HOW TO INFLUENCE THE BIRTH OF NEW BUSINESS FIELDS – NETWORK AND KNOWLEDGE PERSPECTIVES

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Abstract

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Keywords: Business networks, dynamic capabilities, network management, emergence.

How to Influence the Birth of New Business Fields – Network and Knowledge Perspectives

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Introduction

This paper examines the tasks and managerial challenges faced by companies involved in the emergence of new businesses during periods of radical technological change. This landscape is one where new technological regimes such as the Internet and technological systems as the mobile telephony or digital imaging emerge as a result of activity by networks of interlinked actors.

Eisenhardt and Martin (2000, 1111) describe this emerging business landscape as “high-velocity markets”, characterized by nonlinear and unpredictable change, with blurred market boundaries and ambiguous and shifting market players, with no evidently-successful business models. Rather than considering markets or industries, we will examine this environment through the network “lens”. It can be argued that there are no markets in the early emergence phase since markets presume structures which constitute relatively-identifiable actors and their value propositions.

The network view, we contend, provides a better conceptual tool for describing the emergence of complex value-systems often involving many non-business actors such as

government agencies, supra-national bodies, university research centers, and regulatory agencies (Håkansson and Snehota 1995; Lundval 1992; Möller and Svahn 2003; Nelson 1993; Parolini 1999). Levels of technological complexity and the degree of embeddedness mean it is actually impossible for any single firm to create a new technology or business (Lundgren 1995; Tushman and Anderson 1990). The interconnected and interactive character of complex value-systems supports adoption of the network perspective (Håkansson and Waluszewski 2002; Levinthal and Warglien 1999; Nelson 1993; Seufert et al. 1999; Shy 2001).

More specifically, we are interested in the role of management and the modes of management employed in the context of emerging business networks, and in intentionally developed strategic nets which simultaneously face and try to create radical change. Why is this theme important?

Firstly, Ford and Håkansson, prominent scholars in the Industrial Marketing and Purchasing Group, contend that the complex, interconnected nature of industrial networks makes the creation and management of intentional networks practically impossible (Ford and McDowell 1999; Håkansson and Ford 2002). The challenges facing management in networks can be expected to be further accentuated in an environment of radical change. There is accumulating evidence, however, that firms are not only trying to influence emerging networks but also deliberately constructing what have been called value nets or strategic nets to pursue their goals (Hinterhuber 2002; Hung 2002; Jarillo 1993; Parolini 1999; Spencer 2003). Is it possible for this "it cannot work in theory but works in practice" paradox to be solved, or at least reformulated?

Secondly, it has been claimed that in a landscape of radical and discontinuous change, managerial suggestions which derive from the resource-based theory (RBV) of the firm break down (Eisenhardt and Martin 2000). This view is supported by evolutionary economics, which suggests that firms must have capabilities that allow them to adapt to change in their

operating environment change if they wish to survive and perform. These capabilities, however, evolve over time as experimental learning develops into organizational routines and exhibits patterns of accumulation, making rapid changes in company behavior both unlikely and difficult (Nelson and Winter 1982). Have firms operating in and even creating radical change been able to develop capabilities that allow them to not only survive but also prosper?

Thirdly, although there has been unprecedented growth in corporate collaboration and different forms of partnering and inter-organizational networks (Anand and Khanna 2000; Achrol and Kotler 1999; Brandenburger and Nalebuff 1996; Gulati 1998; Hinterhuber 2002; Hung 2002; Powell et al. 1996, 1998; Spekman et al. 2000), relatively little is known about management practices which intentionally influence emerging technological and business networks, or about efforts which intentionally use nets of organizations in the creation of new technologies/businesses (Kenis and Knoke 2002; Park 1996)**.** The majority of the work already done has, as Lorenzoni and Lipparini (1999, p. 318) note, "tended to consider networks as given contexts, rather than a structure that can be deliberately designed."

Together, these postulations and findings emphasize the theoretical and managerial relevance of identifying how firms are actively creating change through innovation networks and also surviving change in radical emergence.

Our study addresses this knowledge gap. We aim to contribute to the emerging theory of network management in the context of radical change by integrating notions from the industrial network approach, from strategic management, from the dynamic capabilities view, and from organizational learning studies. A number of premises guide our work. First, it is clear that the characteristics of an emerging network influence the capabilities required when operating in this environment. Second, the task that organizations aim to accomplish, either through influencing emerging networks and other network actors, or more directly by trying to create specific network organizations (we call these "strategic nets"), influence the

managerial capabilities required. Third, the pool of resources and capabilities available from potential collaborating actors also conditions the capabilities that are critical for a focal actor. Finally, the formation of potential new net organizations is subject to the availability of different types of network actors and their resource pools.

Based on these premises, we aim to (1) identify a set of characteristics describing the environment of emerging networks, (2) propose key management tasks that are relevant when operating in an emerging network environment, and (3), identify the basic capabilities required. The paper is organized as follows. We start by discussing the nature of emerging networks and their environment, which is characterized by radical change. The basic dimensions of these landscapes are then identified and an organizing framework is proposed. The fundamental tasks of operating in radical emergence are put forward and the management capabilities related to these are identified and discussed. A discussion of the theoretical contributions concludes the paper.

Characteristics of Innovations and the Environment of Emerging Networks

Since the early work of Schumpeter (1934) that pioneered the theory of economic development, several research traditions have addressed the emergence of new technologies and businesses. In their exploration of value creation in e-business, Amit and Zott (2001) identify and review “Schumpeterian innovation, Porter’s value-chain analysis, the resource-based view of the firm, strategic networks, and transaction-cost economics”. To this list could be added organizational learning theory, evolutionary economics, technological and innovation dynamics, and complex systems theory.

A proper review of this rich base of knowledge is outside the scope of the present paper. We will allocate priorities firmly using the following criteria: (1) Does the literature address value creation and management in the network context? (2) Does it describe the

characteristics of business/social networks? (3) Does it describe the value-creation process? We start by discussing the characteristics of technological innovations and their development dynamics since these heavily influence the kinds of capability required from involved firms.

Innovation Types

Freeman and Perez (1988) distinguish between four different types of innovation:

1. Incremental innovations which occur more or less continuously in any industry (e.g., new generations in RAMs, new "Walkman models").

2. Radical innovations which are discontinuous events unattainable through incremental adjustments to already-existing regimes (analog vs. digital mobile phones).

3. New technological systems which are far-reaching changes in the technology affecting several branches of the economy (digital imaging, mobile telephony).

4. New techno-economic paradigms or technological revolutions which are so far-reaching in their effects that they have a major influence on the behavior of the entire economy (electromechanical technology vs. electronics, the Internet).

The taxonomy is based on the scale (i.e. single innovations vs. clusters of innovation) and the scope (minor changes vs. major changes) of technological change. Although these types of innovation are, as Lundgren (1995) points out, neither independent nor mutually-exclusive but embedded, they are useful for characterizing different innovation networks.

Cycles of Technological Change

Research in technological dynamics provides additional insights into the innovation environment. In their study of the nature of technological change, Tushman and Anderson (1990) suggest two cycles. An era of "ferment" which is characterized by competition between emergent technological designs (e.g. DOS and the Macintosh operating systems) and an era of "incremental change" which is characterized by gradual improvement of the new dominant design (e.g. new generations of Intel processors). A discontinuous technological change triggers the era of ferment, its impact can either enhance current resources or destroy them. Discontinuous and resource-destroying change, exemplified by the impact of digital quartz technology on the Swiss watch industry, brings with it severe technological and

commercial uncertainty, and may ruin the position of major incumbents who have been slow to react (Dosi et al. 2000). Incremental change is more continuous in nature and generally enhances the positions of actors that are mobilizing these innovations.

These two eras present actors in the networks with different challenges. During the era of ferment, actors who conceptualize new innovations are searching for partners with complementary resources and capabilities, and in general try to mobilize the behavior of relevant actors in the direction of building the necessary infrastructure for commercialization. In cases where there are two or more technological solutions, the emergence of sub-networks of actors competing for the dominant design can be expected (e.g. Betamax vs. VHS video-recorder technology).

Phases of Network Emergence

In his historical analysis of the emergence of a new technological system network, digital image processing in Sweden, Lundgren (1995) suggested that network emergence includes three partly-parallel but distinct phases: genesis, coalescence and dissemination.

'Genesis' (1995, p. 100-102) represents the creation of novelty and variety in the network. This generally takes place through several R&D initiatives and projects by individual actors who rely on their established network partners. In the digital image processing case, actors within different technological systems and located in different industrial systems initiated these projects. As the projects opened up new possibilities, their initiating actors had to search for complementary resources/capabilities outside their original networks (Lundgren 1995, p. 101). Sense making and early identification of the application potential of new emerging technological knowledge drive this process.

'Coalescence' (1995, p. 102) takes place when the proponents of new technology have identified each other and any supporting actors, and form a network through interaction. This mobilization of actors and the emergence of technological applications is characterized by the

intensive development of new capabilities, which also creates also increased legitimacy among critical constituents such as potential users and financers.

'Dissemination' refers to expansion of the primarily R&D-oriented network (which has one or more sub-networks or blocks depending on the technological system in question) towards suppliers of components and complementary products, services and systems, and towards major customer groups. This concerns exploitation of the new technology by providing applications for different user groups. During this phase, suppliers may specialize by fulfilling the needs of specific customer groups. In Tushman and Anderson's terms, the emerging network has reached the era of incremental change.

Lundgren's three phases of network emergence offers perceptive insight into the issues and tasks that face companies involved in this process. The genesis-coalescence-dissemination framework helps in understanding the era of ferment and demonstrates that interlinked individual firms forming networks are responsible for the birth of individual innovations and the creation of technological regimes or trajectories. So far, we have examined emerging networks or innovation environments from the macro perspective, identifying relevant structural and process aspects. We now adopt a "more-micro" perspective, examining the characteristics of an individual innovation and how these drive networking.

Synthesis of the Environment of Emerging Business Networks

Based on the previous discussion, we suggest the framework shown in Figure 1 as a summary of two key aspects which influence the formation of collaborative networks. This Systemic Innovation Space (SIS) is based on the number of capabilities required by an innovation, and on the level of autonomy or embeddedness of the innovation in relation to the existing infrastructure.

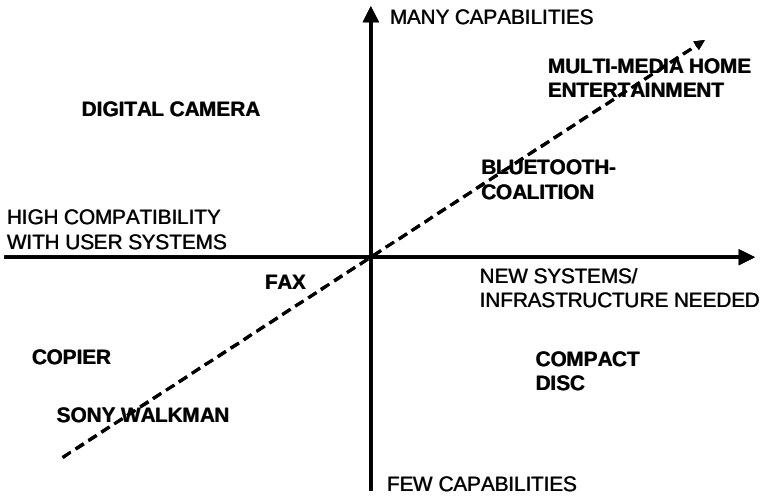

FIGURE 1. Systemic Product-Service Base (adapted from Normann 1995)

Four propositions can be derived from the figure 1. Firstly, the more capabilities that an innovation requires, the more probable it is that its creation and business realization will be carried out by an intentional net of organizations. Secondly, the higher the number of new supporting systems (i.e. specific infrastructure) required for the innovation to be commercialized, the more probable it is that its creation and realization will be carried out by an intentionally developed net of organizations, and that these processes will probably involve several networks. Thirdly, the less the innovation requires capabilities and new supporting infrastructure, the more probable it is that a single organization can create it. Fourthly, the higher the number of capabilities required by the innovation and the more it needs the co-development of new infrastructure for commercialization, the more probable it is that it will be developed by an intentionally-developed net of organizations, and that the process will involve several networks.

The diagonal vector describes the move from autonomous and simple innovations to embedded and complex ones, and indicates both increasing uncertainty in estimating the potential success of an innovation and an increasing need to mobilize a dispersed group of specialized actors to exploit the innovation. The value of an innovation and its appropriation

by the engaged actors will only become evident in the future and will be influenced by actors and forces that are probably cannot be recognized at the outset of the innovation process (Ford and McDowell 1999; Möller and Törrönen 2003).

A final characteristic in our description of the innovation environment is the variety of actors who are related to the creation and commercialization of an innovation. Institutional theory suggests that company behavior is embedded in a broader setting of political, educational, and social institutions: as the deregulation and globalization of the telecommunication industry suggests (DiMaggio and Powell 1991; Lundval 1992; Nelson 1993), these play an often vital role in the emergence and shaping of new business sectors. A variety of agencies often play key roles in the formation of technological standards. We suggest that the more embedded an innovation is with current infrastructure and the greater the amount of the new infrastructure needed for the commercialization of a new innovation, the more that innovating firms will have to develop relationships with political and social actors. This is even more obvious if, instead of individual innovations, companies are participating in the creation of technological systems or the emergence of new paradigms (Freeman and Perez 1988).

Pulling together our discussion, we offer a framework which synthesizes the characteristics describing the environment of emergent business networks, see Figure 2.

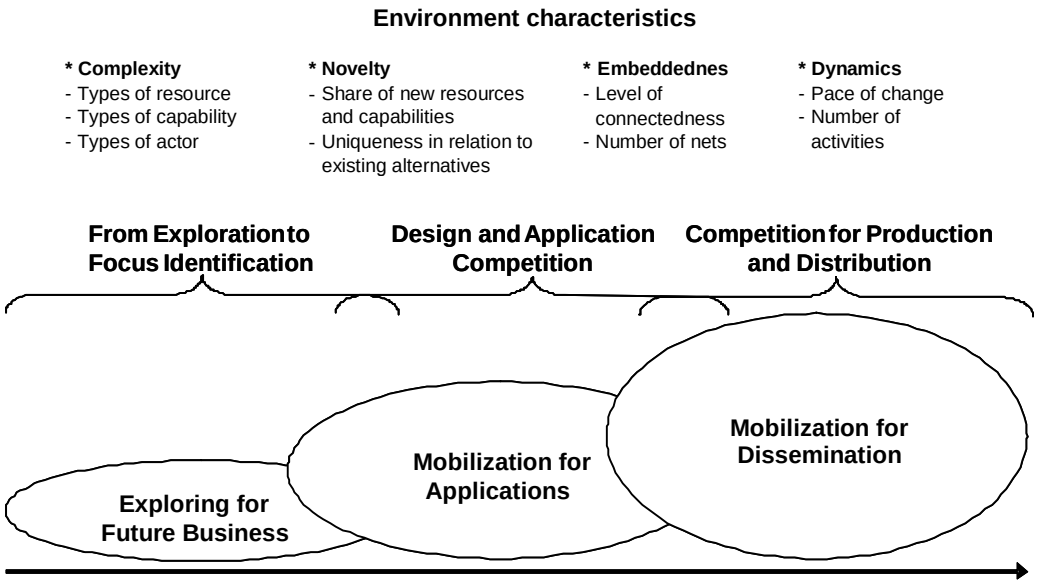

FIGURE 2. Landscape of Emergent Business Networks

Following Lundgren (1995), we frame emergence using the three phases shown in Figure 2. The Exploration for Future Business phase is characterized by competition between the actors and collaboration in the exploration and making sense of the application potential for emerging technologies. The Mobilization for Applications phase concerns actors competing and collaborating in constructing dominant designs and applications. The Mobilization for Dissemination phase covers actors competing and collaborating in scaling up production and distribution networks in the competition to create markets. The increasing size of the ellipses reflect the expanding networks required to transform an idea into an innovation, and to turn an innovation into a viable business.

We suggest that the degree of complexity, novelty, embeddedness and dynamics, shown at the top of the framework in Figure 2 influence the execution of the "meta tasks" which constitute the phases of new business networks emergence. The interlocked and overlapping nature of the three phases is symbolized by the over-arching ellipses. When considering this framework, we are much in dept to Lundgren's work and to Tushman and Anderson's technology cycle. Our exploration phase represents an early stage of the era of ferment, with

the latter part represented by mobilization for applications and for dissemination. The intellectual relationship between this scheme and the classical evolutionary paradigm of variation-selection-retention (Nelson and Winter 1982; Zollo and Winter 2002) should be noted. In more managerial terms, the first two phases represent pre-market competition (and cooperation), while activities in the third phase are already addressing market competition.

Firms in Emerging Business Networks - Tasks and Capabilities

We now shift the focus of attention to the company level to consider how organizations initiate and carry out the activities which result in new business networks. Key issues here are how the actors that are involved perceive the emerging network, how they try to influence and adapt to it, and the capabilities they need to survive and prosper. These questions are addressed in each of the three phases of emergence using the perspective of dynamic capabilities, and special attention is paid to the role of knowledge and learning (c.f. Möller and Svahn 2002; 2003 for a discussion of dynamic capabilities and learning in a network context).

Early Emergence – Exploration for Future Business Options

It is usually firms that are carrying out their existing businesses through well-established networks that make up the early-emergence landscape. Most of the actors and strategic nets are also engaged in incremental, local development activity aimed at improvement of their products and business processes. These activities take place under traditional technological paradigms.

On the other hand, actors that are sowing the seeds of change also populate this landscape. The seeds are created by research activities in universities and public research centers, in the research units of corporations, and by small innovative science- and technology-driven firms.

This mixture of old and new, stability and change forms a complex system of partly-transparent and non-transparent sub networks exemplified by the combination of traditional food production networks and the emergence of biotechnology, and by the landscape of ICT convergence. We suggest that the tasks of sense making and focus identification are essential in this phase, and now discuss these from the perspective of a large incumbent firm.

'Sense making' refers to an actor's capability to perceive and interpret the emerging business landscape (Weick 1995). This is a demanding task because of the tacit and dispersed nature of new ideas. Ideas refer to beliefs about how emerging knowledge can be utilized. They are often fuzzy, and there is ambiguity about the possible cause-and-effect relationships between existing and emergent knowledge. Vague ideas may not yet present a heuristic picture of how to pursue them. Ideas may also be held uncertainly - the holder cannot articulate either the roots of the idea or its logic, but feels that it captures something important about the emerging reality. Scharmer (2000) discusses this kind of knowledge and views it as "not-yet-embodied" tacit knowledge, based simultaneously on the inner experience and interpretation of the actor concerned, and on the perceived "outer" reality. It is a reflection of, or an idea about, "not-yet-enacted reality."

The wide dispersion of ideas and technological knowledge is another characteristic of early emergence. Actors exploring new technologies and advancing novel business ideas generally come from several different fields (Håkansson and Waluszewski 2002; Lundgren 1995). The creation of new mobile Internet-based banking services, for example, involves expertise in Internet-related software solutions, Internet-related wired technology, mobile terminals, mobility software, radio technology, secure-over-net payment technology, financial services and database management.

Each actor has a specific view of the emerging opportunities which is based on his own specialization and technology base and a position in the emerging network. This cognitive

representation of the network forms the actor's network theory (Johanson and Mattsson 1992), that guides his behavior in the network and also influences his on-going sense making (Spender 1989). As specialization, especially when driven by the search for higher efficiency, leads to a narrow outlook, actors have difficulties in developing a wide or systematic perspective on emergence and its opportunities. On the other hand, by increasing the variety of knowledge within a macro network, this tendency supports the likelihood of the creation of radically-new knowledge (Nelson and Winter 1982; Zollo and Winter 2002). This reflects the relevance of recognizing the influence of the characteristics of the network(s) in which the firm is embedded in both the new-knowledge-creation and sense-making processes. This situation is highlighted using the diagrams of centralized, decentralized, and distributed networks shown in Figure 3 (Barabasi 2002, p. 145).

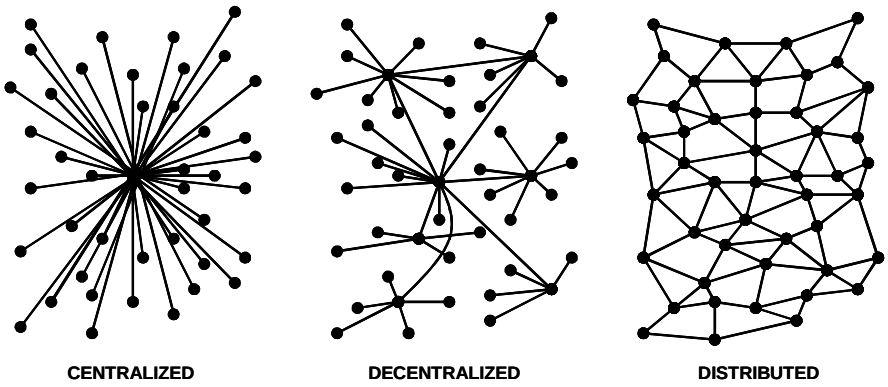

FIGURE 3. Three Types of Networks (Barabasi 2002)

A centralized network contains relatively-little variety: its members are united under a single technology-business mode that is best understood by the hub with its knowledge of the network architecture. Mutual learning between specialist members which could lead to new ideas is greatly restricted by the centralized architecture.

A decentralized network consists of several sub-networks, some of which can be strategic nets, linked by ties between the central actors in each sub-network. This type of network contains much more heterogeneous resources and capabilities, which – when connected through communication and joint learning – can lead to radically-novel ideas and knowledge creation. The actors' sense making and learning opportunities obviously depend on their location. Most of the actors are only connected to the central firm in their sub-network, while the best-connected hub has access to all the other central actors. All the second-order hubs are, however, connected via second-order ties, which thus form weak but important links for the exchange of ideas.

The distributed network form, which probably does not describe any real business network, represents a landscape with multiple relatively-equal actors, most of them well-connected via direct and indirect relationships. This structure – which has some similarity to large groupings of science- and technology-driven small firms – exhibits great variety and its high degree of connectivity could make it a "hot spot" for innovative knowledge creation. For a more detailed discussion on change in networks, see Halinen et al. (1999), Håkansson and Lundgren (1995), Håkansson and Waluszewski (2002).

Faced with this kind of complex network landscape, how should a company wanting to be at the forefront of capitalizing opportunities offered by various emerging technologies behave? In other words, is it possible to create learning and "knowledge-management" solutions that match the ambiguous and uncertain character of emerging business networks?

Two key issues are involved here: how to recognize widely-dispersed and vague ideas in the first place, and then how to make sense of them. One aspect is exposure, or access to ideas and stimuli. It appears that actors located in nodes which connect multiple actors and create different types of new knowledge have a better chance of recognizing emerging technological and business opportunities than actors who are highly specialized (Håkansson et al. 1999;

Kogut 2000; Powell et al. 1996). Since they are involved in several interlinked but different strategic nets, major corporations have increased exposure to ideas emerging from other actors. Furthermore, Granovetter's (1973) and Uzzi's (1997) findings suggest that weak ties with many actors form an important source of information about ideas that originate outside an actor's more-immediate network environment.

Utilization of this "exposure potential" is not, however, without its problems. There must be motivation for transition from on-going routines which exploit a firm's current knowledge base to activities involving exploration and discovery. Many authors observe that this transition is not an automatic one, but a result of major internal or external shocks that lead to the questioning of current practices and to critical self-evaluation of an existing worldview (e.g., Cyert and March 1992; Fiol and Lyles 1985; Holmqvist 2003; March et al. 2000). In a sense it is a question of whether an organization can pursue exploitation and exploration simultaneously (March 1991). This is not easy as these behaviors are based on different learning modes. In 'adaptive' learning, actors utilize their existing cognitive framework or recipe for the business and other network actors. 'Generative' learning presumes that the actor is able to subject the framework to critical examination and not only create radically-new knowledge but also reconstruct the business recipe (Argyris 1977; Argyris and Schön 1978; Senge 1990; Slater and Narver 1995; Spender 1989, 1996). In this sense, the actor's learning culture plays an important role in shaping sense-making capability.

Organizations are becoming sensitive to this "exploitation trap". Several multinational corporations have established formal knowledge-management functions and empowered boundary personnel to scout for even weak signals of new emerging technological breakthroughs and business opportunities. (Baghai et al. 1999; Doz et al. 2001; Normann 2001; Ramirez and Wallin 2000; Seufert et al. 1999).

In brief, the sense-making capability entails, besides being open to new information and knowledge, a *capacity to learn, or an absorptive capacity*, as Cohen and Levinthal (1990) called it, which depends on the knowledge base of an organization, the learning skills of its boundary-spanning personnel and their motivation for discovery-type search behavior (all of which are dependent on the learning goals and learning orientation of the actor); and whether it has been able to create an organization which enables knowledge transfer and creation (Zahra and George 2002; Zollo and Winter 2002). We suggest that actors who hold relevant positions in several networks or nets can be expected to have better absorptive capacity, since they must have developed learning and communication capabilities in order to make sense of, and exploit, the different types of knowledge possessed by their network partners. In sum, network positions offering extensive exposure and proactive scouting combined with a strong sense-making capacity provide an actor with a pool of ideas about emergence. The next question is whether some or one of these ideas can be prioritized and developed further.

Focusing and Selecting. Many organizations collect vast amounts of information and even transform part of it into knowledge and ideas without being able to turn this "experience accumulation" (Zollo and Winter 2002) into any radical breakthroughs. A critical threshold is the *capability to select and thus provide focus* for further development activities. Zollo and Winter (2002) include both evaluation and legitimisation processes in this capability: in learning theory it is considered to be part of the assimilation process of a firm's absorptive capacity (Zahra and George 2002). Even with established assessment routines, the activity of selection can be very a difficult one as many ideas are in embryonic form and at too early a stage to allow evaluation of their future potential. To circumvent or postpone this selection problem, proactive incumbent corporations are deliberately exploring the potential of several emerging technologies by acquiring tens or even hundreds of small technology companies. This is a very costly but effective way of increasing the variety and richness of one's learning

environment and to attempting to ensure that one is not locking-in too early. Similar results can sometimes be achieved by having an extensive alliance net, including a pool of R&D projects involving interesting SMEs (Blomqvist 2002; Dyer and Singh 2000; Kale et al. 2002).

Several network-related aspects influence both an actor's selection situation and their selection capability. Firstly, if an emerging idea has a high level of embeddedness and its realization is related to several different technologies and business networks (see Figure 1), the difficulty of evaluation is increased. Secondly, being involved in different networks and their development projects enhances an actor's evaluation and selection capability by providing access to different learning experiences and perspectives. In today's decentralized corporations (which are themselves networks) these experiences are, however, often dispersed within several companies and business units where local boundary spanners have the best opportunities to observe and participate in the creation of new knowledge and value-activities.

The essential problem in the corporate context is how to collect, evaluate, and potentially integrate these fragmented ideas and partial visions. Integration presumes, in addition to the possession of a good information system, the use of not only cross-functional but also cross-business-unit teams and the existence of an open corporate culture that is conducive to exploration. Even extensive resources do not guarantee this sense-making and selection capability, something that is illustrated by IBM's failure to anticipate the breakthrough of personal computers and the changing role of the operating system owned by Microsoft in the computer industry's value system (Fine 1998). This phenomenon can be explained by von Krogh's and Grand's (2000) propositions on the justification of new knowledge/ideas in a corporate context, i.e. that if new interpretations made locally in a corporation, or proposed by other net members, are contradictory to the corporation's dominant logic, they will not be

accepted or acted upon. This finding emphasizes the crucial role played by corporate culture in fostering generative learning and legitimizing risk taking.

We conclude discussion of the challenges, tasks, and capabilities involved in the exploration phase of radical emergence with a brief synthesis. Firstly, a position in multiple different business networks and having many weak links provides a company with extensive exposure to new ideas and emerging knowledge. Secondly, experiential learning achieved through multiple network positions and several partner relationships with different perspectives enhances a firm's sense-making capability. This is manifested in its absorptive or learning capacity, and includes the abilities to focus, assess and select. A core internal driver of these dynamic capabilities is an organizational culture which creates and maintains a generative learning orientation, encouraging both experimentation and risk taking. We contend that mutually, these positional advantages, cultural values, and competencies lead to a *framing capability*. This is the cognitive capacity to form a holistic or architectural understanding of emergence, and also involves the mental flexibility to reframe as and when the need arises. *Framing capability* is the secret behind *visioning*, i.e. sensing future potential before most of the other actors, a truly complex capability which is difficult to create as the IBM example shows.

Mid Emergence – Mobilization for Designs and Applications

The core issue in the mid-emergence phase is how to turn a strong vision manifested in an articulated technological or business concept into a realized business or technology. The exact nature of this phase depends a great deal on whether there is more than one actor sharing similar concepts. We assume a competitive situation, i.e. one which concerns the influencing and mobilization of actors who command attractive current resources and capabilities, as well as the co-creation with specific actors of new resources and capabilities that the initiating firm

is not able to handle. The final goal is to develop and commercialize an application or design that becomes dominant in the emerging industrial system.

This mobilization demands several interlinked networking capabilities. Actors who will have important roles in the emerging network must first be identified. Second, these actors must then be convinced of the viability and earning potential offered by the new value system, and finally, an architecture and organization for network collaboration must be created. This is the phase where a balanced appreciation of both the creation of new knowledge and its exploitation is required, and where the emerging value-system architecture takes shape and influences the roles, functions and learning potential of the major actors included in it. In this respect, it concerns both value creation and value appropriation.

In emerging value systems, actors face great uncertainty in connection with the relative value of embryonic new knowledge. There is also ambiguity about which actors master what kinds of knowledge and value activities. In this setting, *framing capability* allows the development of a systematic view of the emerging field and the envisioning of its architectural development with different types of actors, with their roles and business models representing critical capabilities as they enable the core actor to reduce perceived uncertainty and provide direction for taking action. *Visioning* is, however, not enough, since mobilization of an emerging business network requires the possession of a strong position in the field providing both credibility and resources.

An impending hub-firm should have specific resources and knowledge that make it an attractive mobilizer for potential partners and the field in general, including the institutional actors who establish rules for the emerging business. A mobilizer should be able to develop and communicate an agenda for influencing the field in a preferred direction. *Agenda setting* involves communicating one's beliefs and visions and providing direction by sharing one's technological knowledge and suggesting potential business models for various actors in the

emerging value system. A prominent position in the current network or networks and a strong reputation for technological and business leadership enhances credibility in agenda setting. Recent evidence from the flat-panel-display industry suggests that firms sharing their technological knowledge in the pre-commercial phase of emergence were not only able to influence the institutional environment in favor of their technological solution, but that higher performance in terms of innovation was also achieved (Spencer 2003).

In addition to influencing an emerging larger-business network to adopt its technological solution and to hasten potential lock-in, a mobilizer must simultaneously create a specific strategic net responsible for producing and marketing commercial applications of the technology. Once again, the stronger an actor's resources and the more credible its technology and business vision, the easier it is to attract and select strong partners to participate in a strategic net that covers the new value system from customer care to component and service supply. In this early phase, still dominated by the technological development of applications and production processes, the emphasis is on sharing technical knowledge and the joint creation of working solutions. This demands, in addition to a clear and systematic view of the value-activity architecture (Parolini 1999), the ability to create a collaboration system for the sharing and co-creation of knowledge and capabilities with other net actors who represent different communities of practice, each of whom has their own knowledge articulations and working cultures embedded in people and routines.

The core *capability is to bridge different communities of practice.* Bridging is essential when creating new specialist knowledge which results in product and process improvements, etc. (Dyer and Nobeoka 2000), and requires the ability to cross the professional language and cultural barriers embraced by, for instance, experts in product and process technologies, software developers, marketing and business managers (Blomqvist 2002; Dougherty 1992; Happonen 2001). Being able to understand specialist knowledge domains requires a sphere of

jointly-held knowledge that provides the people representing different communities of practice with a base they can exploit to initiate the mutual learning and combining of their specialist knowledge constructs (Nonaka and Takeutcshi 1995).

In sum, *net mobilization* requires an organization-wide network-player orientation, with key personnel sharing and supporting the achievement of joint goals. The mobilizer must be able to create an organizational forum for sharing the work and responsibilities between actors, to establish coordination mechanisms for net cooperation, and to instill a network identity (Dyer and Nobeoka 2000; Gadde and Håkansson 2001). As most joint development work is carried out through multi-actor/multi-functional teams, team management and bridging capabilities are at the heart of the process. The role played by boundary personnel is crucial in this process. Their knowledge base and their understanding of the cultures involved should enable them to bridge at least two communities of practice . In brief, *net mobilization capability* requires the ability to organize multi-level and multi-functional contacts and teams in general, involves several actors and must be supported by an integrated information system. This “macrocultural” aspect remains quite unexplored (Jones et al. 1997).

The previous discussion focused on value creation and mobilization in a new strategic net. A different aspect, but an equally important one, is the appropriation of value. The mobilizer should carefully attempt to assess both the future value-creation potential of the key value tasks in the new net and their ownership. In doing this, a resource-based view provides some suggestions. An actor that commands resources through which it can carry out activities that are valuable, rare, inimitable, and non-substitutable (i.e., the so-called VRIN attributes, Eisenhardt and Martin 2000; Wernerfelt 1984) has a very strong power position in a strategic net and can often appropriate the largest share of the revenue that is created by that net. Valuability itself is determined by the relative importance of the task to the final offering made by the net.

Utilizing its architectural knowledge the mobilizer should attempt to forecast or to ascertain that it commands the key value activities in the emerging business field. This is not easy, as illustrated by IBM's surrendering one of the strongest positions in the PC field to Microsoft, its originally-much-smaller partner.

From Emergence to Market Competition – Mobilization for Dissemination

The last phase in our emergence framework represents the transition to market competition from a situation of pre-market competition with an emphasis on exploration, sense-making and the creation of new solutions. This phase is characterized by competition between the strategic coalitions that have emerged or nets formed for market creation and gaining market share. It involves time-to-market competition, emphasizing speed, and – in the case of rapid growth in demand as in the mobile phone sector in the late 1990s - escalating production and distribution. As these types of networks and nets, especially supplier nets, have already been the subject of considerable research (see the discussion in Möller and Svahn 2003 and Möller et al. 2002) only a limited discussion is offered here.

In the application and process development phase, the core task is to create a winning application design through both technological cooperation and influencing the emerging business and institutional network via agenda-setting practices. In the dissemination phase, the emphasis is on the creation of a highly-efficient demand-supply value system by exploiting the specialist capabilities of a variety of component and service suppliers and distribution channel members. Since the emphasis has so far been on co-development activities and culture development, but assembly and distribution activities require capacity and efficiency derived from strong coordination capabilities, this may require reorganization of the strategic net.

The *net-management capability* in this kind of primarily-vertical value net is manifested in the information and management systems that combine the business processes of each actor

and monitor the efficiency of production, logistics, customer delivery and service. It is essentially a *coordinating capability* requiring knowledge of the architecture of the value system which constitutes the complete business process represented by the net. In an advanced case, this would lead to the coordinated management of a complete value system ranging from customer care to component production, and would require that tools from Supply Chain Management, Enterprise Resource Planning, and Customer Relationship Management be combined (see, for example, Means and Schneider 2000; Lambert and Cooper 2000). This shift requires that roles be determined in a very careful manner and that they are supported by a set of matching contractual arrangements. Other core issues are the re-examination of potential shifts in value appropriation and attempts to influence the value architecture of the net so that it remains competitive without the hub firm losing its dominant position.

In terms of knowledge and learning, the mobilization and management of vertical, efficiency-seeking strategic nets emphasize the capability of exploiting current actor competencies through effective knowledge transformation and sharing (Boisot 1998**;** Dyer and Nobeoka 2000; Levinthal and March 1993; March 1991; Möller and Svahn 2002). *Knowledge codification* (see Zollo and Winter 2002) is considered to be an essential part of this process, forming a prerequisite for the coordination of business processes and logistics among key members of the net.

The picture presented in the above is, however, too simple. In many emergent fields, technological development continues strongly even after first-generation solutions have been created, as exemplified by the competition between technological solutions such as UMTS, CDMA, PDC in third-generation mobile handsets. On occasions, there is also competition between different technological paradigms, as illustrated by Microsoft's attempts to move into mobile technology and business applications and by countermoves from the mobile business

community through initiatives such as the Bluetooth and Symbian coalitions. This kind of transition context requires the strong network-level mobilization capability discussed in the previous section.

Nokia Corporation's announcement at the Comdex fair in Las Vegas on November 12, 2001 that it would provide open access to some of its mobile-telephony source code is an example of agenda setting resulting in wide network mobilization. The announcement was only made place following after the careful mobilization of an alliance of 18 key players in the mobile-phone field who endorsed their commitment to "open mobile architecture enabling a non-fragmented global services market."(press release, http:/www.symbian.com/press-office). This agenda-setting move led to the establishment of the Open Mobile Alliance (OMA, June 2002, http://www.openmobilealliance.org) which aimed at the more-rapid development of the global market for 3G mobile services, such as multimedia messaging through Internet applications. The goal of OMA members (approximately 300 companies in November 2002) is to ensure their end-customers of complete interoperability between systems: this is expected to benefit all players through more rapid growth in both demand and available applications. OMA is an example of successful network mobilization which also aims to stall Microsoft's efforts to take a stronger role in the mobility network. It is a case which shows the value of being able to influence or "orchestrate" a whole emerging sector. For an example from the agrochemical sector, see (Hinterhuber 2002).

In sum, the transition period which concludes emergence requires that the mobilizer is able to shift the emphasis from R&D to the creation of an efficient dissemination net, or in more managerial terms, a "production and distribution machine". As our mobile telephony community example suggests, mobilizers must, however, simultaneously maintain their R&D capability and be prepared to orchestrate even the larger new business sector.

Discussion

This paper contains several theoretical contributions. Firstly, it increases our current understanding of the emergence of new business sectors by proposing a framework for describing the environment of emergent business networks. This is achieved by linking the theory of technological cycles (Tushman and Anderson 1990) to the three phases of network emergence articulated by Lundren (1995): we therefore synthesize the core propositions from two different research fields. Secondly, we offer detailed descriptions of the sub-processes which constitute each of the proposed phases (Exploration for Future Business Options, Mobilization for Applications, Mobilization for Dissemination). In doing this, we show how the characteristics of a network environment influence the behavior of the actors, and vice versa, how actor behavior characterizes the emerging network. This interactive construction process has not been examined in such detail in the extant literature. Finally, using the perspectives of dynamic capabilities, organizational-learning theory and an industrial-network approach, we identify the core company-level tasks in each phase of emergence and suggest the type of dynamic organizational capabilities which will allow these to be addressed, with the emphasis on network management capabilities.

As noted in the introduction to this paper, Eisenhardt and Martin (2000) argue that the resource-based view breaks down in a high-velocity context because the competitive advantage gained by a current resource pool becomes unpredictable, and dynamic capabilities are themselves unstable. Based on our analysis we are more hesitant about imposing a clear boundary condition. Although many dynamic capabilities lose part of their relevance, there are signs that firms that have both strong learning and network capabilities are able to learn more quickly and from a larger pool of experience and competence than is available from the strategic nets and partnerships in which they are involved. This means they are able not only to survive change, but also to create it and even influence new path dependence via network

orchestration. In other words, we argue that both learning and network capabilities differentiate firms and nets in their ability to manage and utilize change.

What does our analysis suggest about the “managing networks” dilemma? Firstly, that generic management systems and capabilities for operating and surviving in an emerging network environment do not exist. Our phase analysis suggests that the capabilities required are highly dependent on the specific context, and that the creation of capabilities is highly conditioned by the network positioning of each actor. It appears that deliberation, serendipity, and collective interaction, i.e. creating spontaneous emergence, are all important factors in shaping the emergence of business networks. In spite of this complexity, it is also evident that in an emergent situation, an individual actor who masters the types of network capability we have identified can strongly influence not only its own destiny, but also the emergence process.

REFERENCES

Achrol, Ravi S. and Philip Kotler (1999), "Marketing in the Network Economy," Journal of Marketing, 63 (Special Issue), 146-63.

Amit, Raphael and Christoph Zott (2001), "Value Creation in E-Business," Strategic Management Journal, 22, 493-520.

Anand, Bharat N. and Tarun Khanna (2000), "Do Firms Learn to Create Value? The Case of Alliances," Strategic Management Journal, 21, 295-315.

Argyris, C. (1977), "Double Loop Learning in Organizations," Harvard Business Review, 55 (5), 115-25.

Argyris, C. and D. Schön (1978), Organizational Learning. Reading, MA: Addison-Wesley.

Baghai, M., S. Coley, and D. White (1999), The Alchemy of Growth: Kickstarting and sustaining growth in your company. London: Orion Business Books.

Barabasi, Albert-Laszlo (2002), Linked: The New Science of Networks. Cambridge: Perseus Publishing.

Blomqvist, Kirsimarja (2002), Partnering in the Dynamic Environment: The Role of Trust in Asymmetric Technology Partnership Formation. Lappeenranta: University of Technology.

Boisot, M. H. (1998), Knowledge Assets: Securing Competitive Advantage in the Information Economy. Oxford: Oxford University Press.

Brandenburger, A. M. and B. J. Nalebuff (1996), Co-opetition. New York: Doubleday.

Cohen, W. M. and D. A. Levinthal (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation," Administrative Science Quarterly, 35 (1), 128-52.

Cyert, Richard and James G. March (1992), A Behavioral Theory of the Firm (2nd ed.). Cambridge: Blackwell.

DiMaggio, Paul J. and Walter W. Powell (1991), "Introduction," in The New Institutionalism in Organizational Analysis, Walter W. Powell and Paul J. DiMaggio, Eds. Chicago: University of Chicago Press.

Dosi, Giovanni, Richard R. Nelson, and Sidney G. Winter Eds. (2000), The Nature and Dynamics of Organizational Capabilities. New York: Oxford University Press.

Dougherty, Deborah (1992), "Interpretative Barriers to Successful Product Innovation in Large Firms," Organization Science, 3 (2), 179-202.

Doz, Y., J. Santos, and P. Williamson (2001), From Global to Metanational: How Companies Win in the Knowledge Economy. Boston, MA: Harvard Business School Press.

Dyer, J. H. and H. Singh (2000), "Using Alliance to Build Competitive Advantage in Emerging Technologies," in Wharton on managing emerging technologies, G. S. Day and P. J. H. Schoemaker and R. E. Gunther, Eds. New York: John Wiley & Sons, Inc.

Dyer, Jeffrey H. and Kentaro Nobeoka (2000), "Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case," Strategic Management Journal, 21, 345-67.

Eisenhardt, Kathleen M. and Jeffrey A. Martin (2000), "Dynamic Capabilities: What Are They?," Strategic Management Journal, 21 (10/11), 1105-21.

Fine, C. H. (1998), Clockspeed: winning industry control in the age of temporary advantage. Reading, MA: Perseus Books.

Fiol, Marlene C. and Marjorie A. Lyles (1985), "Organizational Learning," Academy of Management Review, 10 (4), 803-13.

Ford, David and Raymond McDowell (1999), "Managing Business Relationships by Analyzing the Effects and Value of Different Actions," Industrial Marketing Management, 28, 429-42.

Freeman, C. and C. Perez (1988), "Structural crisis of adjustment: business cycles and investment behaviour," in Technical change and economic theory, G. Dosi and C. Freeman and R. Nelson and G. Silverberg and L. Soete, Eds. London: Pinter.

Gadde, Lars-Erik and Håkan Håkansson (2001), Supply network strategies. Chichester: Wiley.

Granovetter, M. (1973), "The Strength of Weak Ties," American Journal of Sociology, 78, 1360-80.

Gulati, Ranjay (1998), "Alliances and Networks," Strategic Management Journal, 19 (4), 293-317.

Halinen, Aino, Asta Salmi, and Virpi Havila (1999), "From Dyadic Change to Changing Business Networks: An Analytical Framework," Journal of Management Studies, 36 (6), 779-94.

Happonen, Harri (2001), Framework for integrating Knowledge and Process Dimensions of a Product Development systems. Tampere: Tampere University of Technology Publications 323, TTKK-Paino.

Hinterhuber, Andreas (2002), "Value Chain Orchestration in Action and the Case of the Global Agrochemical Industry," Long Range Planning, 35 (6), 615-35.

Holmqvist, M. (2003), "A Dynamic Model of Intra- and Interorganizational Learning," Organization Studies, 24 (1), 93-121.

Hung, Shih-Chang (2002), "Mobilising networks to achieve strategic difference," Long Range Planning, 35 (6), 591-613.

Håkansson, H. and A. Waluszewski (2002), Managing Technological Development. IKEA, the environment and technology. London: Routledge.

Håkansson, Håkan and David Ford (2002), "How Should Companies Interact in Business Environments," Journal of Business Research, 55, 133-39.

Håkansson, Håkan, Virpi Havila, and Ann-Charlott Pedersen (1999), "Learning in Networks," Industrial Marketing Management, 28, 443-52.

Håkansson, Håkan and Anders Lundgren (1995), "Industrial Networks and Technological Innovation," in Business Marketing: An Interaction and Network Perspective, Kristian Möller and David Wilson, Eds. London: Kluwer Academic Publishers.

Håkansson, Håkan and Ivan Snehota Eds. (1995), Developing Relationships in Business Networks. London: Routledge.

Jarillo, J. Carlos (1993), Strategic Networks. Creating the Borderless Organization. Great Britain: Butterworth-Heinemann.

Johanson, J. and L.-G. Mattsson (1992), "Network Positions and Strategic Action - An analytical framework," in Industrial Networks: A New View of Reality, B. Axelsson and G. Easton, Eds. London: Routledge.

Jones, Candace, William S. Hesterly, and Stephen P. Borgatti (1997), "A General Theory of Network Governance: Exchange Conditions and Social Mechanism," Academy of Management Review, 22 (4), 911-45.

Kale, Prashant, Jeffrey H. Dyer, and Harbir Singh (2002), "Alliance Capability, Stock Market Response, and Long Term Alliance Success: The Role of the Alliance Function," Strategic Management Journal, 23 (8), 747-67.

Kenis, P. and D. Knoke (2002), "How Organizational Field Networks Shape Interorganizational Tie-Formation Rates," Academy of Management Review, 27 (2), 275-93.

Kogut, Bruce (2000), "The Network as Knowledge: Generative Rules and the Emergence of Structure," Strategic Management Journal, 21, 405-25.

Lambert, D. and M. Cooper (2000), "Issues in supply chain management," Industrial Marketing Management, 29 (1), 65-84.

Levinthal, D. A. and J. March (1993), "The Myopia of Learning," Strategic Management Journal, 14, 95-112.

Levinthal, D. and M. Warglien (1999), "Landscape Design: Designing for Local Actions in Complex Worlds," Organization Science, 10 (3), 342-57.

Lorenzoni, Gianni and Andrea Lipparini (1999), "The Leveraging of Interfirm Relationships as a Distinctive Organizational Capability: A Longitudinal Study," Strategic Management Journal, 20, 317-38.
Lundgren, Anders (1995), Technological Innovation and Network Evolution. London: Routledge.
Lundvall, B. A. Ed. (1992), National Systems of Innovation. London: Pinter.
March, James G. (1991), "Exploration and Exploitation in Organizational Learning," Organization Science, 2 (1), 71-87.
March, James G., Martin Schulz, and Xueguang Zhou (2000), The Dynamics of Rules. Stanford, CA: Stanford University Press.
Means, G. and D. Schneider (2000), Metacapitalism: The e-business revolution and the design of 21st-century companies and markets. New York: Wiley.
Möller, Kristian, Arto Rajala, and Senja Svahn (2002), "Strategic Business Nets - Their Types and Management," in Helsinki School of Economics, Working papers, W-326. Helsinki, Finland: Helsinki School of Economics.
Möller, Kristian and Senja Svahn (2003), "Managing Strategic Nets: A Capability Perspective," Marketing Theory, 3 (2), 201-26.
Möller, Kristian and Senja Svahn (2002), "Role of Knowledge in the Value Creation in Business Nets," in 18th Annual IMP Conference. Dijon, France.
Möller, Kristian and Pekka Törrönen (2003), "Business Suppliers' Value Creation Potential: A Capability-based analysis," Industrial Marketing Management, 32 (2), 109-18.
Nelson, R. (1993), National Innovation Systems: A Comparative Study. New York: Oxford University Press.
Nelson, R. R. and Sidney G. Winter (1982), An Evolutionary Theory of Economic Change. Cambridge, MA: Harvard University Press.
Nonaka, Ikujiro and H. Takeuchi (1995), The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. New York: Oxford University Press.
Normann, Richard (1995). Unpublished seminar material, Helsinki.
Normann, Richard (2001), Reframing Business: When the Map Changes the Landscape. New York: Wiley.
Park, Seung Ho (1996), "Managing an Interorganizational Network: A Framework of the Institutional Mechanism for Network Control," Organization Studies, 17 (5), 795-824.
Parolini, C. (1999), The Value Net. A Tool for Competitive Strategy. Great Britain: John Wiley & Sons Ltd.
Powell, Walter W. (1998), "Learning from Collaboration: Knowledge and Networks in the Biotechnology and Pharmaceutical Industries," California Management Review, 40 (3), 228-340.
Powell, Walter W., Kenneth W. Koput, and Laurel Smith-Doerr (1996), "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology," Administrative Science Quarterly, 41, 116-45.
Ramirez, R. and J. Wallin (2000), Prime Movers - Define Your Business or Have Someone Define it Against You. New York: Wiley.
Scharmer, Klaus Otto (2000), "Organizing Around Not-Yet-Embodied Knowledge," in Knowledge Creation: A Source of Value, G. Von Krogh and I. Nonaka and T. Nishiguchi, Eds. London: MacMillan.
Schumpeter, Joseph A. (1934), The Theory of Economic Development. Cambride: Harvard University Press.
Senge, P. M. (1990), The Fifth Dicipline: The Art and Practice of the Learning Organization. New York: Doubleday.
Seufert, Andreas, Georg von Krogh, and Andrea Back (1999), "Towards Knowledge Networking," Journal of Knowledge Management, 3 (3), 180-90.
Shy, Oz (2001), The Economics of Network Industries. Cambridge: Cambridge University Press.
Slater, S. F. and J. C. Narver (1995), "Market Orientation and the Learning Organization," Journal of Marketing, 59 (July), 63-74.
Spekman, R. E., L. A. Isabella, and T. C. MacAvoy (2000), Alliance Competence: Maximizing the Value of Your Partnerships. New York: John Wiley & Sons.
Spencer, Jennifer W. (2003), "Firms' Knowledge-Sharing Strategies in the Global Innovation System: Empirical Evidence From the Flat Panel Display Industry," Strategic Management Journal, 24 (3), 217-33.
Spender, J.-C. (1989), Industry Recipes - The Nature and Sources of Managerial Judgement. Great Britain: Basil Blackwell.
Spender, J.-C. (1996), "Making knowledge the basis of a dynamic theory of the firm," Strategic Management Journal, 17 (10), 45-52.
Tushman, M. L. and P. Anderson (1990), "Technological Discontinuities and Dominant Designs: a Cyclical Model of Technological Change'," Administrative Science Quarterly, 35, 604-33.
Uzzi, Brian (1997), "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness," Administrative Science Quarterly, 42, 35-67.
Weick, K. (1995), Sensemaking in organizations. Thousand Oaks, CA: Sage.
Wernerfelt, Birger (1984), "A Resource-Based View of the Firm," Strategic Management Journal, 5 (2), 171-80.

Von Krogh, G. and S. Grand (2000), "Justification in Knowledge Creation," in Knowledge Creation: A Source of Value, G. Von Krogh and I. Nonaka and T. Nishiguchi, Eds. London: McMillan.
Zahra, Shaker A. and Gerard George (2002), "Absorptive Capacity: A Review, Reconceptualization, and Extension," Academy of Management Review, 27 (2), 185-203.
Zollo, Maurizio and Sidney G. Winter (2002), "Deliberate Learning and the Evolution of Dynamic Capabilities," Organization Science, 13 (3), 339-51.