APPENDIX 1

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Assessing intellectual capital creation in regional clusters

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Keywords: Intellectual capital, Knowledge management, Information networks, Systems theory

Abstract: To provide a theoretical model of the dynamics of intellectual capital creation in regional clusters and in inter-organizational networks. The model has been constructed on the basis of earlier studies, especially system’s theoretical interpretation of organizations as knowledge systems, and then applied to the examination of a regional cluster operating in the mechanical wood processing industry in Eastern Finland. Intellectual capital in regional clusters is created by three main knowledge creation activities, each of which corresponds to a specific type of an inter-organizational network. First, production networks aiming at efficiency and replication should function according to mechanistic system logic, focusing on the enactment of rules and regulations. Development networks aiming at continuous incremental development, on the other hand, are most successful when adhering to an organic mode, which emphasizes participation, tacit knowledge sharing, dialogue and mutual adjustments. Finally, innovation networks seeking to produce new intangible assets benefit from a dynamic systems model, where entropy and spontaneous knowledge flows form the basis for mastering radical change. Model should be applied to more cases to ascertain its validity. Provides means for understanding, assessing and managing creation of knowledge-based value in inter-organizational collaboration. Addresses three gaps in earlier research: it focuses on regional intellectual capital; it examines the ways in which intellectual capital is created as a dynamic process; it provides means for understanding the future potential of a region.

Introduction
There exists a widespread agreement that the differences in the competitiveness of organizations are based first and foremost on their intangible resources and capabilities to extract value from them (Drucker, 1988; Prahalad and Hamel, 1990; Quinn et al., 1997; Teece et al., 1998). Moreover, it has been noted that intellectual capital is a significant source of competitiveness on national level (Bontis, 2003; Edvinsson, 2002; Edvinsson and Stenfelt, 1999). According to the logic of the knowledge-based economy also the success of a region depends essentially on the ability of its actors to employ, circulate and create knowledge. In other words, the ability for intellectual capital creation is a crucial determinant for regional competitiveness.

Nevertheless, most of the research on intellectual capital has focused on individual companies rather than on more macro-level units such as regions or nations (Bontis, 2003). Furthermore, even though there are several theories about the composition of intellectual capital, as well as measurement frameworks for assessing the actualized, already existing intellectual capital (Edvinsson and Malone, 1997; Kaplan and Norton, 1992; Sveiby, 1997; Stewart, 1997; Roos et al., 1998; Sullivan, 1998), there is relatively little knowledge about “the ways in which intellectual capital is created as a dynamic process; it provides means for understanding the future potential of a region.”

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and maintained as a dynamic process. Most of the theories of intellectual capital treat organizational knowledge as a static package rather than as a dynamic capability for knowledgeable action (Spender, 1996; Nahapiet and Ghoshal, 1998; Orlikowski, 2002). However, in order to understand and develop the future potential of an organization or a region, it is necessary to look at the ways in which intellectual capital is created (Teece et al., 1997; Edvinsson, 2002). In this paper, we present a model of intellectual capital creation within regions, and demonstrate how it can be used in assessing and developing regional intellectual capital. In our approach, intellectual capital is viewed as an ongoing, emergent process, and the focus is not on the intangible assets per se, but on the capability to leverage, develop and change them.

In practice, regional competitive advantage is created in the networks that operate within the region (McDonald and Vertova, 2001). In this paper, we approach regional intellectual capital development by examining inter-organizational networks and their dynamics within a regional cluster. Regional clusters are collaborations of several organizations within the same geographical area and industry (Wertner, 1999). By an inter-organizational network we mean the totality of the relatively constant, intentional and goal-directed collaborative arrangements between several organizations. Viewed as a whole, an inter-organizational network contains the actors (individuals and organizations) belonging to the network, the relationships between them, the resources flowing in the relationships, as well as the coordinating and steering mechanisms of the network (Seufert et al., 1999).

Inter-organizational networks and collaboration between organizations have become important and widely spread phenomena in the modern society. Manuel Castells, a Sociologist, (1996) calls the currently emerging societal structure network society, while according to the Economists Shapiro and Varian (1998), we live in a network economy, where success is based on understanding the logic of relational networks and the ability to use them for creating value. The globalization of competition, advances in technology, and the increasing rapidity and nonlinearity of change have made it necessary for all types of organizations to engage in collaborative arrangements that complement their own core competences (Powell et al., 1996; Inkpen, 1998). In a large part of industries, organizations nowadays use collaborative arrangements in all phases of the production process from research and development to manufacturing and marketing. In fact, collaboration has been called the meta capability of the 21st century (Miles et al., 2009). This poses new challenges and requirements for the management and the development of both organizations and regions. In this paper, we present a framework that can support regional competitiveness by providing means to meet these challenges.

Intellectual capital creation in inter-organizational networks

With the dawn of the knowledge era, new determinants for competitive advantage have been proposed. In the current discussion of intellectual resources, three main themes have been brought up: intangible assets, the dynamic capabilities to create and modify these assets, and the social relationships in which the knowledge processes take place. Each of the approaches implies a different conception of knowledge in organizational contexts. When knowledge is framed as an intangible asset, it is understood as a possession or property of the organization, typically consisting of investments and intellectual property rights or human, structural and customer capital
The dynamic capabilities approach, in contrast, views knowledge as an ongoing, emergent process, and focuses not on the intangible assets per se, but on the capability to leverage, develop and change them (Edvinsson, 2002; Eisenhardt and Martin, 2000; Ståhle et al., 2004; Teece et al., 1997). Finally, in the relational approach, knowledge is understood as a socially constructed and shared resource, and the focus is on the characteristics of the social relationships connecting the various actors and the social capital embedded in them (Brown and Duguid, 1991; Lave and Wenger, 1991; Lesser and Prusak, 1999; Nahapiet and Ghoshal, 1998). Studies on intellectual capital tend to emphasize the intangible assets view of knowledge, while the latter two viewpoints are more common in knowledge management literature. We argue that in order to understand value creation in the knowledge economy, it is necessary to take all the three facets into account.

To understand how intellectual capital is created, the dynamic and social facets of knowledge are especially pertinent. They are particularly important when the focus of interest is not on identifying and evaluating the intangible assets possessed at the moment, but on analyzing how the network is operating as a relational system, where the actors are involved in the exchange and mutual development and innovation efforts, and how this operational mode influences its capability to create intellectual capital.

In this paper, we look at the intellectual capital of regions by differentiating three modes of intellectual capital creation and examining the requirements that each of these pose for the functioning of networks within the region. Our analysis of intellectual capital creation is based on systemic interpretation of the functioning of inter-organizational networks. By a system we mean a complex network of interrelationships, which are demonstrated through communication and actions between the elements of the system. Essentially, the systemic view emphasizes connections between the elements of the system, rather than the attributes of the elements per se.

The systemic view has been used to describe a large variety of phenomena, ranging from thermodynamics to human behavior. Accordingly, even the definitions of what constitutes a system tend to vary a great deal depending on the point of departure of the author (Luhmann, 1995; Ståhle, 1998). Based on this lack of coherence in systemic views, Ståhle (1998) and Ståhle et al. (2000) have discerned three paradigms underlying system theoretical studies, which can be labeled as mechanistic, organic and dynamic. The three paradigms actually depict different system types, and imply different criteria for the effective functioning of the system. The mechanistic paradigm is based on Newtonian physics and focuses on universal laws, rules and regularities, and considers systems as stable and closed. The organic paradigm, on the other hand, regards systems as open and evolving, and emphasizes interaction with the environment and internal regulation via feedback processes. Finally, the dynamic systems paradigm focuses on the non-linear and unpredictable behavior of systems, and on their internal dynamics for producing change. Ståhle and her colleagues (Ståhle and Grönroos, 2000; Ståhle et al., 2003) have applied this idea to organizations and constructed a model of organizations as three-dimensional knowledge systems, consisting of mechanistic, organic and dynamic knowledge environments.

We apply this framework to the level of inter-organizational networks and suggest that networks can be classified according to their tasks in intellectual capital creation, assessing intellectual capital creation.

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We apply this framework to the level of inter-organizational networks and suggest that networks can be classified according to their tasks in intellectual capital creation,
or, in other words, the basic knowledge creation activity that they conduct. We also claim that each system type represents a distinct mode of intellectual capital creation, has different effectiveness criteria and serves different purposes in the strive of a region towards competitive advantage.

The first way in which intellectual capital is created in inter-organizational networks is through the efficient implementation of the network members’ knowledge for the production and stabilization of routines. We propose that the network arrangements aiming at efficiency and replication should function according to a mechanistic system logic, focusing on the enactment of rules and regulations. Second, intellectual capital can be created by mutual learning between the participating organizations. A network whose aim is to transfer knowledge between its members and thus, support their continuous incremental development is most successful when adhering to an organic mode, which emphasizes participation, tacit knowledge sharing, dialogue and mutual adjustments. Finally, intellectual capital can also be created in a network by jointly producing new, previously non-existing knowledge. Networks seeking to produce innovations such as new products benefit from a dynamic systems model, where entropy and spontaneous knowledge flows form the basis for mastering radical change. In sum, intellectual capital is produced by implementing and developing the intangible assets, knowledge and competencies already existing within the network, and by creating totally new intangible assets, knowledge and competencies.

The three modes of intellectual capital creation described above can be connected with distinct network types, which we call production network, development network and innovation network. These will be described in more detail below. Several authors have proposed similar classifications of inter-organizational networks, even though we could not locate any earlier studies categorizing networks based on their system dynamics or knowledge focuses. For example, Nooteboom (1999) describes networks as either vertical, horizontal or diagonal. According to him, vertical structure depicts networks that are based on subcontracting and include both customers and suppliers. Horizontal networks, on the other hand, are co-operative arrangements among firms in the same field of business, and diagonal networks consist of firms from several different lines of business. Also the classification of Koivisto and Ahmaniemi (2001) resembles our model. They identify three network types:

1. a vertical production network that coordinates and develops network activities;
2. a horizontal learning network, which aims at sharing knowledge between the participants; and
3. an innovation network aiming at a combination of diverse resources and knowledge.

Production network

In a production network, the flows between the actors mainly consist of physical products and money. All the information flowing between the actors are related to production, e.g. information about stock levels. The production network can be dominated by a single central actor, or it can be coordinated by a broker outside the actual network setting. The actors in the production network do not necessarily know all the other actors involved. The relations in the network are based on dyadic dynamics or knowledge focuses. For example, Nooteboom (1999) describes networks as either vertical, horizontal or diagonal. According to him, vertical structure depicts networks that are based on subcontracting and include both customers and suppliers. Horizontal networks, on the other hand, are co-operative arrangements among firms in the same field of business, and diagonal networks consist of firms from several different lines of business. Also the classification of Koivisto and Ahmaniemi (2001) resembles our model. They identify three network types:

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relationships between an actor of the network and the dominating actor or the broker. The network structure is hierarchical. An essential characteristic of the production network is that it serves as an effective way to produce a pre-designed product or service.

Ideally, a production network functions as a mechanistic machinery (Ståhle and Grönroos, 2000), which efficiently produces permanent quality and achieves pre-determined goals. In order to do this, the network needs clear and coherent rules and regulations. Thus, the essential knowledge of the production network should be in an explicit form and circulated to all relevant actors. It is enough that the information flows in one direction, mostly top-down, because discussion and elaboration open up the possibility for modifications, which in this type of network are unwanted and mere hindrances to its effectiveness. This kind of operational mode is facilitated by centralized control and a hierarchical structure.

Japanese Keiretsu is an example of a production-based network. Keiretsu is a vertical group of small companies that is dominated by a large firm, and it is structured in a pyramid form. The goal of Keiretsu is to provide regular supply and steady prices for the dominant member. Keiretsu has been used extensively as an example in network literature, and it has even been cited as one of the explanations for the Japanese post-war success (Dennis, 2000). The production network model of western countries is somewhat different from the Keiretsu model. In the west, the dominating actor tends to have dyadic relationships with several subcontractors. The subcontractors are chosen by the dominating firm on the basis of their individual offers rather than on cartel arrangements (Luomas et al., 2001).

The cooperation between the dominating focal company and its network partners can be called strategic, because the networks are used purposefully to achieve competitive advantage (Jarillo, 1988, p. 32). The focal company is likely to maintain long-term relationships with its specialized partners, because long-term relationships create trust and reduce transaction costs (Jarillo, 1988, p. 39). The focal company also tends to transfer some of the risks involved in the production to its partners (Paija, 1999, p. 38). From the supplier’s point of view, big customers are strategically essential. Belonging to a production network is especially important for suppliers that have low innovation capabilities, because they have the weakest capacity to keep up with technological and market development (Kautonen et al., 2002, pp. 9-10).

Development network

A development network is a network construct that can be used for joining firms in a regional cluster, even if they do not have cooperation in the production function. The actors in a development network can even be competitors. The goal of a development network is to spread information that benefits all the actors individually. By learning the best practices of others, firms can achieve a higher level of efficiency. In a regional setting, a development-focused network can improve the actors’ performance in, for example, marketing or acquisition of venture capital. An essential characteristic of the development network is its knowledge sharing nature.

The development network resembles Ståhle and Grönroos (2000) account of the organic knowledge environment within organizations. The continuous development maintained in the organic environment is based on tacit knowledge, lateral two-way information flows, double contingent relationships, and empowering leadership.
Similarly, in the development network the actors’ capabilities develop over time as they learn from each other’s experiences. The relations are reciprocal and based on trust rather than on detailed formal agreements. Co-operation is conducted in everyday casual communication between the actors, and active participation is encouraged.

There is no single dominant actor in the development network. However, there can be a coordinator that supports knowledge sharing.

A development network is formed horizontally between the actors. In a horizontal network consisting of competing organizations, there is a chance of a “zero-sum game”, where one actor’s profit is another actor’s loss. Collaboration between competing firms cannot usually happen lest the firms are willing for some kind of integration or merging with each other. In contrast, if the products and markets of the actors are different, knowledge sharing can be achieved without the need to unite. (Nooitgebom, 1999, p. 6) Besides knowledge sharing, the actors can form a development network around a shared resource that benefits all the participants (Venalainen, 1996, pp. 19-23).

One example of horizontal networking between competitors is the One World alliance formed by several airlines. The goal of the One World alliance is to provide competitive advantage for the participants by improving the coordination of flights and by providing them a uniform brand, which is then used in marketing. According to Pirnes (2002), this kind of model improves the individual capacities of each actor and provides synergy benefits by combining the diverse knowledge of the actors.

Innovation network
In an innovation network, new solutions for problems are developed consciously in cooperation of the actors involved. The main goal of an innovation network is to create new knowledge. The relationship structure in the innovation network is diagonal. This means that the actors participating in the innovation network are from different production chains and from different industries. An innovation network can also tie together institutional and entrepreneurial actors.

The innovation network should master creation of knowledge that is novel for everyone in the network. This requires that there is room for creativity and that the operational mode of the network is not too structured and formalized. Along the lines of Stahle’s (Stahle and Gronroos, 2000) description of a dynamic knowledge environment, potential and intuitive knowledge, even self-transcending knowledge (Scharmer, 2001), should be highly valued. The relations are informal and rich and the actors’ capabilities are multifaceted. The network is ideally lead by the actor who is most suitable for coordinating the resources and knowledge, i.e., authority migrates according to expertise rather than position in the hierarchy.

The creation of innovations requires highly specialized knowledge from different fields, and thus, networks are a fertile soil for the creation of radically new knowledge. In fact, it has been argued that most of new knowledge creation happens in networks, not within organizations (Powell, 1998; Powell et al., 1996; Miettinen et al., 1999). For example, Miettinen et al. (1999) conducted extensive longitudinal studies of several Finnish innovation processes from the network point of view. One of the innovations was the cholesterol-lowering margarine Benecol, which was developed for eight years in collaboration between actors representing such diverse fields as the wood processing industry, public health services, food industry and universities.

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Lundvall and Borra’s (1998, p. 109) define an innovation network as “an explicit organizational co-operation and exchange arrangement aimed at the development of knowledge, products or services.” In their opinion, the regional dimension of the innovation network is crucial for three reasons. First, the creation of human capital requires geographical proximity. Second, geographical proximity increases the possibility for both casual and planned meetings as well as spontaneous and structured information exchange, and thereby increases the emergence of formal and informal networks. Third, synergies can emerge from the shared cultural, psychological or political perspectives of those engaged in the same industry within the same economic space or region.

Summary of the network types
The characteristics describing the different network types in a regional cluster are shown in Figure 1.

One of the classical problems in business economics and organizational theory is how to combine innovativeness and efficiency. Traditionally, these have been perceived as contradictory and mutually excluding (Stinchfield et al., 2000). For example, March (1991) has portrayed organizations as focusing either on exploration, i.e. search for new knowledge, or exploitation, i.e. application of existing knowledge. According to him, these processes are contradictory, and an organization should not attempt to accomplish both. Our position on this issue is that as the various modes of intellectual
capital creation operate by different logics, a given network should choose which one to specialize on and then organize its operations accordingly. However, when the regional cluster is viewed as a whole, it should include all types of networks, operating concurrently. Naturally, there can be several networks of each type within the cluster, and an individual firm can be a member in several networks at the same time.

Several authors (Benner and Tushman, 2003; Teece et al., 1997; Weick, 1998) have recently proposed the view that a given organization should be able to engage in many kinds of change processes or knowledge creation activities simultaneously. For example, Teece et al. (1997, p. 515) argue that competitive advantage requires both exploitation of existing internal and external firm-specific capabilities and development of new ones. We have taken this thinking to the level of regions and argue that in order to create competitive advantage, a regional cluster is likely to require all three types of networks, because each of them is apt for a particular knowledge-based activity: an innovation network is needed for the creation of new knowledge, a development network for the dissemination of knowledge and best practices, and a production network for implementing knowledge into practice efficiently. Thus, in our view, the intellectual capital creation of regional clusters encompasses the whole spectrum of knowledge-based activities from the execution and replication of the existing knowledge to quantum-leap innovations. With this set of thinking, the capacity of the regional cluster to create intellectual capital can be maximized and its ability for continuous self-renewal secured.

Methods

The empirical case examined in this research is regional and relatively young cluster of small firms that are located in the eastern part of Finland. The firms in the cluster operate in the mechanical wood processing industry, which is a relatively traditional field of business dominated by few large corporations. At least in Finland, there has been very little network-based co-operation in this particular industry, and almost all previous attempts to form network arrangements have failed (Passila, 1998).

The case cluster is a collaboration bringing together several regional actors: local entrepreneurs, venture capitalists and institutional actors. The main institutional actors are several local municipalities and a local university. Compared to their overall budgets, the local municipalities had invested heavily in the formation of the cluster.

In March 2003, there were eight actors involved in the cluster. The number of actors is likely to increase in the following years. All the actors are situated within a couple of hundred yards from each other in the same industrial area provided by local municipalities. Four of the actors are small manufacturing firms that manufacture end products to the market. All the manufacturing firms have slightly different raw material requirements and products, so they are not direct competitors with each other. One of the actors is a service provider that takes care of one phase of the production of the manufacturing firms, and the other actors is owned jointly by all the municipalities in the region, and handles raw material acquisition for the manufacturing firms. Finally, one of the actors rents labor and machinery to all the other actors in the area. There is also a university’s research laboratory in this industrial area.

As regional competitive advantage is created in networks operating within the region, we studied the collaborative arrangements within the cluster. The inter-organizational networks were examined according to the socio-centric
perspective, i.e. from the viewpoint of the whole network, not from the actor-centric perspective of an individual organization (Adler and Kwon, 2002).

We made several visits to the industrial area between December 2002 and March 2003, and collected data by theme-based interviews (N = 11) which included representatives from all the actors involved in the cluster. The interviews lasted for about one hour each, and were all recorded on tape and transcribed.

The interview themes were constructed on the basis of the knowledge environment theory by Ståhle and Gronroos (2000) and Ståhle et al. (2003). In this theory, four basic factors are used for defining the weights between mechanic, organic and dynamic knowledge environments. These factors are:
(1) knowledge and competence;
(2) relationships;
(3) information flow; and
(4) management and leadership method.

The intellectual capital creation process in different network types was thus studied from the viewpoints of:
(1) what kind of knowledge and competence the actors had;
(2) what the nature of relationships between the actors was;
(3) how information was transmitted; and
(4) how these processes were managed and coordinated.

With these themes, we were able to discern the systemic logic according to which the various types of networks within the cluster were functioning. In addition, the interviewees were asked either to draw a graph of how they perceive the network, and verbally explain the connections and flows between the actors, or to comment on a graph made by the researchers. Based on these graphs and the related explanations, an overall presentation of the cluster and the three network types identified within it were modeled by using Allee’s value network approach model (Allee, 2000, 2002).

Results

When the cluster was examined as a whole, three main strategic goals were identified:
(1) decreasing transaction costs;
(2) formation of a single, united market force to compete against big corporations in the industry; and
(3) improving the capacity to continuously innovate new products, technologies and processes.

Based on the interviews and the graphic illustrations, we were then able to identify three distinct inter-organizational networks within the regional cluster, namely production, development and innovation networks. (Larger clusters are likely to include several networks of each type.) Each network type had its own objective in the area. The objective of the production network was to bring cash flow to the area by producing pre-designed products as efficiently as possible. The aim of the development network was to distribute knowledge between the actors, and the goal of the innovation network was to improve the capacity to continuously innovate new products, technologies and processes.

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Innovation network was to create new knowledge. Thus, these network types functioned as knowledge implementing, knowledge transferring and (new) knowledge creating levels in the cluster.

In order to achieve its main strategic goals, the cluster needed all three types of networks. The production network was needed to lower transaction costs, the development network for forming a single marketing force, and the innovation network for developing new products and methods. Together the three networks formed a cycle, where the innovations produced in the diagonal innovation network were transferred via the horizontal development network to improve the performance of the vertical production network. On the other hand, when an actor noticed a weakness in their production process, this trigger was passed on to the innovation network by using the development network in between.

Allee’s (2000, 2002) value network approach model was used to illustrate the tangible and intangible flows between the actors. With this method it was easy to see that in the different network types the flows between the actors were different and consistent with the hypothesized model. In the production network the flows consisted of products, money and production-related information, whereas in the development network the only flow between the actors was knowledge. In the innovation network the flows were mainly knowledge, but also resources, money and products (Figure 1).

Figure 2 shows an example of the types of tangible and intangible flows in the development of an innovation within the cluster. Along the principles suggested by Allee (2002), internal actors (actors in the same industrial area) are presented by circles, external actors (actors outside the industrial area) by ovals, intangible flows are dashed lines, and tangible flows are solid lines. The direction of the flow is presented with an arrow. In this case one of the manufacturing firms in the cluster noticed problems in the quality of the finished products supplied by the service provider. The manufacturing firm notified the research laboratory about the problems, which then took on the task of solving the problem. The issue was solved in collaboration with the entrepreneurs, with funding from several sources. In the process the research laboratory combined...
the tacit knowledge of the entrepreneurs with its own research knowledge, and took advantage of the possibility for quick experimentation of possible solutions onsite.

By applying the criteria of systemic functioning of the three network types, it was possible to find the strengths and weaknesses in the operation of the case cluster. Overall, the production network had insufficient and poorly structured information flows between the material acquisition firm and the manufacturing firms. The innovation network functioned best, but the most important network type for this particular cluster was the development network. Within the development network, the actors shared best practices used in production with each other and built social capital, i.e. personal networks, trust and shared norms (Putnam, 1995), within the cluster. The main results of this analysis are summarized in Table I.

**Assessing intellectual capital creation**

### Conclusion

This paper examined regional clusters as dynamic knowledge-based systems. On the basis of the literature and the empirical case, it was argued that regional clusters can be

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<th>Production network</th>
<th>Development network</th>
<th>Innovation network</th>
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<tbody>
<tr>
<td>Knowledge and competence</td>
<td>Intuitive, potential Tacit knowledge of diverse actors is combined with theoretical research knowledge to create innovations</td>
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<tr>
<td>Case</td>
<td>Actors' core competencies have not been clarified and internal production processes are not as efficient as possible</td>
<td></td>
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<tr>
<td>Relationships</td>
<td>Reciprocal, seeking consensus Plenty of personal and causal relationships between almost everyone. Researchers are highly appreciated by other actors</td>
<td></td>
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<tr>
<td>Information flow</td>
<td>Chaotic, sporadic A lot of real-time communication and problem-solving. Quick reaction time to problems arising from entrepreneurs</td>
<td></td>
</tr>
<tr>
<td>Management and leadership method</td>
<td>Personal networking skills, relinquishing power The institutional actor leads. The other actors are not empowered and active enough</td>
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<tr>
<td>Case</td>
<td>The raw material acquisition firm has too much power over the manufacturing firms' processes, even though it is not the focal company of the network.</td>
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### Table I. Strengths and weaknesses in the operation of three identified network types within the case cluster

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<th>Case</th>
<th>Strengths and weaknesses</th>
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perceived as consisting of three types of networks, namely production, development and innovation networks. Each network type is apt for creating a certain type of knowledge-based competitive advantage, and has its own operational logic and effectiveness criteria. Furthermore, it was claimed that in order to effectively implement, develop and innovate intellectual resources, a regional cluster has to include all types of networks. Thus, in our view, intellectual capital creation encompasses the whole spectrum of knowledge processes from replication of existing knowledge and competencies to quantum-leap innovations. Consequently, in order to maximise its potential for intellectual capital creation and leverage, a regional cluster must be able to combine such various features as exploration and exploitation, effectiveness and innovation, routine and non-routine (Weick, 1998).

The ways in which intellectual capital is created has been a neglected subject in the research on intellectual capital. Our construct of the three ways of intellectual capital creation in inter-organizational networks is an attempt to model this important phenomenon, and also to bridge the gap between the two schools examining knowledge in business contexts, namely the intellectual capital and knowledge management approaches. Our interpretation is related to such emerging themes as dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997), renewal ability (Brown and Eisenhardt, 1997; Leonard-Barton, 1995; Weick, 1996; Psychnien, 2004) and dynamic intellectual capital (Ståhle and Groenros, 2000; Ståhle et al., 2003). Naturally, our model has to be applied to a number of cases to prove its viability in other regional clusters and inter-organizational networks.

From a practitioner’s point of view, the framework presented in this paper offers several benefits. By understanding regional clusters as consisting of different types of networks, a more thorough understanding of the complex multi-level processes at work can be achieved. Our model describes how a network should operate to create knowledge-based value, and it can be used for identifying the weaknesses and strengths in the current operational logic of regional clusters and the networks embedded in them. In addition, as the efficient application of knowledge to production processes requires very different kind of steering from that of innovation processes, our model provides a basis for strategically focused intellectual capital management of regions and networks.

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References


Further reading

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