correlation with types of networks and outcomes. With these caveats in mind, our reconceptualised framework should be seen as a starting point for the development of a network theory, rather than an end in itself.

Discussion and implications

The reviewed literature reports a great deal of research into the nature of different kinds of networks but it is difficult to see exactly what are the similarities and differences hidden behind the different concepts. To some extent the reason for this is that the different articles have different purposes and perspectives. While some articles aim at explaining generic behaviour of networks, others aim at nailing out the specifics of a specific kind of network. With that proviso, the framework presented in this paper builds on a thorough review of the subject-specific literature, describing the many elements of the reviewed contributions and discussing their conceptual limitations. If we accept that there are indeed many different kinds of networks, it would be timely to develop the conceptual framework further by examining in more detail the logical and causal links among types of antecedents, networks and outcomes. What is problematic with the literature is that it sometimes does not seem to be clear which one of these approaches the author(s) have and what exactly they mean with “ecosystem”, “business network”, or similar concepts. To avoid conceptual confusion it would be useful to have a continuum or typology of different sorts of networks and their central features.

In future research, the framework depicted in Figure 1 should therefore be developed to distinguish different kinds of networks explicitly, and to suggest more clearly how different combinations of characteristics, antecedents, and outcomes

relate to each other and may be more or less feasible in practice. Tentatively, it could look as in Table V. This distinction draws on various definition of complexity (Nordin *et al.*, 2013, Sivadasan et al., 2006), and based on these, complex networks are here seen as the networks with many different kinds of actors, a low degree of order within the network, a high degree of interaction or connectivity between the actors and their environment, and a low degree of predictability and uncertainty within and outside the network.

Take in Table V

Admittedly, few networks fit neatly into either of the extreme forms described in the table. Neither is it usually possible to characterize a network objectively and "truly". Nevertheless, it is our hope that the contents of table V and figure 1 may serve as inspiration for further research on value-creating networks.

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Table I: Descriptions and characteristics of value-creating networks

Source	*Network Type*	*Extract*
Amaral and Uzzi (2007)	Complex systems	Interacting agents (persons, organizations or communities) that act on their limited and local information, by trading their resources without the aid of a central control mechanism or even a clear understanding the effects of how different actions
Anderson *et al.* (1994)	Business Network	A set of two or more connected business relationships
Basole (2009)	Business Ecosystem	Complex networked systems in which a variety of firms coexist and interdependent and symbiotic relationships are formed
Battistella and Colucci (2012)	Business Ecosystem	A huge network of actors, products, services and technologies that directly and indirectly contribute to the development of a business, product or process
Gebauer and Paiola (2012)	Service network	A loosely coupled collection of upstream suppliers, downstream channels to markets and ancillary service providers
Iansiti and Levien (2004)	Business Ecosystem	A large number of loosely interconnected participants that depend on one another for their effectiveness and survival.
Kim *et al.* (2010)	Business Ecosystem	An economic community involving many companies working together to gain comparative advantages as a result of their symbiotic relationships
Koenig (2012)	Business	Four kinds of business ecosystems: supply systems

	Ecosystems	(reciprocal interdependence, centralised control of key resources), platforms (pooled interdependence, centralised control), communities of destiny (decentralised, centralised), expanding communities (decentralised, pooled).
Lewis and Erickson (1969)	Marketing System	A set of objects with a given set of relationships between the objects and their attributes.
Möller and Rajala (2007)	Strategic nets	Intentionally created business networks
Moore (1993)	Business Ecosystem	Companies coevolve capabilities around a new innovation and work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations.
Normann and Ramirez (1993)	Value Constellation	Value creating system of different economic actors - suppliers, business partners, allies, customers - working together to co-produce value
Ojasalo (2013)	Network	Evolving organisms and a set of nodes and relationships that connect them.
Orton and Weick (1990)	Loosely coupled systems	Systems in which elements are responsive, but retain evidence of separateness and identity
Ritter *et al.* (2004)	Business Networks	Self-organizing systems, in which order emerges in a bottom-up fashion from the local interactions taking place

		among firms in the relationships in which they are involved.
Spohrer *et al.* (2007)	Service systems	A value-coproduction configuration of people, technology, other internal and external service systems, and shared information(such as language, processes, metrics, prices, policies, and laws)
Vargo and Lusch (2011)	Service Ecosystem	A spontaneously sensing and responding spatial and temporal structure of largely loosely coupled, value-proposing social and economic actors interacting through institutions, technology, and language to (1) co-produce service offerings, (2) engage in mutual service provision, and (3) co-create value.
Williamson and Meyer (2012)	Business Ecosystem	A network of organizations and individuals that co-evolve their capabilities and roles and align their investments so as to create additional value and/or improve efficiency.

Table II: Drivers of value-creating networks

Source	*Network*	*Extract*
Adomavicius *et al.* (2007)	Business ecosystem	Interrelationship and evolution of technologies, driven by R&D and customer demand.
Basole (2009)	Ecosystem	Increasing customer demand, competition and short product life cycles
Brusoni and Prencipe (2001)	Loosely Coupled Networks	A widening range of actors to interact with to gather and develop information and knowledge.
Iansiti and Levien (2004)	Ecosystem	Companies depend on the collective health of the other organizations and are increasingly intertwined in mutually dependent relationships outside of which they have little meaning.
Kim, Lee *et al.* (2010)	Business ecosystem	Companies need to collaborate to survive.
Normann and Ramirez (1993)	Value constellation	Volatile environment, including global competition and changing markets
Orton and Weick (1990)	Loosely coupled systems	Causal indeterminacy and fragmentation of the external and internal environment.
Ritter *et al.* (2004)	Business networks	Provide access to valuable resources, competences, functions, markets, and relations.
Rohrbeck *et*	Open	Business disruptions and shifts in value distribution among

al. (2009)	innovation ecosystem	companies in the industry driving a need to use external resources and capabilities in innovation.
Vargo and Lusch (2011)	Service ecosystem	The global networked economy becomes more pervasive and compelling
Williamson and De Meyer (2012)	Business ecosystem	Satisfying customers' demand for complex solutions, as well as an increased volatility and rapid change, requires the flexibility rendered by using knowledge distributed among several players.

Table III: Enablers of value-creating networks

Source	*Network*	*Extract*
Basole (2009)	Ecosystems	Convergence of technologies, products and service
Battistella and Colucci (2012)	Ecosystems	Technological innovations headed by the information and communications technology.
Cusumano and Graver (2002)	Ecosystems	Broader platforms or systems
Gebauer *et al.* (2013)	Service Network	Specific dynamic and operational capabilities are required to form and utilize different kinds of service networks.
Kim and Lee (2010)	Business ecosystem	IT, information = critical tool and essential asset. To exchange and share vital resources in a healthy BES the following will be needed from the IT system: interoperability, robustness, creativity, productivity
Koenig (2012)	Ecosystems	Cultural and technological evolutions
Normann and Ramirez (1993)	Value constellation	New technologies
Ordanini and Parasuraman (2011)	Service ecosystem	Technological changes (digitalization of music through MP3 files)
Vargo and Lusch (2011)	Service ecosystem	Soft contracts, a common language, social institutions (e.g. monetary systems, laws, etc.) and technology
Williamson and De Meyer	Ecosystem	Fall in the costs of information technology and communications (ICT) allows efficient coordination of

(2012)		widely dispersed capabilities and knowledge.

Table IV: Outcomes of value-creating networks

Source	*Network*	*Extract*
Battistella and Colucci (2012)	Business Ecosystem	Long-term sustainability of the whole community (i.e. "shared fate").
Brusoni and Prencipe (2001)	Loosely Coupled Networks	Loose coupling allows firms specialized in different bodies of knowledge, design steps, manufacturing processes to follow their idiosyncratic learning processes while retaining some degree of responsiveness.
Corsaro and Ramos (2012)	Network	Rationalization (efficiency) effects and development (effectiveness) effects, depending on network configuration
Iansiti and Levien (2004)	Ecosystem	Ability to innovate, surviving disruptions, and absorb external shocks.
Kim *et al.* (2010)	Business ecosystem	Can create values that no company could achieve alone
Moore (1993)	Ecosystem	Survival and innovation
Ordanini and Parasuraman (2011)	Service ecosystem	Value co-creation
Orton and Weick (1990)	Loosely coupled systems	Claimed benefits of loosely coupled systems include; "persistence", i.e. stability and resistance to change, "buffering", i.e. the ability to seal off and prevent the spread of problems, "adaptability", i.e. ability to accommodate change, "satisfaction" of employees, and "effectiveness" of the organization. These benefits are a

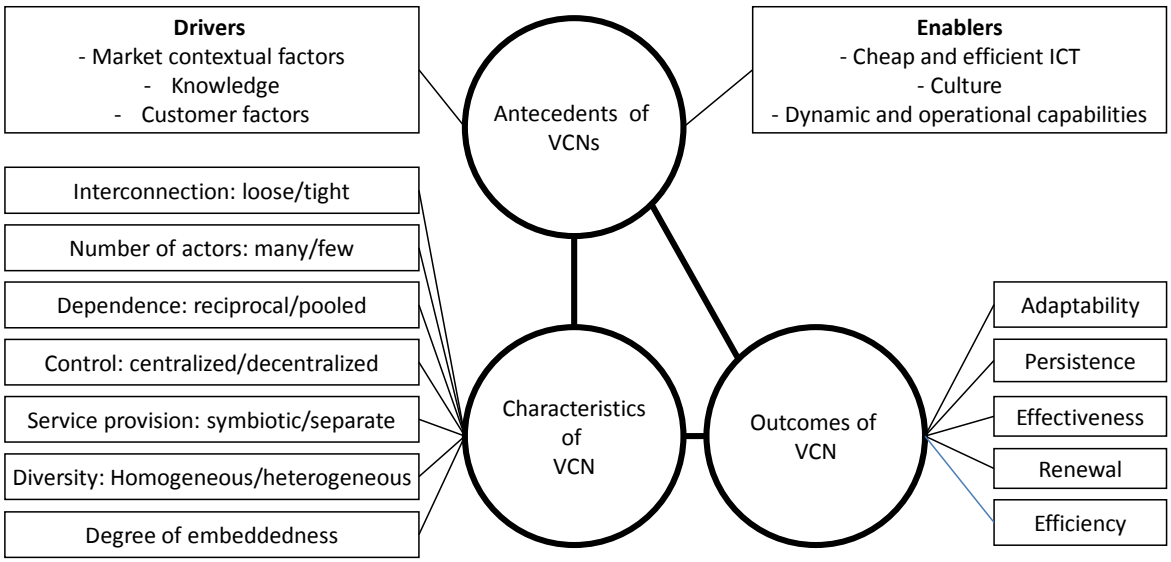
		product of the system's capacity for experimentation and learning at a range of levels.
Vargo and Lusch (2011)	Ecosystem	Co-production of service offerings, mutual service provision and co-creation of value.
Vargo *et al.* (2008)	Service system	Adaptability and survivability of all service systems engaged in exchange, by allowing integration of resources that are mutually beneficial.

Table V: Polar network forms and their central features

	Simple Networks	*Complex Networks*
Characteristics	Tight or loose interconnections Few actors Pooled dependence Centralised control Separate service provision Homogeneous actors and links	Loose and tight interconnections Many actors Reciprocal dependence Decentralised control Symbiotic service provision Heterogeneous actors and links
Management	Direct	Indirect
Network scope	Business actors	Business actors + environment (technological, economic, political, and social influences)
Drivers	Stable business environments Low degree of competition Stable markets Long product life cycles	Volatile business environments Global competition Changing markets Short product life cycles
Enablers	ICT Culture Operational capabilities	ICT Culture Operational and dynamic capabilities
Outcomes	Persistence Effectiveness	Adaptability Persistence

	Efficiency	Effectiveness Renewal Efficiency

Figure 1: A framework for value-creating networks



Appendix 1: Subject-specific publications selected for review:

key inputs to the reconceptualisation

Year	*Author(s)*
1969	Lewis and Erickson
1985	Granovetter
1990	Orton and Weick
1993	Moore; Normann and Ramirez
1994	Anderson *et al.*
1998	Halinen and Törnroos
2001	Brusoni and Prencipe
2002	Cusumano and Graver
2004	Iansiti and Levien; Ritter *et al.*
2005	Echols and Tsai
2007	Adomavicius *et al.*; Amaral and Uzzi; Möller and Rajala; Spohrer *et al.*
2008	Vargo *et al.*
2009	Basole; Rohrbeck *et al.*
2010	Kim *et al.*
2011	Ordanini and Parasuraman; Vargo and Lusch
2012	Battistella and Colucci; Corsaro and Ramos; Gebauer and Paiola; Koenig; Williamson and Meyer
2013	Gebauer *et al.*; Ojasalo

Note: for full details, see References