

NETWORK ORCHESTRATOR AND KNOWLEDGE MOBILITY IN INNOVATION NETWORKS

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Abstract

Innovation networks seem to require certain amount of direction and orchestration so that multiple actors can be efficiently connected. However, what this task means from the knowledge mobility point of view, and what the value is that the orchestrator can bring to that activity, could be described more profoundly. In this paper we focus on finding out what the facilitators and inhibitors of knowledge mobility in innovation network are, and how the orchestrator can influence that mobility. Our goal is to build on a prior theoretical model, augment it, and provide propositions for future empirical studies.

Keywords: Innovation networks, knowledge mobility, network orchestrator

1. Introduction

In the current business environment, innovation activities are rarely carried out within a single organisation, but knowledge and ideas have to be extracted from multiple sources (Chesbrough, 2003; Perks and Jeffery, 2006). Consequently, it is not surprising that networking has increased its importance in this respect. Möller and Rajala (2006) define three types of emerging value systems that aim at generating innovations: First, there are intentionally created innovative networks of universities, research institutions, and research organizations of corporations through which new, technological business-related innovations emerge. Second, there are inter-firm networks focusing on technological innovations and creating dominant technological designs, and finally, there are so called application networks which create commercially potential business applications from those technological innovations. In this study we focus on the firstly mentioned innovation networks of varying research organizations.

Bringing together different actors creates its own challenges, however: innovation networks are full of paradoxes. For example, they simultaneously incorporate stability and dynamism, autonomy and interdependence, and hiding core knowledge and sharing it. Thus, networking inherently brings with it the search of balance and the element of compromise. One reason behind this is that business relationships play an important role in networks, both as a central source of benefits, and as a potential restricting factor to achieving company-specific aspirations (Håkansson and Ford, 2002). Therefore, certain amount of coordination is needed in order to guide the network activities.

Since innovation collaboration spreads outside the boundaries and structures of any individual organisation, such challenges that are not that pronounced in internal innovation activities likely arise (Tikkanen and Renko, 2006). In loosely coupled innovation systems (see Orton and Weick, 1990; Dhanaraj and Parkhe, 2006) one actor very likely has to take a more leading role and be the one to orchestrate the innovation processes (Santos and Eisenhardt, 2005). However, since the pooled resources of individual actors outgrow those of a single firm, mutually beneficial behaviour cannot be enforced efficiently from the top down (Dingledine et al., 2003). Since the premises of traditional or intra-firm innovation management may not apply to innovation networks, new approach is needed for such network coordination.

In this study operating in innovation networks is approached from the viewpoint of *network orchestration*. Dhanaraj and Parkhe (2006) present a set of purposeful, deliberate and interrelated processes

(or activities; we prefer the latter term) – *knowledge mobility, network stability and innovation appropriability* – that, when undertaken by a hub firm or orchestrator, enable coordination of the innovation network and bringing about the innovation outputs. Our goal is to provide an extension to the network orchestration model created by Dhanaraj and Parkhe by delving deeper into the orchestrating role of hub firms, and by examining the dimensions and role of knowledge mobility in a more detailed manner. We take upon the notion of Dhanaraj and Parkhe (2006) that the value that the orchestrator adds to this process is under-examined so far, and aim at contributing to this area. Prior research suggests that the role of an actor who “holds a nodal position” (e.g., Möller and Rajala 2006) may become crucial from knowledge transfer point of view, especially because such an actor’s task is to connect multiple actors in the net. However, what this role incorporates or what it should be from the knowledge mobilisation point of view remains ambiguous. In line with the above mentioned, we want to find out *what the facilitators and inhibitors of knowledge mobility are in innovation networks, and how the orchestrator can influence that mobility*. In the attempt to find answers, ideas are drawn from established theoretical models in the fields of strategic management, organisation theory, and network theory, for instance. We aim, in particular, at giving a more detailed description of knowledge mobility as an orchestration activity, and also at making its linkages with other orchestration activities more explicit.

In the following, we first briefly present the orchestration activities identified by Dhanaraj and Parkhe (2006), and then concentrate on knowledge mobility in particular. Presenting elements and dimensions that may foster or hinder knowledge mobility (i.e., the attributes of innovation activities, nature of knowledge to be transferred, and characteristics of parties sharing and receiving knowledge), precede the discussion on the ways in which the orchestrator can influence these so as to facilitate knowledge mobility. The examination then proceeds to the linkages between knowledge mobility and the other orchestration activities. In this part we augment the original model of Dhanaraj and Parkhe as we suggest that knowledge mobility is an antecedent of both innovation appropriability and network stability activities and vice versa. Based on the discussions, we present propositions for future empirical studies. Discussion and conclusions summarises and concludes our work.

2. Orchestration of Innovation Networks

In network discourse, management related issues have been quite debated – even to the level of being controversial. In prior literature network management has been approached from two different points of view (e.g., Heikkinen and Tähtinen, 2006; Möller and Svahn, 2003). According to the Network Approach networks cannot be managed or designed by a single actor (e.g., Axelsson and Easton, 1992). On the other hand a “strong research tradition in Strategic Networks (see e.g., Edwarsson et al., 1995; Gulati, 1998; Gulati et al., 2000; Jarillo, 1988) endorses and accepts the idea of a hub in networks.” (Heikkinen and Tähtinen, 2006, p. 273). In this study the latter approach is adopted, as it is suggested that a certain amount of influence and direction is possible – and even needed – without sacrificing independence and flexibility in innovation activities. While it can be agreed that firms in a node position cannot really exercise strong authority in the sense that they would be able to simply lay out rules and expect other actors of the network to follow them without any resistance, it is noticed that they may have capabilities that enable them to influence the other organizations’ activities and relationships. This discreet direction, or orchestration, can be carried out by facilitating three main areas: knowledge mobility, innovation appropriability, and network stability (Dhanaraj and Parkhe, 2006). These three orchestration activities deal with the attributes of innovation activities, of knowledge resources needed in them, and of actors in the innovation network.

First of all, *stability* is needed in innovation networks, since “a network that is unravelling is not conducive to value creation or value extraction” (Dhanaraj and Parkhe, 2006, p.663, see also Håkansson and Johanson, 1992). In reality innovation networks are often characterised by interplay between more or less static and dynamic elements, where there can also be disruptive (even counterproductive) features and political game (Koch, 2004). Long-term relationships are required, and bonds between the network members have to be formed at several levels in order to ensure adequate levels of stability. However, also dynamism needs to be preserved in order to ensure sufficient diversity in the common pool of knowledge. Network stability can be fostered through improving the image and common vision of the network, through increasing the amount of ties between the actors (e.g., by giving start to additional collaborative endeavours) and through emphasising the expected future benefits (Dhanaraj and Parkhe, 2006). Indeed, in relation to innovation network formation, importance of reputation, trust, reciprocity, and mutual interdependence are often highlighted (Larson, 1992): Stability-fostering voluntary collaboration (see, e.g., Pleschak and Stummer, 2001) is more likely to take place if the reputation and credibility of central actors and the network are

appealing (Turnbull et al., 1996; Dingledine et al., 2003). Moreover, common reciprocity and ties reduce the emergence of isolation, migration, and cliques.

Stability can hardly be reached, if there is risk of the actors ending up in unfair situations: Getting the network to where it is wanted requires also distributing the created value fairly among the actors. Free riding and opportunism need to be dealt with efficiently, if the nodal organisation wishes to orchestrate the network successfully. Indeed, as Heiman and Nickerson (2004, p.402) note, “a real possibility is that the value created by the collaboration from transferring knowledge may be eclipsed by the value of the knowledge expropriated”. Thus, it is acknowledged that unwanted knowledge flows represent hazards to networks. In order to overcome the challenges related to these issues, *innovation appropriability* needs to be facilitated. Innovation appropriability means making sure that valuable knowledge does not leak to rival networks or organisations, and by doing that, enhancing the commercial exploitation possibilities of knowledge and innovations (Hurmelinna-Laukkanen and Puumalainen, 2007; Heiman and Nickerson, 2004). The orchestrator can improve innovation appropriability by presenting contractual arrangements that emphasize safe knowledge transfer, equity, and fairness among the participants (e.g., Oxley, 1999), and by providing assistance with the attempts of individual actors to improve appropriability of their intellectual property. There are several mechanisms that allow more efficient appropriation of profits from innovation (see, e.g., Levin et al, 1987; Cohen et al., 2000; Hurmelinna and Puumalainen, 2007). However, as choosing the ones that work in a network context is challenging (see, e.g., Hurmelinna et al., 2007 about the downsides of too strong protection), the orchestrator may have a key role in guiding the activities of the members. Supporting joint asset ownership can be an effective form of orchestration through innovation appropriability. Also procedural justice (i.e., the fairness and consistency of decision processes) needs to be facilitated by the orchestrator (Dhanaraj and Parkhe, 2006).

Although knowledge protection is relevant, it should be more pronounced considering the interface between the active actors of the network and outsiders than that of an individual actor and other actors within the network. In fact, the innovation network simply cannot reach its goals if knowledge does not flow fluently enough between the actors. Thus, *knowledge mobility* needs to be enhanced.

3. Knowledge Mobility for Network Orchestration

Dhanaraj and Parkhe (2006, p. 660) define knowledge mobility “as the ease with which knowledge is shared, acquired and deployed within the network” (see also Doz, 1996; Nonaka, 1994; Parolini, 1999). The full potential of innovation networks can only be realised if and when the diverse knowledge assets of independent actors are brought together and combined into an innovation (Crossan and Inkpen, 1995, Kogut and Zander, 1996). This may happen only through adequate levels of knowledge exchange.

3.1. The context and attributes for knowledge mobility

In innovation networks, the goal of cooperation is often related to creating radical innovations and influencing emerging fields. Systems with such aims are typically loosely coupled by nature (Möller and Rajala, 2006). Orton and Weick (1990) suggest that an organisation contains interdependent elements that differ in the strength of their interdependencies (“coupled”). These elements also preserve a certain degree of independence (“loosely”). This idea can be applied to innovation networks as well.

In principle, coupling generates stability and looseness flexibility (e.g., McGrath, 2001; Slater and Narver, 1995; March, 1991). In innovation networks, knowledge exploration through weak ties (i.e, sources external to the network) is needed (Möller and Rajala, 2006), and flexibility is of essence. In other words, features of loose coupling can be seen as a prerequisite for amplified flexibility, adaptation, knowledge integration, and innovativeness, especially in a hypercompetitive environment (see Ravasi and Verona, 2001). However, problems may emerge if the knowledge base common to the network actors is too weak due to excessive looseness: The risk of loose coupling lies in knowledge staying too fragmented, which leads to a situation where the innovation network is not capable of creating sufficiently integrated knowledge resources. It could be said that high levels of flexibility often emerge at the expense of collective knowledge utilisation (Nätti et al., 2006), since utilising the existing knowledge base of the network members and building it jointly may be neglected when the actors are too focused on external knowledge. Learning from external sources (exploratory learning) is naturally critical to the capacity of the system to create variety, but it also requires acquiring knowledge from internal sources (i.e., exploitation): otherwise benefiting from the “lessons learned” cannot take place (McGrath, 2001; Slater and Narver, 1995; see also March, 1991.) Thus, from knowledge mobilisation point of view it is paramount to find the right balance between loose and tightly coupled structures and an appropriate balance between knowledge exploration and exploitation (March, 1991).

Related to this, it needs to be acknowledged that there is no “pure form” of loose or tightly coupled systems, but more or less mixed forms along a continuum. Furthermore, within wide and seemingly loose innovation networks there may be more tightly coupled collegial groups or communities with their own tight structures. These communities can have a remarkable role in the knowledge creation process (See e.g. von Hippel and von Krogh, 2003). Transferring their contribution to benefit the whole network is essential, which – again – calls for knowledge mobilisation.

Considering the above described context, it seems clear that in relation to knowledge mobility within innovation networks, attributes of the knowledge and actors sharing it are of importance: the nature of the knowledge (i.e., tacitness/ codifiability), causal ambiguity and absorptive capacity are all factors to be reckoned with, together with the actors’ ability and willingness to share knowledge.

3.1.1 Innovation networks and nature of knowledge within – tacit and complex

Characteristics of knowledge are important in determining the degree of its transfer, the rate at which knowledge is accumulated and retained, where it is retained, how much of it is retained, and how easily it diffuses within and across organisational boundaries (Argote et al., 2003; Szulanski 1996). In innovation networks the most precious knowledge is often tacit and complex (see the discussion on VRIN attributes (valuable, rare, inimitable, and non-substitutable resources); Barney, 1991). Tacit knowledge – especially in its complex form – is highly personal (even though it may be collective) and difficult to articulate, which makes it difficult to transfer and acquire across markets. Because of its nature, tacit knowledge may be difficult or even impossible to codify, and in such cases it may stay embedded within a single actor or collegial groups of the network. Tacit knowledge is transferable only in close interaction, by participation and/or observation, by sharing an experience, and only for a limited audience (Polanyi, 1966; Nelson and Winter, 1982; Zander and Kogut, 1995), which means that it needs to be developed internally over time, accessed through long-term business relationships with customers and suppliers, or through shorter-term relationships with competitors (consider, e.g., cooptation) (Dierickx and Cool, 1989; Håkansson and Snehota, 1995; Barringer and Harrison, 2000). Considering the transferability in particular, the nature of knowledge is closely linked to perceived causal ambiguity and absorptive capacity.

3.1.2 Causal ambiguity and absorptive capacity – Actors receiving knowledge

The ambiguous relationship between existing and emerging knowledge is often characteristic to the knowledge in innovation networks. This ambiguity is related to the fact that in innovation activities there is often a high level of uncertainty concerning the knowledge structures and value activities of the network (Möller and Rajala 2006, see also Strang and Still, 2006). There is often a high level of uncertainty about what kind of knowledge different actors possess, what kind of knowledge is needed in the innovation process and what kind of value may be created as a result (Arrow, 1974). Moreover, there very likely is ambiguity as to what factors are responsible for superior (or inferior) performance or innovation output of an individual actor, and this acts as a powerful block for knowledge mobility between organisations – even within the network (Lippman and Rumelt, 1982). For example, it may not be possible to observe or describe which resources or practices add value, why, and how (Barney, 1986). The more easily a capability or a resource can be communicated and understood, the shorter the time to transfer or replication (Zander and Kogut, 1995; p. 80). The ability to pinpoint those knowledge assets that can contribute to the innovation activities of the network would help the parties in the receiving end to ask for them. This is not enough, however, since the *receiver’s ability to find the right kind of knowledge* needs to be accompanied by the ability to absorb it.

Cohen and Levinthal (1990, p. 128) define absorptive capacity as “the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends.” In line with this, Zahra and George (2002) identify four dimensions of absorptive capacity: acquisition, assimilation, transformation and exploitation of knowledge. They divide the absorptive capacity into two components that both are needed for improved performance. The first one, potential absorptive capacity, refers to the ability of an organisation to receive outside signals. The second one, realised absorptive capacity, reflects the ways in which external knowledge is utilised (Zahra and George 2002). Absorptive capacity (and thus *knowledge absorption* in the innovation network) is enhanced by internal and external factors. Internal elements include factors such as organisational culture and structure, and external forces deal with knowledge diffusion, for example (Tu et al., 2006). Prior related knowledge and effective organisational routines and communication have been identified as major constituents of absorptive capacity (Cohen and Levinthal 1990, Zahra and George 2002). These are not only relevant factors at firm level, but considering the whole innovation network as well.

3.1.3 Actors sharing knowledge

Besides the nature of knowledge to be transferred in the innovation network and the ability of the receiving end to identify, capture, and use it, also the *features, capabilities and motives of actors giving out knowledge* are of relevance.

It is far from self-evident, that a company participating an innovation network is able or willing to pass on knowledge assets that the other network actors would like to have access to. For example, the company may not know what knowledge to offer or what the other actors need, or it may not be able to transform it into transferable form. On the other hand, the company may be reserved considering knowledge sharing. Even though the attitudes towards joint innovation and knowledge exchange have become more open (see the Open Innovation model of Chesbrough, 2003), limitations still exist: It is more common for organisations to extract ideas from external sources than to give even non-core ideas to others (e.g., Miller 2003). Also, it may be easier to outsource manufacturing, distribution and marketing of innovative offerings than innovation creation and development. However, in certain cases openness pays off. In contrast to the closed model where companies seek for control and do everything by themselves, open innovation refers to a model where organisations realise that valuable ideas are not generated only within their firms, and that it does not have to be the organisation itself that releases these ideas into the market. (Chesbrough, 2003; Caloghirou et al., 2004). Open innovation also enables organisations to seize and utilise ideas that may not have been so attractive originally, but which turn out to be valuable later on. In fact, important innovations may surface from apparently unexpected sources (Chesbrough, 2003). Therefore the orchestrator may be in a key role in promoting knowledge mobility among the knowledge sharing firms.

3.2 Dealing with the attributes of knowledge mobility

Being able to deal with all the above discussed factors that have an effect on speed and efficiency of knowledge mobility is a capability that the nodal actor needs have in order to orchestrate the innovation network. The orchestrator needs to create and maintain processes and activities that support each other, enhance finding the relevant actors, and facilitate the fluent knowledge exchange between the members.

Considering the *tacitness and complexity of knowledge* in innovation activities, creating a field of interaction is important (Nonaka 1994, p. 24). Knowledge transformation to more explicit mode can be facilitated by encouraging documentation and other codification activities to common IT-systems, for example. Tacit knowledge may be (at least partly) transferred through active teaching, creating prerequisites for personnel exchange, and supporting close collaboration (e.g., between organisations with close geographical proximity). The variety in knowledge bases of different actors in the network challenges knowledge mobilisation, and thus the orchestrator needs to pay attention to facilitating the creation of a “common language”. Creating informal and formal forums of discussions may foster this and allow the orchestrator to diminish excessive stickiness of knowledge.

Communication is the key for dealing with knowledge-related ambiguities as well. For instance Davis (1991, p. 593-594) notes that “communication with one's contacts helps resolve the ambiguity surrounding the value of an innovation”. Considering *absorptive capacity of knowledge receiving companies*, the orchestrator needs to be particularly conscious: It holds a significant role in terms of knowledge scanning that enables identifying and capturing relevant external knowledge, and the subsequent recruitment and activation of network members (Tu et al. 2006). If the orchestrator is able to improve its knowledge scanning, it is more likely able to find such members that have certain common knowledge base, and yet enough variety in their intangible assets. The variety is, as noted above, needed for innovation, and the (adequate) similarity is important in at least two respects considering knowledge mobility: First, it has been noted that absorptive capacity results from the cumulative effect of continuous learning. Thus, certain common ground, where learning can start and take place, is needed. Second, prior research has shown that an organisation that has a large knowledge base is capable of understanding new knowledge and its applicability (e.g., Cohen and Levinthal, 1990), i.e., it is efficient in absorbing knowledge (See Garud and Nayyar, 1994; Breschi et al., 2000; Montobbio, 2003; cf. internal R&D as the basis for firm-level absorptive capacity in Cohen and Levinthal, 1990; Zahra and George 2002). This can be applied to networks as well. Naturally, a “large” knowledge base can be achieved by putting together knowledge bases that do not really overlap, but the resulting fragmentation hardly improves the ability of the network as a whole to absorb and distribute knowledge among its members efficiently.

In enhancing the *willingness of actors to share knowledge*, the example of the nodal organisation in opening up to cooperation can be a significant factor. The actors' willingness to share knowledge can be affected through activities such as facilitating network identification (i.e., common identity building) and

interorganisational socialisation (Dhanaraj and Parkhe, 2006). In addition, actors may compensate the effects of loose coupling to a certain level by “carefully selecting targets, controlling resources and acting forcefully” (Orton and Weick 1990, 212). This might mean paying attention to controllable and essential behaviours, but also providing freedom for local adaptation (Orton and Weick 1990, p. 212), for example. This is enabled by creating common, guiding culture and norms to the system. In addition, meaning of trust as a guiding mechanism is important (Orton and Weick, 1990; see also Möller and Rajala, 2006). In the ambiguous context typical for innovation activities, the above defined “collective agreements” about preferences are needed (Orton and Weick, 1990). To sum up, the organisation orchestrating the network can strengthen the common identity among actors, which is needed in motivating the participants to share knowledge more freely (Dyer and Nobeoka, 2000). In addition, it can facilitate formal and informal linkages and forums for knowledge exchange so that innovative ad hoc combinations can be created (see, e.g. Kale et al., 2000).

4. Knowledge Mobility as Prerequisite for Network Stability and Innovation Appropriability

The discussion above holds some hints on dimensions of knowledge mobility being linked to each other, and similar interfaces can be found among the three orchestration activities described by Dhanaraj and Parkhe as well. However, while Dhanaraj and Parkhe (2006) consider innovation appropriability to have an effect on knowledge mobility and network stability, and network stability to influence appropriability, they do not consider that knowledge mobility could, in fact, have a more pronounced role. According to our view, knowledge mobility can be seen as a prerequisite for innovation appropriability and network stability.

When Dhanaraj and Parkhe (2006) note that innovation appropriability can promote network stability, and vice versa, they base their reasoning on the idea that equity is the common denominator for both appropriability and stability. If the actors feel that they are or can be exploited, they may withdraw from collaborative activities with such actors (Dhanaraj and Parkhe, 2006). On the other hand, joint ownership of the created innovations and trusting relationships (i.e., appropriability-related elements identified by Dhanaraj and Parkhe) may create barriers to exit (see also Halinen and Tähtinen, 2002). Dhanaraj and Parkhe (2006) also acknowledge that a sufficient level of appropriability facilitates knowledge mobility within the network, considering, in particular, the potential of appropriability to remove obstacles and insecurities related to knowledge sharing.

However, knowledge mobility and network stability are joined as well. Moreover (and adding to prior discussion), knowledge flows can foster the connections between stability and appropriability, for example: when knowledge flows within the network, actors learn from each other, which further creates mutual trust, switching costs and exit barriers (see, e.g., Doz and Hamel, 1998). This works also the other way around: when the actors in the network remain the same, the power distance between the actors may diminish and created trusting relationships allow more efficient knowledge sharing. In other words, processes that enhance knowledge mobility can make or break the ties between the actors, and the stable environment can support knowledge flows. Furthermore, the connection between knowledge mobility and appropriability can actually be two-directional. Knowledge mobility can enhance appropriability in different ways. First of all, while Dhanaraj and Parkhe (2006) note that the sufficient level of appropriability facilitates knowledge mobility within the network, we argue that without adequate knowledge transfer the network cannot create new knowledge combinations, which are the threshold elements of successful innovation (e.g., Doz, 2006). Therefore, without knowledge mobility there hardly are new innovations to keep from flowing out of the network. Second, genuinely new combinations of knowledge – that may emerge more easily if they are drawn from really diverse knowledge-bases – are likely to be more easy to protect: Outsiders will have a harder time understanding the elements of the innovation (cf. Strang and Still, 2006), and institutional protection such as intellectual property rights may be more readily available (see, e.g., Levin et al., 1987, Hurmelinna-Laukkanen et al. 2008 on the protection issues related to radical innovations). Third, it needs to be noted that knowledge mobility includes exchanging different types of knowledge between the network actors. It may not just be innovation related (technological or conceptual) knowledge that is exchanged, but also knowledge related to appropriation possibilities. The actors can share knowledge on how to apply for a patent or draft a contract (in different countries, for example), or on the channels through which the innovation should be taken to markets in order to access the desired markets. All this has the potential to strengthen appropriability.

5. Discussion and Conclusions

The aim of this paper was to describe the facilitators and inhibitors of knowledge mobility in innovation network, and how the orchestrator can influence that mobility considering these contextual characteristics. As described above, these facilitators and inhibitors stem from the features of the actors in the network as well as

of the exchanged knowledge. In innovation networks *loosely coupled characteristics* form a challenging starting point for the knowledge mobility. The danger in loose coupling lies in knowledge base, activities, and network of actors being too fragmented considering innovation creation. *The nature of knowledge* in innovation networks is characteristically often tacit and complex which further poses challenges for knowledge transfer. This is closely linked to the causal ambiguity prevailing in innovation activities: in those activities there is often a high level of uncertainty concerning the knowledge needed and value potentially created along the innovation process. *The features and motives of single actors* are thus influential from knowledge mobilisation point of view. Absorptive capacity of single actors and network of actors may be weak if there is not at least certain level of common knowledge base to which link internal and external knowledge resources. Further, there may be ambiguity related to what the motives to participate the cooperation are, and how the output will be divided among the members of the network. Based on this, following proposition can be presented:

Proposition 1a: Knowledge mobility depends on the attributes of knowledge and the actors sharing it.

The network orchestrator needs to assume the responsibility of supporting such factors and activities that deal with the above described issues and facilitate knowledge mobility. In line with this, it is up to the orchestrator to support absorptive competences among the network actors, foster articulation and codification of tacit knowledge when it is reasonable and possible, and develop long-term inter-firm relationships and network identities for members (Uzzi, 1997; Håkansson et al., 1999). Indeed, the lack of adequate common ground, stickiness of knowledge, and causal ambiguity among other things may turn out to be obstacles that cannot be completely removed, but there are certain remedies that the orchestrator can use to diminish their knowledge mobility decreasing effects. Thus, it can be proposed that:

Proposition 1b: The orchestrator needs to adopt the responsibility of enabling premises and incentives of firms to share and combine their knowledge

This task of the orchestrator is not just about dealing with the attributes of innovation, knowledge, or network actors, but also with the linkages between the orchestration activities. The orchestrator also needs to create and maintain activities that support knowledge mobility, innovation appropriability, and network stability simultaneously. Problems in appropriability and stability can make or break knowledge mobility, and, on the other hand, knowledge mobility can be seen as an important prerequisite for appropriability and network stability. Thus we augment the original model of Dhanaraj and Parkhe and propose that:

Proposition 2a: Knowledge mobility is an antecedent of both network stability and innovation appropriability

Proposition 2b: Network stability and innovation appropriability foster knowledge mobility

The above propositions provide a basis for case-studies. Our aim is to examine these issues in a multiple-case study. There are also possibilities to widen this examination into the direction of quantitative analysis. However, we believe that since the model still is incomplete, the different orchestration activities need to be examined in more detail before assessing their effects on the innovation output. Furthermore, examination of orchestration of other types of networks and the subsequent changes in the performance levels of the network members is worthwhile as well. This study provides a good starting point for such endeavours.

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References

- Argote, L., McEvily, B. and Reagans, R. (2003) "Managing Knowledge in Organizations: An Integrative Framework and Review of Emerging Themes" **Management Science**, Vol 49 No 4, 571-582.
- Arrow, K. J. (1974): **Organization and Information. The Limits of Organization**. W.W. Norton & Co., New York.
- Axelsson, B and Easton, G (1992) **Network Perspective: A New View to Reality**, Routledge, London.

- Barney, J.B. (1986) "Organizational culture: Can it be a source of sustained competitive advantage?" **Academy of Management Review**, Vol 11, 656-665.
- Barney, J.B. (1991) "Firm resources and sustained competitive advantage" **Journal of Management**, Vol 17, No 1, 99-120.
- Barringer, B. and Harrison, J. (2000) "Walking a tightrope: Creating value through interorganizational relationships" **Journal of Management**, Vol. 26, No. 3, 367-403.
- Breschi, S., Malerba, F. and Orsenigo, L. (2000) "Technological regimes and Schumpeterian patterns of innovation" **The Economic Journal**, Vol 110, No 463, 388-410.
- Caloghirou, Y., Kastelli I. and Tsakanikas, A. (2004). "Internal capabilities and external knowledge sources: Complements or substitutes for innovative performance?" **Technovation**, Vol 24, 29-39.
- Chesbrough, H. (2003) "The Logic of Open Innovation: Managing Intellectual Property" **California Management Review**, Vol. 45 No. 3, 33-58.
- Cohen, W.M. and Levinthal, D.A. (1990) "Absorptive capacity: A new perspective on learning and innovation" **Administrative Science Quarterly**, Vol 35, No 1, 128-152.
- Cohen, W.M., Nelson, R.R. and Walsh, J.P. (2000) "Protecting their intellectual assets: appropriability conditions and why U.S. manufacturing firms patent (or not)" Working Paper 7552, **National Bureau of Economic Research**, Inc.
- Crossan, M.M. and Inkpen, A.C. (1995) "The subtle art of learning through alliances" **Business Quarterly**, Vol 60, No 2, 68-78.
- Davis, G.F. (1991) "Agents without principles? The spread of the poison pill through the intercorporate network". **Administrative Science Quarterly**, Vol 36, 583-613.
- Dhanaraj, C. and Parkhe, A. (2006) "Orchestrating innovation networks", **Academy of Management Review**, Vol 31 No 3, 659-669.
- Dierickx, I. and Cool, K. (1989) "Asset stock accumulation and sustainability of competitive advantage" **Management Science**, Vol. 35, No. 12, 1504-1511.
- Dingledine, R., Mathewson, N. and Syverson P. (2003) "Reputation in P2P anonymity systems". **Workshop on Economics of Peer-to-Peer Systems**. Berkeley, CA, June 5-6 2003.
- Doz, Y (1996) "The evolution of cooperation in strategic alliances: Initial conditions or learning processes?" **Strategic Management Journal** (Special Issue), Vol 17, 55-83.
- Doz, Y. and Hamel G. (1998). **Alliance Advantage. The Art of Creating Value through Partnering**, Harvard, USA.
- Dyer, J.H. and Nobeoka, K. (2000) "Creating and managing a high-performance knowledge sharing network: The Toyota case" **Strategic Management Journal**, Vol 21, 239-266.
- Edwarsson, B, L Hagglund and J Mattson (1995). "Analysis, planning, improvisation and control in the developments of new services", **International Journal of Service Industry Management**, Vol 6 No 2, 24-35.
- Garud, R. and Nayyar, P. (1994) "Transformative capacity: Continual structuring by intemporal technology transfer" **Strategic Management Journal**, Vol 15, No 5, 365-385.
- Gulati, R (1998) "Alliances and networks". **Strategic Management Journal**, Vol 19 No 4, 293-317.
- Gulati, R. N Nohria and A Zaheer (2000). "Strategic Networks". **Strategic Management Journal**, Vol 21 No 3, 203-215.
- Heikkinen, M. and Tähtinen, J. (2006) Managed formation process of R&D networks, **International Journal of Innovation Management**, Vol 10 No 3, 271-298.
- Heiman B.A., Nickerson J.A. (2004) "Empirical Evidence Regarding the Tension Between Knowledge Sharing and Knowledge Expropriation in Collaborations" **Managerial and Decision Economics**, Vol. 25, 401-420.
- Hurmelinna, P., Kyläheiko, K. and Jauhiainen, T. (2007) "The Janus face of the appropriability regime in the protection of innovations: Theoretical re-appraisal and empirical analysis" **Technovation**, Vol. 27, No. 3, 133-144
- Hurmelinna-Laukkanen, P. and Puumalainen, K. (2007) "The nature and dynamics of appropriability – Strategies for appropriating returns on innovation" **R&D Management**, Vol. 37 No. 2, 95-112.
- Hurmelinna-Laukkanen P., Sainio L-M. and Jauhiainen T. (2008) "Appropriability regime for radical and incremental innovations" **R&D Management**, Vol. 38, No. 3, 278-289.
- Håkansson, H. and Ford, D. (2002) "How should companies interact in business networks?" **Journal of Business Research**, Vol 55, 133-139.
- Håkansson, H., Havila, V. and Pedersen, A-C. (1999) "Learning in networks" **Industrial Marketing Management**, Vol. 28, 443-452.

- Håkansson, H. and Johanson, J. (1992) "A model of industrial networks", in: *Industrial Networks* (Axelsson, B. and Easton, G., eds.), Routledge, London.
- Håkansson H. and Snehota, I. (1995) **Developing relationships in business networks**, Routledge, London.
- Jarillo, J (1988) "On strategic networks". **Strategic Management Journal**, Vol 9 No 1, 31-44.
- Kale, P., Singh, H. and Perlmutter, H. (2000) "Learning and protection of proprietary assets in strategic alliances: Building relational capital" **Strategic Management Journal**, Vol 21, 217-237.
- Koch, C. (2004) "Innovation networking between stability and political dynamics" **Technovation**, Vol 24, No 9, 729-739.
- Kogut, B. and Zander, U. (1996) "What firms do? Coordination, identity, and learning" **Organization Science**, Vol 7, No 5, 502-518.
- Larson, A. (1992) "Network Dyads in Entrepreneurial Settings: A Study of the Governance of Exchange Relationships" **Administrative Science Quarterly**, Vol 37, 76-104.
- Levin, R.C., Klevorick, Alvin K., Nelson, R.R. and Winter, S.G. (1987) "Appropriating the returns from industrial research and development" **Brookings Papers on Economic Activity**, Vol. 3, 783-831.
- Lippman, S.A., Rumelt, R.P. (1982) "Uncertain imitability: An analysis of interfirm differences in efficiency under competition" **Bell Journal of Economics**, Vol 13, No 2, 418-438.
- March, J. G. (1991) "Exploration and Exploitation in Organizational Learning" **Organization Science**, Vol 2 No 1, 71-87.
- McGrath, R. G. (2001) "Exploratory Learning, Innovative Capacity, and Managerial Oversight" **Academy of Management Journal**, Vol 44, No 1, 118-131.
- Miller, D. (2003). "An asymmetry-based view of advantage: Towards an attainable sustainability" **Strategic Management Journal**, Vol 24, 961-976.
- Montobbio, F. (2003) "Sectoral patterns of technological activity and export market share dynamics" **Cambridge Journal of Economics**, Vol 27, No 4, 523-544.
- Möller, K. and Svahn, S. (2003) Managing strategic nets: A capability perspective, **Marketing Theory**, Vol 3 No 2, 209-234.
- Möller, K. and Rajala, A. (2006) **Business Nets: Classification and Management Mechanisms**, Helsinki School of Economics, Working Papers W-407, Helsinki.
- Nelson, R.R and Winter, S.G. (1982) *An Evolutionary Theory of Economic Change*. Harvard University Press, Cambridge, MA.
- Nonaka, I (1994) "A Dynamic Theory of Organizational Knowledge Creation", **Organization Science**, Vol 5 No 1, 14-38.
- Nätti, S. and Halinen, A. & Hanttu, N. (2006), "Customer Knowledge Transfer and Key Account Management in Professional Service Organisations" **International Journal of Service Industry Management**, Vol 17 No 4, 304-319.
- Oxley, J.E. (1999) "Institutional environment and the mechanisms of governance: The impact of intellectual property protection on the structure of inter-firm alliances" **Journal of Economic Behavior and Organization**, Vol 38, 283-309.
- Orton, J. D. and Weick, K. E. (1990) "Loosely Coupled Systems: A Reconceptualization" **Academy of Management Review**, Vol 15 No 2, 203-223.
- Parolini, C (1999) *The Value Net – A Tool for Competitive Advantage*, John Wiley & Sons, Chichester, England.
- Perks, H. and Jeffery, R. (2006) "Global network configuration for innovation: A study of international fibre innovation", **R&D Management**, Vol 36, No 1, 67-83.
- Pleschak, F. and Stummer, F. (2001) "East German industrial research: Improved competitiveness through innovative networks", in: *Innovation Networks – Concepts and Challenges in the European Perspective* (Koschatzky, K., Kulicke, M. and Zenker, A., eds.), Physica, Heidelberg, 175-189.
- Polanyi, M. (1966). *The Tacit Dimension*. Routledge & Kegan Paul, London.
- Ravasi, D. and Verona, G. (2001) "Organising the Process of Knowledge Integration: The Benefits of Structural Ambiguity" **Scandinavian Journal of Management**, Vol 17, 41–66.
- Santos, F.M. and Eisenhardt, K. (2005). "Organizational boundaries and theories of organization" **Organization Science**, Vol 16, No 5, 491-508.
- Slater, S. F. and Narver, J. C. (1995) "Market Orientation and the Learning Organization" **Journal of Marketing**, Vol 59 No 3, 63-75.
- Strang, D. and Still, M.C. (2006) "Does ambiguity promote imitation or hinder it? An empirical study of benchmarking teams" **European Management Review**, Vol 3, 101-112.

Szulanski, G. (1996) "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm" **Strategic Management Journal**, Vol 17, 27-43.

Tikkanen, J. and Renko, M. (2006). "Developing innovation networks – The art of interorganizational collaboration in high-technology innovation", **International Journal of Entrepreneurship and Innovation Management**, Vol 6, No 6, 573-590.

Tu, Q., Vonderembse, M.A., Ragu-Nathan, T.S. and Sharkey, T.W. (2006) "Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices" **Journal of Operations Management**, Vol 24, 692-710.

Turnbull, P., Ford, D. and Cunningham, M. (1996) "Interactions, relationships and networks in business markets: An evolving perspective" **Journal of Business & Industrial Marketing**, Vol 11, No 3/4, 44-62.

Uzzi, B. (1997) "Social structure and competition in interfirm networks: the paradox of embeddedness" **Administrative Science Quarterly**, Vol. 42, No. 1, 35-67.

von Hippel, E. and von Krogh, G. (2003) "Open Source Software and the "Private-Collective" Innovation Model: Issues for Organization Science", **Organization Science**, Vol 14, No 2, 209-223.

Zahra, S.A. and George, G. (2007) "Absorptive capacity: A review, reconceptualization, and extension" **Academy of Management Review**, Vol. 27 No. 2, 185-203.

Zander, U. and Kogut, B. (1995) "Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test" **Organization Science**, Vol 6, No 1, 76-92.