Role of Knowledge in the Value Creation in Business Nets

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Introduction

Strategic, purposefully developed business nets are becoming an increasingly important way of producing economic value. This paper examines the role of knowledge and learning in the value production of different types of strategic business nets. We aim to show that the issues involved in the value creation differ widely between three ideal types of nets – mature and stable nets, local and incremental development nets, radical, new value creating nets. A conceptual analysis of the types of knowledge and learning required in each net type is provided, forming the key contribution of the paper.

Knowledge creation is examined from the perspectives of interorganizational networks, resources, knowledge and learning in a network context, and dynamic capabilities. Dynamic capabilities are the capabilities by which firms integrate, build and reconfigure internal and external resources and competencies and they are seen to be a response to the rapidly changing environment (Eisenhardt and Martin 2000). According to the network perspective actors develop network relationships in order to utilize each others' resources and capabilities (Håkansson and Snehota 1995). Knowledge and learning can be shown to play a crucial role in this process requiring mutual adaptation and co-creation of knowledge (Araujo 1998, Dyer and Nobeoka 2000, Håkansson 1993, Håkansson et al. 1999). Strategic business nets refer to intentionally developed coalitions of more than two actors pursuing at least partly shared goals (Amit and Zott 2001, Möller, Rajala and Svahn 2002).

Three major literatures will be utilized. The industrial network theory, advanced by the IMP Group (Ford 2001, Håkansson and Snehota 1995), articulating the general characteristics of industrial networks and network relationships; emerging theory of strategic value-nets, emphasizing the management of intentional nets and the dynamic capabilities required (Amit and Zott 2001, Dyer and Nobeoka 2000, Eisenhardt and Martin 2000, Gulati 1998); and the notions on the creation and management of knowledge embodied in the knowledge management literature (Kogut and Zander 1996, Nonaka and Takeuchi 1995, Nonaka and Teece 2001, von Krogh et al., 2000).

We first present a value-system continuum for identifying different types of strategic nets and for discussing the nature of value creation in the three types to be postulated. Then the nature of learning and knowledge creation in a network context is discussed in general terms. This involves issues like the types and role of learning in a network context, and the key characteristics of knowledge and their consequences for net management. This paves the way

for the third section, "Role of Knowledge and Learning in Strategic Business Nets, where we examine the different modes and roles of knowledge and learning in three strategic nets and identify the conditions and capabilities leading to high performance in each net type. This forms the major section of the paper. A discussion of theoretical and managerial implications concludes the paper.

Value creation in business nets

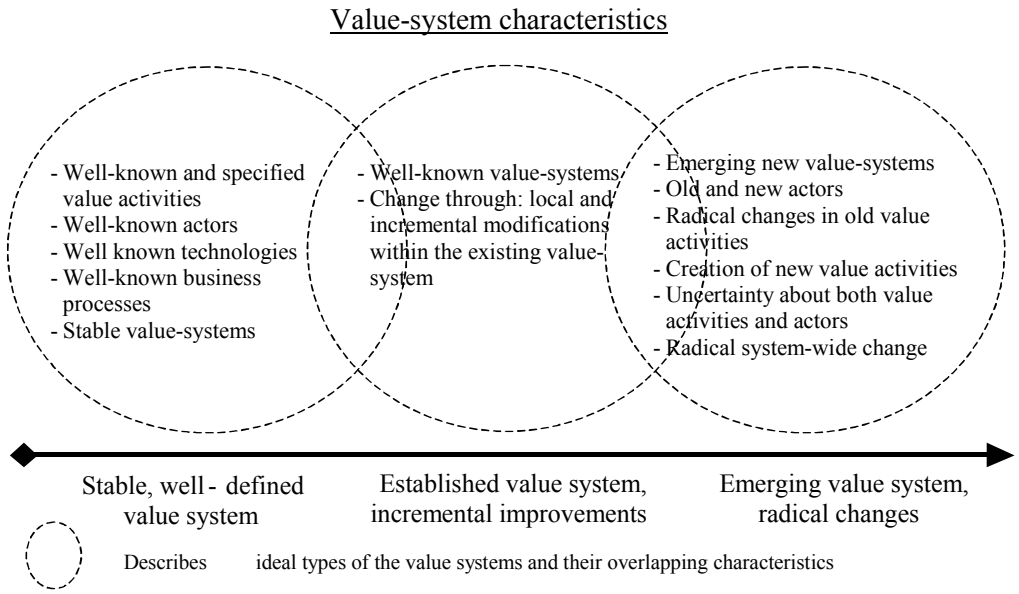
In order to understand the role of knowledge and the nature of knowledge creation in different types of nets – supplier nets, distribution nets, R&D nets, competitive coalitions such as the airline alliances, and technology-coalition nets - we need a systematic description of their characteristics. Essential to any strategic net is the underlying system through which it produces value. This value-system construct is based on the notion that each product/service requires a set of value activities performed by a number of actors forming a value-creating system, using Parolini's term (1999, p. 59-68). Value creation spans firm and industry boundaries (Amit and Zott, 2001), and can be encapsulated in the value system. Another aspect is that value creation is fundamentally based on the knowledge of the actors and on how they combine this knowledge (Håkanson 1993). Value system is not a new concept, and has been given different shades of meaning by authors such as Håkansson and Snehota (1995), Normann and Ramirez (1993), Parolini (1999), Porter (1985), and Richardson (1972).

We adopt the value system concept for describing the characteristics of business nets and contend that the level of determination of value system influences greatly knowledge and value creation in the net. With determination we refer to the how well-known are the value activities of the net and the capabilities of the actors to carry them out, and to what extent can these value activities be explicitly specified. The value creation is illustrated with a value system continuum (Figure 1) that presents three ideal types of value systems.

The left end describes clearly specified and relatively stable value systems. The actors producing and delivering specific products, and their value activities and capabilities, are basically known. The multi-tiered supply systems in the automobile industry provide a typical illustration (Dyer, 1996). Toyota, Dell, IKEA and Nike illustrate well-specified supplier or distribution solutions based on strategic nets that, we suggest, generally pursue efficiency gains in terms of production/logistics and time compression, rapid growth opportunity, and

access to a wider customer base. In terms of knowledge the capability to exploit current actor competencies through effective knowledge transformation and sharing is expected to be essential (Dyer and Nobeoka 2000, Levinthal and March 1993, March 1991).

The right end of the continuum describes emerging value systems aimed at developing new technologies, products or business concepts. These future-oriented systems may require radical changes in the existing value systems and in the creation of new value activities. This is the landscape that Eisenhardt and Martin (2000) describe as "high velocity markets". For example, Internet portals and emerging mobile services are generally created through strategic nets involving a telecom operator, several "middleware-type" software producers, and content/services producers. Emerging value systems involve complex collaborative learning processes (e.g., the Bluetooth coalition). Uncertainty related to value activities and to actors and their capabilities is an inherent feature. Nets creating emerging value systems pursue technology and business solutions that are pronouncedly more effective than the existing ones.



Note: Large corporations are hubs and participants in all kinds of nets

Figure 1. Value system continuum (Source: Möller, Rajala, Svahn 2002)

From the perspective of knowledge creation and sharing the challenges faced by the actors in emerging value systems are pronouncedly different to the stable value systems. The sense making of the emerging opportunities (Weick 1995) and the co-creation of knowledge

through exploration (March 1991) dominates over the issues of transferring existing explicit knowledge.

The middle of the continuum describes value systems that are relatively well determined, but that are being modified through incremental and local change processes. Most multi-actor R&D projects, as well as business-process modifications, exemplify these kinds of changes. From the knowledge perspective the local development nets require a balanced position between knowledge exploitation and exploration. Capability to bridge different communities of practise – experts of various technologies, software developers, business managers – is essential in creating new specialized knowledge (Araujo 1998, Dyer and Nobeoka 2000, Tuomi 1999).

It should be noted that the value system continuum is an abstract and static theoretical construct. In reality, we will never find ideal value systems. Many strategic nets, i.e. their value systems, "stretch" across at least two ideal types. Nets may be interrelated through actors having roles in several; and most large corporations have roles in several nets across the continuum. Finally, the "content" of the continuum, the strategic nets and their underlying value systems, is in constant evolution. Once nets creating innovative services such as e- and m-banking are specified, they "move" towards the left end of the continuum.

Based on this discussion we suggest that the issues faced in the knowledge creation in strategic nets are profoundly influenced by their underlying value-systems. That is, the challenges of "knowledge management" are remarkably different across the continuum. This proposition is elaborated in the next section.

Nature of learning and knowledge in network context

Knowledge creation in business networks has attracted growing attention since the late 1990's. Organizational learning, knowledge (or capabilities) based-view of the firm, Industrial Network Theory (INT), and value creating strategic nets approach have all addressed this phenomenon. We begin by discussing briefly the knowledge character of business networks in general terms and continue by exploring more deeply properties of learning and knowledge. This discussion forms the basis for analysing knowledge creation in different types of strategic nets, the theme of the next section.

Networks, resources and learning

According to the Industrial Network Theory (INT) a fundamental characteristic of actors and resources is their heterogeneity. This means, as Håkansson (1993) referring to Alchian and Demsetz (1972) and Pasinetti (1981), points out, that the value of resources is dependent on how they are combined which puts emphasis on the knowledge of resources and on learning involving the use existing resources, their modification, and creation of new. If actors want to combine their resources and competencies, in order to better utilize their own or joint resources, they have to make adaptations requiring mutual learning.

The increased specialization in many industries is a reflection of resource heterogeneity. Specialization, as Håkansson (1993) notes, increases the heterogeneity further and expands the potential of using the specialized resources and knowledge from other actors. Often this requires learning. Learning can be achieved in three different ways (Håkansson 1993, p. 215, see also Levinthal and March 1993). First, through the actor's own experimentation, i.e, learning by doing. This mode is delimited by the knowledge base and resource pool of the actor. Second, through using other actors' knowledge as embodied in their products or services or accepting their advice of how to utilize these resources. This mode provides the user only a partial knowledge about the use and potential of the resources in question. Third, learning can be achieved by collaborative or joint learning with one or more actors. Joint learning mode presumes an interaction process where the actors learn to utilize each other's resources and capabilities (knowledge). Joint learning can also result in creation of new resources.

It is easy to see that all modes of learning are generally necessary for any organization. We suggest, however, that the learning skills required for a successful conduct differ across the value system continuum. For example, in a macro network of dispersed and highly specialized actors – not unlike the ICT sector – an efficient use of resources calls for not only mutual or dyadic but also collective learning with several actors.

Types of Learning and Knowledge

In order to deepen our analysis of "knowledge management" in strategic nets we need more refined concepts for describing the value-production in knowledge terms. First, it is relevant to make a distinction – introduced briefly in the second section - between the utilization, or exploitation of current knowledge held by the net actors, and the joint creation of new knowledge, or exploration, between actors (March 1991). A closely related notion is the distinction between search and discovery (Kirzner 1992 in Håkansson 1993). Search refers to

looking for something that is already identified as relevant, whereas discovery is trying to find something that is unexpected and generally involves exploring. Search and exploitation are captured by the adaptive or single-loop learning representing an actor's incremental transformation of his resource base, while exploration and discovery can be seen as part of the generative or double-loop learning perspective expanding the way an organization learns and creates new knowledge. In adaptive learning the actor utilizes his existing cognitive framework or recipe of the business and network actors. Generative learning presumes that the actor can critically examine this frame and not only create radically new knowledge but reconstruct the business recipe (Argyris 1977, Argyris and Schön 1978, Senge 1990, Slater and Narver 1995, Spender 1989, 1996).

The above remarks concerned the process of learning. We also need tools for describing the nature of knowledge in a network context. Most scholars, as Dyer and Nobeoka (2000) note, divide knowledge into explicit/codifiable knowledge or information, and tacit knowledge or know-how (Grant 1996, Kogut and Zander 1992, Nonaka 1994, Polanyi 1966). Information is seen as easily codifiable knowledge that can be shared between actors presuming that the "syntactical rules required for deciphering it are known" (Kogut and Zander 1992, 386). By comparison know-how involves knowledge that is tacit, 'sticky', and difficult to codify and transfer (Nelson and Winter 1982). Because of these properties know-how is more likely to result in sustainable advantages (Dyer and Nobeoka 2000, Nonaka and Takeuchi 1995). Recently Ambrosini and Bowman (2001), arguing that tacitness should not be regarded as a dichotomy, have proposed four degrees of tacitness, deeply integrated tacit skills, skills that can be imperfectly articulated, skills that can be articulated, and explicit skills.

Another aspect of knowledge is its level of embeddedness, is knowledge hold by an individual, group, organization or a net of actors (Kogut and Zander 1997). This is influenced by the extensiveness and complexity of knowledge, i.e. does the knowledge concern the carrying out of a single activity or a related set of activities forming such functional domains of knowledge as "new product development, key account management", or does it involve the combination of knowledge from two or more actors, like in multiparty R&D projects or in managing the airline alliances. The social character of knowledge and learning is underlined by the communities of practise perspective that binds the social process of using and creating knowledge with the institutional contexts. A community of practice is a group of individuals who share common conventions and knowledge about an activity system. This joint

knowledge base facilitates sharing of partly tacit knowledge and creation of new knowledge claims (Happonen 2001, Lave and Wenger 1993, Schön 1987).

By embracing specified professional languages communities of practice, however, also create barriers for knowledge sharing between different communities and functional groups. The intergroup communication has been identified as a key problem in transfering technologies from research groups to manufacturing and marketing within large organizations (Dougherty 1992). This barrier can be expected to be intensified in network relationships due to different organizational cultures involved. Bridging these specialization barriers generally takes place through boundary spanners, individuals sharing enough of the various knowledge bases to enable them to provide inter-community sensemaking (Kogut and Zander 1997, Tushman 1977).

Nonaka's and Takeuchi's SECI-model (1995), presented in Figure 2, can be used to conclude our discussion on the types of learning and characteristics of knowledge.

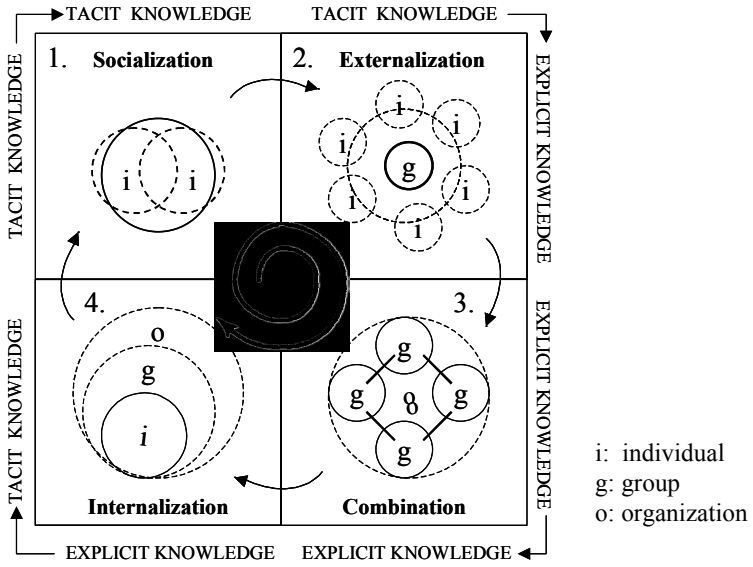


Figure 2. Knowledge creation process. Source: Nonaka and Takeuchi (1995)

According to the SECI-model creation of tacit knowledge always takes place at individual level through carrying out activities together and it can be only shared through socialization. In this process an individual's tacit knowledge is interpreted and shared by other individuals that may start to form a community of practice. By explicating their working habits and internalized knowledge individuals can share their skills and knowledge. For a discussion of the individual as an agent in organizational learning, see Friedman (2002). In externalization

phase tacit knowledge is explicated to a peer group, which, by sharing a knowledge base and language, can engage in more efficient knowledge creation through adaptive learning. When knowledge can be conceptualized, it can be transferred to other functional groups within an organization as well as across organizations. In this combination phase knowledge can be collected and combined and thus modified into more complex knowledge constructs called systemic knowledge presuming that the actors posses necessary absorptive capacity or knowledge base (Cohen and Levithal 1990). These knowledge systems are then manifested in the products/services or processes. The application of systemic knowledge involves internalization, however, meaning that the recipient communities of practice or organizations reinterpret knowledge through their own theories-in-use and the work practices they apply the knowledge for. Through this individual and social use of knowledge parts of it are again retransformed to the tacit form as practices and actions.

Understanding the characteristics of knowledge and the metamorphosis of knowledge from tacit to explicit and back to tacit through individual, social and organizational processes is essential for understanding the fundamental role that knowledge has in the value creating business nets.

Role of Knowledge and Learning in Strategic Business Nets

We discuss the role of knowledge and learning in different business nets by using the three value-system ideal types introduced in Figure 1. There are several reasons to expect that the role of knowledge and the capabilities required in knowledge creation will differ greatly between strategic nets located in different parts of the continuum. First, dynamics of value-systems vary from stable to highly dynamic across the value system continuum influencing both the type of available knowledge and the learning environment of the actors. Second, the availability of specified or coded knowledge is assumed to differ being highest at the left end and changing more towards tacit or unarticulated and uncertain knowledge in the emergence part of the continuum. Third, the goals of the nets are expected to differ in the three parts of the continuum. Whether a net is pursuing greater systemic efficiency or tries to create radically new technology or business system puts emphasis on different types of knowledge and requires distinct knowledge creation solutions. Next we examine the learning capabilities required in the strategic nets located in the three parts of the value system continuum in detail.

Integrated Demand/Supply Nets

Hierarchical, multitier supply and distribution nets developed in the auto industry and widely employed in assembly type industries (PCs, consumer and business electronics, consumer durables, furniture business, etc., Dyer 1996, Gadde and Håkansson 2001) are typical examples of the well specified, relatively stable nets located at the left part of the value system continuum. Currently companies like Cisco, Dell, Nike, and Nokia are expanding these value nets into "end-to-end demand-supply nets or DSNs" covering all the value activities needed in producing value for the end customer (Hoover et al., 2001, Lambert and Cooper 2000). These arrangements generally involve a strong hub company, a set of first tier suppliers responsible for specific major components of the end product or system, and different types of channel members (e-channels, value-adding resellers, franchising chains, etc.), and major corporations as end customers.

There are several knowledge-related characteristics in this kind of strategic nets that influence their development and management. The end product or system that the net produces must be decomposable into smaller subunits requiring specialized resources and value activities from the actors. In spite of the high level of specialization – enabling the actors to reach efficiency gains – the knowledge of the components and value activities is should be relatively codifiable, facilitating its sharing among the members of the net. The level of specialization and the codifiability of resource specifications are dependent on the inherent characteristics of the technologies involved and on the evolution history of the field and the specific net. Highly integrated demand-supply nets can be constructed only when the underlying value-system has reached a prominent level of codiafiability, transparency, and stability.

What kind of capabilities are paramount in these strategic nets pursuing high system efficiency in terms of "lean manufacturing" (lowering costs, shortening lead-time) and "production on demand" (lowering inventories, matching demand and production) The specialized components must be integrated and their production schedules and logistics must be coordinated. A prerequisite is that the hub can mobilize a set of actors willing to form a tightly coordinated supply and channel net. Mobilization involves motivating self-interested actors to participate and share valuable knowledge with others, especially with the integrating actors (Dyer and Nobeoka 2000, Wood and Gray 1991). A hub company must have a well-established position in the field, providing sound end-customer demand reflected in strong brands as exemplified by Nike and Dell. A strong demand position is essential in convincing important first-tier component vendors and integrated manufacturers that they can benefit

from a closer value net in terms of larger volumes and more stability. The stronger the position of the hub firm, the more selective it can be in choosing the net actors.

The resource integration capability requires systemic type knowledge of the architecture of the value activities underlying the net. Achieving of this in complex vertical nets involving several technological platforms, the intimate knowledge of which is dispersed among different actors at different levels of the net, can be very demanding and costly or even impossible. The solution lies in the multi-tiered structure of the net; there are several integrating and coordinating actors that posses the necessary knowledge base for understanding and coordinating their "value sectors or segments" of the value system. This kind of actors – like Intel or Cisco - form the key nodes in the net as they form and hold the theories-in-use or recipes of their value-segments (Spender 1989). Value-segments are constituted by communities of practice, which are close enough to share and develop knowledge about their value activities. Nishigushi and Beaudet (2000) call these "self-organizing" links in the automotive supply chain context; the issue is of a set of interlinked net organizations orchestrated by guiding recipes provided first by the hub firm to the first-tier integrators, which then disseminate these and their own recipes to their suppliers, etc.

Through this kind of distributed coordination the hub firm can synchronize several complex resource domains involving highly embedded tacit knowledge. Successful coordination presumes, however, that all key actors are motivated and capable of learning the recipes. This learning is facilitated by value activity "segmentation". Second, the hub firm must be able to establish an information system that makes the key product and information flows unified and transparent – "one set of numbers/codes". An information and management system should combine the business processes of each integrator-actor and monitor the efficiency of production, logistics, and customer delivery and service. 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 the combination of tools of Supply Chain Management, Enterprise Resource Planning, and Customer Relationship Management (see e.g., Means and Schneider 2000, Lambert and Cooper 2000). A hub organization's efficiency 'dream' is an "plug and play" system where the value-system of the net is so well specified that new product models can be introduced with minimum learning investments and time delays, and poorly performing members smoothly replaced with newcomers.

Previous discussion has focused on the knowledge requirements of the establishment of integrated demand-supply value nets. We conclude by examining the risks and development

potential contained in this kind of nets. By targeting high value-system wide efficiency a hub company runs a risk of turning a net into a hierarchy. Håkansson and Ford (1999) discuss this tendency as one of their three network paradoxes "…the more a company achieves this ambition of control (over other actors), the less effective and innovative will the network be." The point is that in the long run a tightly controlled net is as intelligent and innovative as the controlling company, the hub firm. By unifying the behavior and channeling the resources of the net the hub reduces the very variety and specialization that originally constituted the source of competitive strength for the integrated net. In learning terms continuous emphasis on exploitation destroys the potential for exploration and generative learning. The key issue is how to find a balance between current system efficiency requiring integration and coordination, and innovativeness demanding more autonomy and resources for exploration, and the fostering of variety in the net general. This question is addressed by examining the knowledge creation in the remaining two strategic net types.

Established Value Nets – Incremental Knowledge Creation

The value systems in the middle of our value continuum are relatively well determined, but they are being purposefully modified through incremental and local change processes. Most multi-actor R&D projects, as well as business-process modifications, exemplify nets sharing these characteristics. Also temporal multi-actor business projects, typical in construction industry and in project business involving the establishment of major plants and information systems resemble this category. From the knowledge perspective the local development nets require a balanced position between knowledge exploitation and exploration.

An essential aspect is the existence of specialized knowledge hold by each actor's specific community of practice. This spreading of special, partly tacit knowledge, mostly embedded in people and routines, puts emphasis on the capability to bridge different communities of practise. Bridging is essential in creating new specialized knowledge resulting in product and process improvements, customer service systems, etc. (Dyer and Nobeoka 2000). Bridging requires an ability to cross the professional language and cultural barriers embraced by, for instance, experts of product and process technologies, software developers, marketing and business managers (Blomqvist 2002, Dougherty 1992, Happonen 2001).

Being able to understand specialized knowledge domains requires a sphere of jointly held knowledge that provides the persons representing different communities of practice a base through which to start mutual learning and combining of their specialized knowledge constructs. In Nonaka's SECI-model (Figure 2) this is described as the externalization of

knowledge from tacit to explicit taking place in a peer-to-peer setting. A minimum level of trust, as pointed out by Dyer and Nobeoka (2000), is essential for the interpersonal sharing of knowledge. Similarly these authors regard the creation of group or collective identity vital for joint learning and knowledge creation within multi-actor teams.

The emphasis on trust and collective identity of actors is an obvious challenge for the hub firm. A partnering orientation and personnel who have, besides functional expertise, the strong interaction skills required in multiparty and cross-functional teams are required. Actors must share privileged organizational knowledge and be able to view value activities and changes in them from each other's perspectives. The role of boundary persons is expected to be crucial in this process. They should be able to bridge at least two communities of practice by having a sufficient knowledge base and understanding of the cultures.

An important aspect facilitating the development of net identity, trust and collective learning in multi-actor groups is their stability (Von Hippel 1988, Kogut et al., 1993). By working together the team members coming from different communities learn to explicate and share their knowledge and combine it into new knowledge constructs, solutions, and routines. This process supports trust and group identity that enforce further collective learning leading to modified recipes or theories-in-use of the value-systems. Recipes reduce the tacitness of new routines and thereby facilitate their teaching to new personnel. Stability is, however, more and more challenged in rapidly developing environments where the change in firms' organizational structures, units, and their personnel is an everyday reality (Blackler and McDonald 2000, Blomqvist 2002).

Shifting organizational boundaries and change of key personnel generate further demands for learning in strategic nets. In order to overcome the problems caused by constant fluctuation the net actors should develop a strong collaborative culture, joint identity, and team-orientation with support routines. This kind of culture and infrastructure would facilitate the rapid socialization of new members into decentralized multi-functional teams necessary for joint knowledge creation in the important value-nodes of the strategic net.

Our discussion has primarily taken the hub firm perspective and focused on the process of joint knowledge creation. An important question is how to motivate autonomous net actors to actively propose such development projects that benefit not only the specific actor but the net as a whole; obviously the intra-actor development also benefits the net through the improved efficiency or effectiveness of the single actor. Without members' initiatives much of the learning potential of the net depends on the hub firm's more restricted knowledge base, leading to the "hierarchy trap" described at the end of the previous section.

Again, managers face a balancing dilemma. A tightly coupled net with strong unifying culture and actor bonds can be very efficient in development projects exploiting directly the current knowledge bases of net members. Without enough autonomy and space, time and resources for exploration tightly coupled systems tend, however to loose their innovativeness in the long-run (Levinthal and March 1993, Weick 1995). A challenging solution is to develop such net organizations where the established value-systems are tightly coordinated achieving high operational efficiency and yet critically examined and remodeled through local but multilateral learning activities. In terms of our value-system continuum (Figure 1) this means combining the properties of the stable value-systems with the incremental local improvements.

In order to foster the required proactive knowledge creation behavior the hub firm must establish such benefits and risks sharing norms that are perceived fair and equitable by the net members. Joint knowledge creation cannot be forced but requires openness, trust and a group identity. A further bottleneck in the realization of the knowledge creation potential in the net is the availability of spanning persons. Spanning persons are essential as team and project leaders in multifunctional and multi-actor context. Besides mastering to a certain level the specialized knowledge domains involved they should have social interaction skills, project management skills, and be able to perform in multiorganizational and dynamic settings. As these partly innate and partly learned skills are both rare and valuable great care should be taken to cultivate and nurture them thorough careful recruitment and human resource management.

Emerging Value-Nets – Creation of New Knowledge and Radical Innovations

The value systems in the right end of our value continuum (Figure 1) are in varying stage of emergence. Actors aiming to develop new technologies, products or business concepts are creating these systems. They are future-oriented in the sense that the economic value potential of this kind of nets is generally fully realized only in the future. The Bluetooth coalition, and other nets competing over the introduction of mobile services are good examples. Emerging value nets involve complex collaborative learning processes. Uncertainty and ambiguity related to value activities and to actors and their capabilities are inherent features of this landscape, exemplified by the converging information, communication, and e-content fields.

From the perspective of learning and knowledge emerging value systems contain several new challenges for the development of strategic nets. An essential aspect is the tacit and dispersed character of ideas in the emerging system. Ideas refer to beliefs about how new

knowledge structures can be utilized. Ideas are often fuzzy, that is, there is ambiguity about the possible cause and effect relationships between existing knowledge and the emergent knowledge. Vague or fuzzy ideas do not yet contain a clear heuristic how to pursue the idea. Ideas can also be uncertainly held - the holder of an idea cannot articulate its roots or logic but feels that the idea captures something important of the emerging reality. Scharmer (2000, Von Krogh et al., 2000) discusses this kind of knowledge, ideas, and views it as "not-yet-embodied" tacit knowledge, based simultaneously on the inner experience and interpretation of the actor and on the perceived "outer" reality. It is a reflection or idea about "not-yet-enacted reality."

Another relevant aspect of emerging complex value systems is the wide dispersion of ideas and knowledge about the rising technological knowledge and the related value activities. Actors exploring new technologies advancing novel business ideas generally come from several different fields. The creation of new mobile Internet-based banking services, for example, involves the expertise of the Internet-related software solutions, Internet-related wired-technology, mobile-terminals, mobility software, radio-technology, secure-over-net payment technology, financial services, and data-base management. Each actor has a specific view of emerging opportunities based on her specialization and particular technology base. As specialization leads to a narrow view actors have difficulties in developing a wide or systemic perspective on the emergence and its opportunities. It is paradoxical that this specialization tendency, driven by the seeking of current value-system efficiency, leads into fragmented knowledge making the formation of system-wide visions ever harder. On the other hand, by increasing the variety of knowledge within the macro network this tendency supports the potential for the creation of radically new knowledge.

How should a firm wanting to be in the forefront of capitalizing the opportunities offered by various emerging technologies behave? In more precise terms, how to create such learning and "knowledge management" solutions that match the complex and uncertain character of emerging value-systems?

Two key issues are how to recognize the dispersed and vague ideas in the first place, and then how to be able to make sense of them. It seems that actors who are located in the nodes connecting multiple actors, which are creating different types of new knowledge, have better chances of recognizing emerging technological and business opportunities than highly specialized actors (Håkansson et al; 1999, Kogut 2000, Powell et al., 1996). Also major corporations being involved in several interlinked but different strategic nets have this increased exposure to emerging ideas from other actors. Proactive incumbent corporations

have also deliberately increased their exposure to and exploring potential of emerging technologies by acquiring tens or even hundreds of small technology firms. This is a very costly way of increasing the variety and richness of one's learning environment. Similar results can sometimes be achieved by having an extensive alliance net, including R&D projects with interesting SMEs (Blomqvist 2002, Dyer and Singh 2000).

The utilisation of exposure is not unproblematic, however. It requires knowledge of the actors influencing the network evolution, and competence in interpreting their views and orientation. The recognition of new ideas or the potential in new or even existing knowledge presumes a capability of making sense of it. That entails a capacity to learn or an absorptive capacity, as Cohen and Levinthal (1990) called it, depending on the knowledge base of an organization, the learning skills of its boundary spanning personnel and their motivation for discovery type of search behavior.

Actors holding a node position in a net can be expected to have better absorptive or sense making capacity as they must have developed learning and communication capabilities in order to exploit the different types of knowledge of their net partners. This potential is conditioned by the node actor's learning goal, however. Actors pursuing incremental modifications of the current value-system involving strong single-loop or adaptive learning capability are not so perceptive to new ideas as actors consciously aiming at critically examining the current value-system, identifying new ideas, and creating new knowledge themselves.

Most large corporations have been trying to develop this kind of generative or double-loop learning capability. Envisaging an emerging business field, which may be very complex like the convergence of the ICT field suggests, its future key actors and potential trajectories is very demanding, however. Being involved in different parts of the emerging value system enhances this managerial sense making, as it introduces several learning experiences and multiple perspectives. In today's decentralized corporations these experiences are often dispersed globally in different companies and business units where the local boundary spanners have the best opportunities to observe and participate in the creation of new knowledge and value-activities. The decisive problem in a corporation context is how to collect and integrate these fragmented ideas and partial visions. Integration presumes, besides a good information system, the use of not only cross-functional but cross-business unit teams and an open culture conductive for exploration. Even extensive resources do not guarantee this capability, as 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. If the new interpretations made locally in a corporation, or proposed from other net members, are contradictory to the dominant logic of the corporation they will not be accepted or acted upon. This finding emphasizes the crucial role of corporate culture for fostering generative learning.

The previous points handled the barriers in recognizing and sense making of radically new technological and business ideas. Next issue is how to actively participate and influence the creation of new business or technology nets. Two aspects seem crucial, the attractiveness of the vision or direction that an actor can offer, and the relative importance of the knowledge and resources that it controls for the other potential members of the future strategic net.

In emerging value-systems actors are facing great uncertainty of the relative value of emerging new knowledge, for example which technological modes like UMTS, CDMA, PDC in the third generation mobile telephones will become dominant designs in which markets (Tushman and Anderson 1990). There is also ambiguity on which actors master what kind of knowledge and value activities. An ability to develop a systemic view of the emerging field with its different types of actors and envision promising new business concepts is valuable as it reduces the perceived uncertainty and provides direction for action. Vision is, however, not enough, the development of a new strategic net requires a strong position in the field.

An impending hub-firm should have specific resources and knowledge that make it an attractive mobilizer for potential partners. A mobilizer should be able to develop and communicate an agenda for influencing the field to a preferred direction. Agenda setting involves communicating one's beliefs and visions and providing direction by suggesting a business model for the potential actors of the new net. The hub firm must be able to create an organizational forum for sharing the work and responsibilities between the actors, to establish coordination mechanisms for net cooperation, and to instil a network identity (Dyer and Nobeoka 2000, Gadde and Håkansson 2001). The role requires visioning, communication and persuasive skills, coupled with the credibility that can only be achieved through thorough understanding of the field and a strong business position. Net management requires an organization-wide network-player orientation, with the key personnel sharing and supporting the achievement of joint goals. In an environment characterized by strong dynamics a mobilizer should also be able to make rapid decisions and take and promote action. Envisioned "windows" of opportunity tend to be closed quickly by other actors.

Conclusions

Only a few major conclusions will be made due to the space limitations. Based on our conceptual analysis we contend that role of both learning and knowledge differs greatly in strategic nets that are characterized by different types of value-systems and are pursuing different goals. Main findings are summarized and briefly discussed.

Integrated Demand/Supply Nets

- Highly integrated demand-supply nets can be constructed only when the underlying value-system has reached a prominent level of codiafiability, transparency, and stability.
- The resource integration capability requires systemic type knowledge of the architecture of the value activities underlying the net.
- In complex and "deep" vertical value nets system integration involves several integrating and coordinating actors specialized on their "value sector/segments".
- This "self-organizing" is orchestrated by guiding recipes from the hub firm to the first-tier integrators, which disseminate these and their own recipes to their suppliers, etc.
- By aiming at high value-system wide efficiency a strong hub risks turning a net into a hierarchy. By unifying the behavior and channelling the resources of the net the hub reduces the very variety and specialization that originally constituted the source of competitive strength for the integrated net. In learning terms continuous emphasis on exploitation destroys the potential for exploration.

Established Value Nets – Incremental Local Knowledge Creation

- A key aspect is the specialized knowledge of each actor's community of practice. This spreading of special, partly tacit knowledge, mostly embedded in people and routines, emphasizes the capability to bridge different communities of practise.
- Bridging requires an ability to cross the professional language and cultural barriers embraced by each community of practice.
- Trust is essential for the interpersonal sharing of knowledge; the creation of collective identity is vital for joint learning and knowledge creation within multi-actor teams.
- The role of boundary persons is expected to be crucial in the bridging process. They should have a sufficient knowledge base, understanding of the sub-cultures, and strong interaction skills.
- Shifting organizational boundaries and key personnel obstruct learning in strategic nets. To overcome the problems of constant fluctuation the net actors should develop a strong collaborative culture, joint identity, and team-orientation with support routines.
- Spanning persons are essential as team and project leaders in multifunctional and multi-actor context. Great care should be taken to cultivate and nurture them thorough careful recruitment and human resource management.

Emerging Value-Nets – Creation of New Knowledge and Radical Innovations

- An essential aspect is the tacit and dispersed character of ideas about the new emerging knowledge structures and their utilization. Ideas are often fuzzy and uncertainly held.
- Ideas are widely dispersed and have a specific character, each actor views the emergence from her specialized knowledge and experience perspective.
- Recognition and interpretation of new ideas and knowledge is problematic; creating a systemic vision of the emergence is vital for creating a new value net.
- Position in the nodes or participation in several nets provides exposure for new ideas and increases both the envisioning potential and absorptive capacity.
- Unless a firm has an open generative learning culture new ideas do not become justified and are rejected.
- An impending integrator role demands strong visioning capability, attractive resources, and a strong network position providing credibility.

When comparing the learning skills and capabilities required in our three ideal strategic nets the fundamental driver of their differences seem to be the varying character of knowledge in their underlying value systems. This ontological dissimilarity is obvious between the well-established and emerging value systems. In the first, knowledge is primarily codifiable and firmly held whereas in the latter it is tacit – or even pre-tacit - widely dispersed, vague and uncertain. The incremental knowledge creation, the middle position, shares aspects of both extremes, the key issue is the invention of new modifications out of existing, partly codified and partly tacit, knowledge bases.

These ontological distinctions form the epistemic conditions that actors have to be able to master in their learning and knowledge exploitation. Strategic nets based on well-known value systems try to bring the total system efficiency into perfection through coordinated adaptive learning, where the challenge lies in the integration and coordination of wider and wider value-systems through central orchestration. The incremental innovation nets need a more generative oriented culture and learning capabilities, where the key is the bridging the boundaries of communities of practise, making them work together, and explicating the resulting local innovations to the benefit of the larger net. In the emerging value nets an actor trying to become a net coordinator needs an open, innovation oriented culture and a generative learning tradition. Having a network node position and being active in several nets increases an actor's exposure to emerging new ideas. These ideas should then be processed into a systemic vision of the emerging new business opportunities, requiring synthesizing skills.

In our analysis and discussion we have examined the three ideal type strategic nets separately. In reality ideal types are very rare, however. Most large companies are operating

in different types of nets that generally span over at least two of our ideal types. Nets are also nested through actors having positions in several of them, that is, the value-systems and activities of several nets pursuing separate goals are interrelated. From the knowledge and learning perspective this realistic complexity poses even greater managerial challenges and a departure for further research.

For firms holding core positions in established business fields an essential advantage can be derived from a capability combining the centralized coordination competence of multi-tiered value nets and the continuous incremental development competence of the value systems involved. A balanced mastering of the codified and tacit knowledge, their exploitation and incremental creation is needed. This sounds simple but is demanding in reality as the case of IBM not being able to envision the changes in the PC industry value system teaches us.

A core question is whether the different epistemological demands of the identified two learning and knowledge management types can be handled through one organizational solution or do they require separate solutions matching the specific requirements of each. Dyer's and Nobeoka's (2000) study on Toyota's supplier network suggests that within the same strategic net different but interrelated organizational solutions are needed for managing the knowledge sharing of explicit knowledge and the sharing of tacit knowledge embedded in diverse communities of practice. There were differences also between the initiation and the mature phase of the Toyota-net. In the creation phase more directions or recipes with explicit knowledge from the hub were required; when the net matured its management involved a balance between hierarchical recipes and locally created incremental innovations containing both explicit and tacit knowledge. These results provide early ideas of the mechanisms and organizational solutions needed in constructing highly efficient value nets that are yet capable of incremental adaptation through local learning.

Even more demanding learning conditions are faced in the domain of emerging value nets creating radically new knowledge. It seems evident that organizations and strategic nets geared to maximize the efficiency of established value systems cannot be radically innovative. Further, they tend to have great difficulties in adapting to radical change as such industrial histories as the inability of the Swiss watch industry to respond to the digitalisation of technology, and the slowness of Xerox Corporation to meet the Japanese competition after its copying technology licence expired, indicate. We believe that radical innovation nets can only be initiated by such organizations that have a generative learning culture and can foster the

spirit of trust, joint knowledge creation and sharing, and a sense of identity among the core actors of the net.

In brief, our study suggests that in order to reach their goals and provide a competitive advantage different type of strategic nets must be able to develop such dynamic learning capabilities that match the requirements of the value system of the net and the greater selection environment and its epistemic characteristics (Kogut 2000). More empirical evidence, however, is needed to examine this postulation. It would seem useful to adopt a two-phased research approach. In order to achieve more in-depth understanding of the dynamic knowledge capability in the strategic nets a comparative case study of carefully chosen strategic nets representing the ideal value systems proposed by our study should be conducted. The accrued knowledge would then be used to construct a conceptual framework of learning capability in a net context and a related set of hypotheses that could be tested through multivariate statistical analysis in cross-industry samples.

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