Network Consulting in Regional Clusters

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Introduction

Network consulting, i.e. consulting inter-organizational networks, is on the rise. This comes as no surprise given the increased practical importance of strategic alliances, R&D consortia, value chain partnerships, project networks, and regional clusters on the one hand and the significant rates of failure of these 'new' organizational forms on the other. Given this situation in practice and the attention organization and management research has paid these forms in recent years (see Gulati, 1998; Borgatti & Foster, 2003; Provan et al., 2007 for reviews), such developments have not gone unnoticed by consultants always looking for new concepts and additional business.

Providing such services is actually becoming an increasingly important business for consultancies, large *and* small. One major reason for this trend is the complex challenge of managing networks successfully, another fundamentally lacking expertise of managers and organizations in what may or even should be called 'network management'. In consequence, inter-organizational networks, in addition to the traditional 'objects' of consulting, i.e. more or less 'isolated' organizations, increasingly become clients in consulting processes. But in which respects is consulting networks similar to or different from consulting organizations? If it were different, experiences and practices from consulting single organizations were not easily transferable to consulting tasks in networks or clusters and, in consequence, traditional consultancies would experience difficulties in diversifying their field of business to network consulting.

Based on a collection of reports from a variety of network(ed) consultants (Sydow & Manning, 2006) and, in particular, a long-term and intensive involvement in researching and, to a limited extend, consulting an emerging regional cluster in the field of optics in the Berlin-Brandenburg region, we gained insights not only in the differences between consulting organizations and consulting networks in general but also into the particularities of consulting networks in regional clusters. We will therefore outline our involvement in this process, describe the cluster, and reflect on our methodology that in several (though limited) ways

combines researching and consulting networks. We will then present our (still explorative) insights, highlighting, on the one hand, the differences between consulting networks and consulting organizations and, on the other hand, the particularities of consulting networks in clusters. On the basis of the presented empirical insights, we will conclude by arguing that network consulting primarily aims at 'developing' networks of relationships between organizational actors so that, in consequence, either the network as a whole or the organizations in these networks profit from changes in their relational and/or structural embeddedness. Although network consulting is primarily directed at managing and developing networks of inter-organizational relationships, neither intra-organizational antecedents nor intra-organizational consequences of inter-organizational networking should be overlooked. By contrast, a secondary aim of network consulting may well be addressing explicitly these intra-organizational antecedents and effects of inter-organizational networking. While this second emphasis is beyond the scope of our own experience (as is the field level of analysis), it may constitute an important direction for future research on consulting networks. In any case, network consulting in regional clusters, as practiced and researched by us, requires at least a two level approach that focuses on: first, the level of inter-organizational networks in the context of a regional cluster and, second, on the level of the regional cluster itself. Whatever consulting approach is being adopted, network consulting has to take notice of and influence the recursive interplay of processes on these two levels of analysis.

Network Consulting: Definitions and Characteristics

Formally, the notion of *inter-organizational networks* adds networks, i.e. sets of ties or relations, to a set of at least three organizations. Two fundamental theoretical perspectives take this into account though highlighting quite different aspects of inter-organizational networks. The *relational* perspective, making often use of structural network analysis (Wasserman & Faust, 1994) because of the very complexity of many real networks, unpacks

not only the relational and structural embeddedness of single network actors but also properties of inter-organizational relationships (e.g. multiplexity) or whole inter-organizational networks (e.g. network density). The focus of the governance perspective on inter-organizational networks, by contrast, is on the practical coordination of different (economic) activities through networks of relationships (Provan & Kenis, 2008).

In this latter sense networks are considered an *organizational form* of its own, either "beyond market and hierarchy" (Powell, 1990) or as a hybrid filling the "swollen middle" (Hennart, 1993) between these two archetypes. While the distinct governance property of inter-organizational networks is still debated, the fundamental understanding of what kind of governance makes an inter-organizational set of relationships an inter-organizational *network* is highly relevant for network consulting. For instance, if a network is essentially defined by trusted and open-ended relationships (Powell, 1990) network consulting would have to try to develop exactly these relational properties, either directly or indirectly by influencing network management. If the essence of a network were about power and negotiation or about organizing cooperation in face of latent competition, the consulting approach would certainly have to differ.

In addition to any constitutive properties of networks, network consulting has to take into account that inter-organizational networks, as an organizational form of economic activity, can display a variety of phenotypes (e.g. Podolny & Page, 1998). These may not only differ in terms of size, goals, governance, spatial organization, leadership, and stage of development, but require special expertise not only with respect to managing but also consulting networks. In consequence, a "type-adapted" consulting approach may be asked for (Sydow & Manning, 2006).

Consulting is understood here as a service that is organized in project form and supports a client to identify and to solve strategic or operational problems (Sturdy, 1997; Werr & Styhre, 2002). Network consulting, then, is defined as a project-based service to support a client to identify and to solve problems that are related to developing and managing an inter-

organizational network. In inter-organizational networks, in sharp contrast to consulting single organizations or collectives such as corporate groups, the consultant has not only one client. Instead several or even all organizations of the network may be 'the client', more often than not only represented by some kind of "network administrative organizations" (Human & Provan, 2000) that handles the contractual relationships with the consultancy.

Delivering such a service follows a more a less distinct approach that may be characteristic of a particular consultancy (or network of consultants). Basically such an approach follows either an expertocratic-functional or an interventionist process-oriented understanding of the consulting process. While the former approach relies on superior knowledge on the part of the consultancy and aims at transferring this knowledge to the client, the latter assumes that the relevant knowledge is available inside the organization or the network but has to be mobilized by some process intervention. More recently, some consultancies and, in particular, networks of consultants tend to reflexively combine these very different approaches, not least when consulting networks (Sydow & Manning, 2006).

Consulting inter-organizational networks is quite different from consulting 'isolated' organizations so that experiences and practices from consulting single organizations are not easily transferred to consulting tasks in networks or clusters. The major difference is that inter-organizational networks, no matter whether conceived as an organizational form based on trust or any other property beyond market and hierarchy or as a hybrid of these archetypes of coordinating economic activities, are never controlled by "hierarchical fiat" (Williamson, 1985).[1] In consequence, the management of an inter-organizational network can not rely on hierarchical authority but has to mobilize different resources of domination in order to powerfully intervene into ongoing practices and to keep the networks of relationships active.

[1] The lack of hierarchical authority distinguishes inter-organizational networks also from other collectives of organizations such as corporate groups. However, we acknowledge that some inter-organizational networks may be governed in a quasi hierarchical manner which can be observed in the case of focal actors or hub firms in strategic networks (Jarillo, 1988; Lorenzioni & Baden-Fuller, 1995).

One of the more important resources is legitimacy that matters inside networks as much as from the perspective of external stakeholders and includes the legitimacy of the network form itself (Human & Provan, 2000). In order to establish and sustain this legitimacy, managers will not only have to be 'successful' in managing this form but negotiate and persuade rather than direct and control other network actors. This has direct implications for the consulting process that can neither rely on the efficacy of coordination in the shadow of the possibility of command and control nor take the legitimacy of the form as given.

The immediate 'object' of, first "trans-organizational diagnosis" and then "trans-organizational intervention" (Cummings, 1984) is of course the network of relationships, that is either relational or structural embeddedness of organizational actors or any qualities of the whole network like network density for example. The goal of the intervention may often be to trans-form interpersonal into more formal inter-organizational relations in order to institutionalize collaboration and make it somewhat more independent of certain individual actors (Chetty & Adndal, 2008). Despite this 'natural' focus on sets of relationships rather than isolated organizations, other 'objects' may also be an important target of inter-organizational interventions. For instance, as Gray (1990) emphasizes,

> "the development of collective definitions are crucial to the process of building collaborative alliances" (115).

This is not only true with respect to developing shared views but also with regard to norms about what should be seen as positive or negative, legitimate or illegitimate, fostering or hindering the emergence of trustful and open ended relationships, the efficient negotiation of a fair share of the collaborative outcome, or the balancing of formal and informal rules and relations that are effective in the network (Ring & Van de Ven, 1994).

Apart from the network of relationships and the inter-organizational views and norms that support (or hinder) their development, intra-organizational structures could be another 'target' of network consulting. Although little is known about the influence of organizational antecedents on relational qualities – and even less about the role of inter-organizational relations as causes of organizational change (Vlaar & Faems, 2008) – network consulting

should take intra-organizational antecedents and consequences of inter-organizational relationships into account.

Another difference results from the fact that the functions of network management are not per se identical to managing (isolated) organizations. Traditional managerial functions are usually listed as planning, organizing, staffing, leading, coordinating, reporting, budgeting and controlling, where the order of these functions is not arbitrarily but determined by a specific understanding of the classical management process (Gulick & Urwick, 1937). No matter whether these are considered as relevant for managing inter-organizational networks too or whether the functions of network management and the respective network management practices are systemized in a different way (e.g. selecting, regulating, allocating and evaluating, cf. Sydow, 2005), some of these practices are of a very distinct importance in the network context. Most obviously, selecting network organizations has an entirely different status than selecting personnel in the classical management process. In addition, tensions and contradiction characteristic of networks – take, for example, the dialectics between cooperation and competition – mould these managerial tasks in a specific way. Like the importance of some managerial functions or practices, these tensions and contradictions are quite different in networks and, hence, must be addressed when consulting networks. Take again the example of cooperation and competition which may be 'redesigned' by either domesticating competition trough more cooperative rules or by injecting more competition into dominantly cooperative relationships (as in the case of switching from a single to a dual sourcing strategy).

Buono (2003) mentions additional differences. When consulting networks the consultant has to mobilize multiple organizations with different strategic interests even if they have agreed on an "inter-organizational domain" (Trist, 1983). Not least for this reason the consultant is well advised in being sensitive to different interpretations and offering alternative interpretations of actions and events to network members. Moreover, power asymmetries may be more complex and subtle and, therefore, more difficult to unpack in inter-

organizational networks. This may be particularly true for networks that seem to be built on trusted and open ended relationships. Table 1 summarizes some of the major differences between consulting networks and consulting organizations.

	Consulting Organizations	**Network Consulting**
Principal form of coordination	Hierarchical authority or fiat	Negotiation, trust, reciprocity, open-endedness etc.
Legitimacy of coordination	Usually given	To be created, internally and externally
Object of consulting	Isolated organization	Network of relationships (or sub-networks), taking intra-organizational structures into account
Managerial functions to be addressed	Traditional managerial functions	Some management functions have a very different status
Mobilizing behaviour	Addressing a single organization	Mobilizing multiple organizations
Client	One client organization	One or more client organizations, possibly whole network

Table 1: Network consulting vs. consulting organizations

Network Consulting in Clusters: A Very Peculiar Context

„Paradoxically, the enduring competitive advantage in a global economy lie increasingly in local things – knowledge, relationships, and motivations that distant rivals cannot match“ (Porter 1998a: 77). Since the 1980s researchers in economic geography, business studies, economics, and sociology and, lately increasingly, politicians and consultants show an increased awareness and interest in (developing) regional clusters (e.g., Asheim et al., 2006). One reason for this can be found in the observation that clusters and the intra-regional networks that constitute them seem to have a positive effect on the performance and innovativeness of those organizations that actively participate in such systems, on the regional economic system itself and even on the competitiveness of nations (Porter, 1998b).

Regional clusters are usually defined as “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and

associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also co-operate" (Porter, 1998b: 197). While clusters and networks are often (not only in praxis) seen as identical, we conceive clusters as consisting of several intertwined networks of inter-organizational relations within a specific region (see also Staber, 1996; Boari & Lipparini, 1999; Chetty & Agndal, 2008). Hence, networks and the interactions that produced and reproduce them are constitutive properties of clusters. Inter-organizational co-operation and networking within a cluster is extremely relevant because the development of a cluster depends not only on particular organizations that are part of the cluster but to a considerable extend also on concrete collaboration between them, between companies and research organizations in particular. On the other hand, the cooperative tone, the shared visions and, eventually, the collective identity that characterize a cluster in turn influence inter-organizational collaboration (Tallman & Jenkins, 2002; Tödtling & Tippl, 2004; Sugden et al., 2006).

In defining, characterizing, analysing and consulting (networks in) clusters it is necessary, by way of inter-organizational diagnosis, to take the (type of) relations between network and cluster actors and the degree of interconnectedness that is present in the cluster into account (Humphrey & Schmitz, 1996). Clusters may consist of some dyadic relations between cluster actors or, in more advanced stages of cluster development, may be composed of triads or even more complex relational sub-networks that are fostered by geographic proximity. Depending on the degree of interconnectedness regional clusters can be positioned on a continuum that spans from agglomerations of atomistic companies and other organizations that do not really deserve to be described as clusters to 'real' regional clusters that are made up of socially embedded relational networks (Brown & McNaughton, 2002: 28).

However, not all inter-organizational networks that characterize clusters are confined to cluster boundaries. Rather, networks often cut across industry and/or region and therefore cluster boundaries. A trans-regional embeddedness of cluster enables cluster organization from profiting both, local buzz and global pipelines of knowledge (Bathelt et al., 2004). In consequence, such networks can be identified at four different levels: (1) At an *organizational*

level, personal networks between employees of the organization can be found in and between groups, divisions and other functional substructures of the organization. (2) At the *network* level, organizations no matter whether they belong to the cluster or not, may entertain ties through which they exchange knowledge or other types of resources. (3) At the *cluster* level one may find the described network relationships that belong to a specific industry in a specific locality. Similarly such relational webs might be found (4) at the level of an "organizational field" (DiMaggio & Powell 1983) of which clusters might be a part of. Clusters or cluster representatives may be in contact with representatives of other clusters within a region in another industry, for instance.

Figure 1 illustrates these relevant levels that would have to be considered, with respect to relationships building and generating output, in a rather complete, multi-level approach in (analyzing) consulting networks in clusters. The arrows between levels signal that structural conditions – including not only resources of domination but also rules of signification and legitimation (Giddens, 1984) – at superior levels affect the actions of cluster actors at lower levels of analysis (downward arrows) – and vice versa. On any of these levels, the activities of actors reproduce the structural conditions at these specific levels and beyond. Thereby, as structural conditions they simultaneously enable and constrain the activities of actors at other levels (above and below).

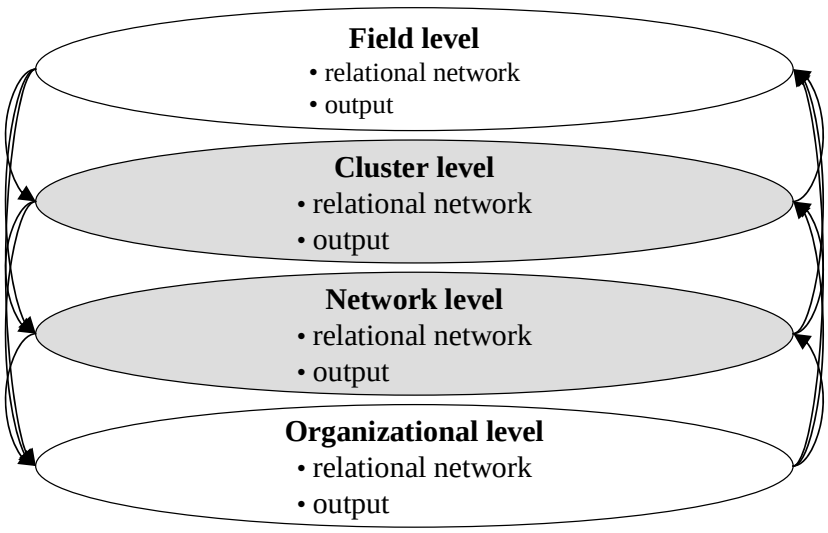

Figure 1: Multi-level-approach in (analyzing) consulting networks in clusters

Network consulting in regional clusters should adopt at least a two level approach that takes the recursiveness between the network and the cluster levels into account. In addition the embedded organizations that are part of a network in regional clusters as well as the wider organizational field (with its competitive dynamics, for example) need to be considered at least as relevant contexts because they can provide a competitive (dis-) advantage. In this paper we focus on only two levels, i.e. on consulting a specific network in a regional cluster in the optics industry.

Research Site and Methodology

Optics or photonics is an enabling technology (NRC, 1998) applied to a variety of areas like lighting, telecommunication equipment, medical devices, scientific instruments, semiconductors, imaging and reproduction, defence and security (see also OECD, 1993; Hendry et al., 2000, 2003). The increasing importance of this technology has its rationale in the leverage effect it has on other markets by enabling innovations. A number of experts today see a bright future for optical technologies and proclaim the “century of the photon” (e.g. Rickman, 2000; Wirth, 2005). Developments in photonics are not driven by single actors but by complex constellations of individual and corporate actors because of the system character of the expected new technologies, the high costs and risks involved and the necessity to involve and coordinate actors from different scientific fields (like physics, material sciences, chemistry, engineering etc.) as well as from different societal spheres (such as economics, science and politics) and from different locations (Hendry et al., 1999). The challenge for managers and consultants hence originates from the complex interplay of different social systems on different levels. The interplay of networking processes on and between these system levels, however, can be seen as the key to successful inter-organizational networking and the development of regional clusters not only in optics (Sydow & Windeler, 2003).

Studying an enabling technology like optics is difficult because it cuts across established industries or fields. Hence current industrial classification systems (e.g. SIC) and patent classes do not display optics as a consistent industry (Feldman & Lendel, 2009a). A number of studies have nevertheless shown that optics, like other science-based industries, tends to cluster in specific regions (Hendry et al., 2000; Sydow & Lerch, 2007; Feldman & Lendel, 2009b; Lerch, 2009). The cluster we study – optics in the German capital region Berlin-Brandenburg – has a more than 200 year old history punctuated by considerable transformations due to the history of Germany (cf. Lerch, 2009). More recently, the cluster has exhibited a more continuous development. Within this cluster, an association – OpTecBB e.V. (www.optecbb.de) – was set up formally in 2000 to organize and administer cluster activities. At about the same time distinct inter-organizational networks (OpTecBB focus groups) were initiated within the cluster in order to organize for the transfer of knowledge generated in the numerous research organizations in the cluster into marketable products and services. One of these concrete networks is the X-Ray Analysis Technology (XRA-Tech) network that has existed right from the beginning of the formal cluster development process and focused on the development and marketing of x-ray analysis technologies. The XRA-Tech network itself is part of a larger regionally based uv- and x-ray technologies community (see Figure 2).

The optics cluster in Berlin-Brandenburg comprises about 270 optics companies and about 30 research organizations engaged in the development, production and sale of optical technologies. The companies generate a turnover of about €2 bn. p.a. and employ about 10,000 people (Hornauer, 2002). While some larger optics companies discontinued production in Berlin (Samsung, Infineon, JVC), most other optics cluster companies in Berlin-Brandenburg are growing. Between 2002 and 2007 sales grew in these companies by 55% and employment increased by 32% (TSB, 2008: 15). This optics cluster, hence, is a rather dynamic entity that is, nonetheless, only partly reflected in the growth rate. For the majority of the companies is rather young, small or at best medium-sized. Every year on average about 16 new start-up companies in optics and nanotechnology emerge within the cluster (TSB,

2008: 10). Moreover, the optics industry in general and the companies within the optics cluster in Berlin-Brandenburg in particular are very innovative. The companies invest about 8% of sales in R&D and about 15% of the employees are working in this field (TSB, 2008: 22).

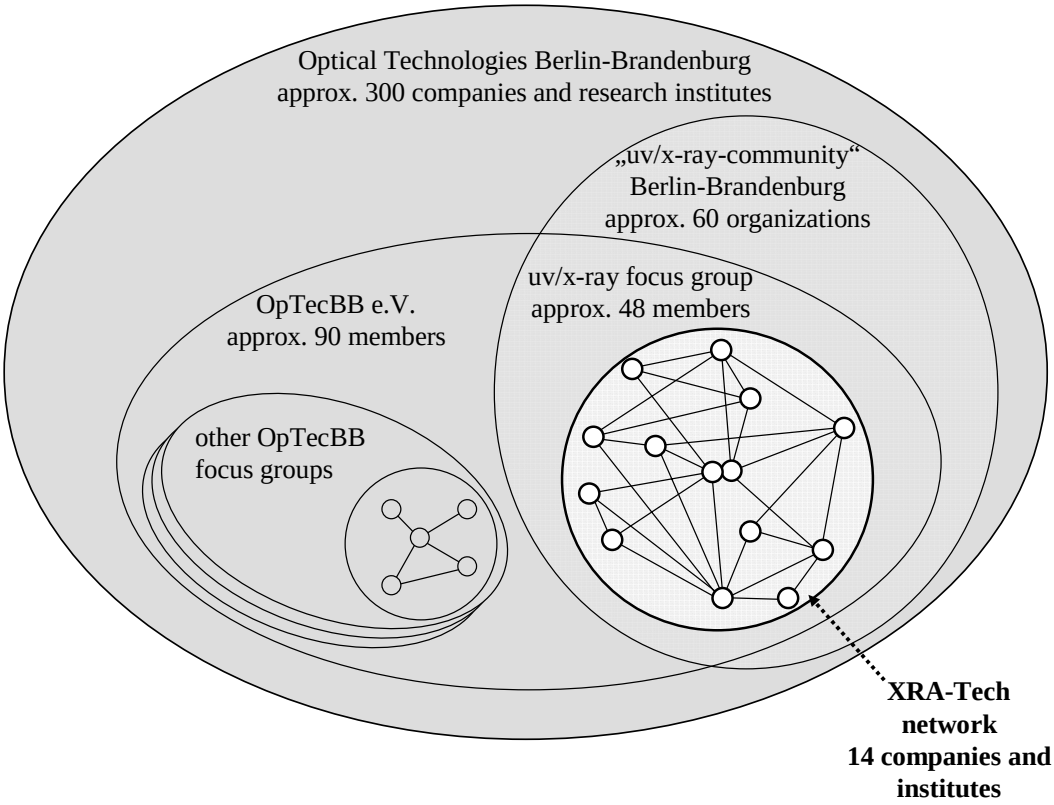

Figure 2: Schematic representation of the XRA-Tech network[2] within the optics cluster in Berlin-Brandenburg displaying multiple embeddedness at different levels

The XRA-Tech network is located in one of the OpTecBB subfields, the uv- and x-ray technology field (see again Figure 2). This network which currently comprises 14 organizations was formed at the same time that OpTecBB was founded as the association representing the cluster. The network's dual governance structure – one speaker from industry, one from the field of science who are formally elected annually by network members – followed the blueprint laid out in OpTecBB's cluster development plan in whose development we were initially involved as consultants. The head of the network representing

[2] While the XRA-Tech network companies and institutes are densely connected and forming a cohesive group within the cluster they simultaneously maintain numerous relations in different relational dimensions (e.g. R&D, commercial, personal, etc.) to other organizations outside the specific network (other OpTecBB members, other cluster organizations in the region and organizations outside the cluster).

the industrial side was a former director of the transfer oriented Institute for (x-ray) Scientific Instruments within the former East German Academy of Sciences. After reunification he had founded his own company (focusing on hard x-ray technologies) after the institute and the Academy were liquidated. He was, and still is, also well connected to researchers and to firms in this industry. The other head representing the science side is one of the directors of the Boltzmann-Institute for Nonlinear Optics and Spectroscopy[3], a successor organization of the East German Central Institute for Optics and Spectroscopy of the Academy of Sciences. Although he is equally well connected to the scientific community, he had been socialized in the West and, in addition, has been heavily involved in lobbying for optics at different political and scientific levels. The network member firms are mostly spin-offs of the liquidated Academy of Sciences or newly founded small enterprises, all of which are active in x-ray analytic technologies. Their staff comes mostly from organizations that were part of the former Academy of Sciences located in Berlin-Adlershof, particularly from the Institute for Scientific Instruments. The other members are x-ray and synchrotron research organizations previously located in West-Berlin. The XRA-Tech network, together with the regional cluster, provides us with the unique opportunity to study the particularities of (consulting) networks in clusters.

The empirical findings discussed below result from extensive research on the development of the optics cluster in the Berlin-Brandenburg region in and, in particular, from the embedded case (Yin, 2009) of the XRA-Tech network. Actors and their networks of relationships have been studied since the year 2000 when OpTecBB was founded. Data were collected through a series of semi-structured interviews with the key players in the cluster and with focal actors in the XRA-Tech network. In total, we interviewed – in two waves (2003 and 2006) – 121 individuals working in 101 organizations in the industrial and institutional domain of this cluster. Because we were involved as observers in the development of this cluster from its beginning in 2000, we achieved a response rate of 96 percent (2003) and 88 percent (2006) of all members of OpTecBB (including all 14 members of the XRA-Tech network). While

[3] Organizational names are anonymized for confidentiality reasons.

OpTecBB does not represent all members of the cluster (see once again Figure 2), it comprises by far the most important cluster actors. The structured interview guide contained questions about the history and the present governance structure, as well as the recent development process of the cluster and its networks. Apart from about a dozen interviews with the most important actors in OpTecBB and the XRA-Tech network, all interviews were conducted by telephone.

Data were also collected through participant observations by two of the authors, one of whom participated in all of the annual XRA-Tech and OpTecBB meetings and strategy workshops over a period of six years. We were also given access to minutes from meetings, documents, and presentations. In addition, we reviewed the secondary literature and Internet sources for information about organizations and technologies (optics and, specifically, x-ray technologies) developed in this region. In the analysis of the interview data, for which we used concepts derived from network theory and reinterpreted from a structuration perspective (Giddens, 1984), the transcribed interviews were coded and then reviewed by each of the authors independently. The results were later discussed by the authors to arrive at a joint interpretation of the data.

Despite – or perhaps because of – this research approach, we were seduced several times to intervene into the development process of the cluster and the network so that, at least at times, we adopted – and reflected upon – an action research approach (Eden & Huxham, 2006). Right at the beginning of the OpTecBB network development process, in 2000, we held for two months a formal contract as consultants specifying our task as "developing a network concept for the emergent optics cluster". A network development concept was a prerequisite for participation in the German Ministry's of Education and Research OptecNet-Competition, which in 2001 promised funding for the winning networks for a five year period.[4]

[4] Seven competence networks in the area of optical technologies were funded under the optecnet competition. The funding was extended to eight years. However, despite this significant public funding, network members had to pay fees for their cluster membership. Right from the beginning, these fees contributed at least 50 per cent of the cluster budget.

Up until 2007 we were basically only involved as researchers,[5] conducted interviews and observed meetings and events and presented results of our research at annual meetings of OpTecBB and discussed their implications with those who attended. In 2007 we engaged in the drawing of a cluster strategy for the ministry of economics in Brandenburg and in 2008 we consulted the XRA-Tech network and two central organizations in this network on technology transfer issues and the drawing of a business plan and organizational concept for a collaborative application lab.

A Reflexive Multi-level Approach to Network Consulting in Clusters

For the consulting and developing of the optics cluster in the Berlin-Brandenburg region a reflexive approach was proposed and adopted right from the outset. Reflexivity in this sense means that "social practices are constantly examined and reformed in the light of incoming information about those very practices, thus constantly altering their character" (Giddens, 1990: 38). Reflexive structuration implies the necessity of managers of organizations, inter-organizational networks, cluster representatives and consultants to continuously produce and reproduce (network) structures taking into account the information they gather by "reflexive monitoring" (Giddens, 1984) of their practices, their antecedents and consequences. These structures, that are dependent on the managers' and consultants' practices, enable and restrain organizational, inter-organizational and cluster managers' actions. The developed process framework makes use of the idea of "reflexive network development" (Windeler, 2001; Sydow & Windeler, 2003) in which managers at different levels, assisted by consultants or not, refer to structural properties of the network (e.g., the quality of specific

[5] Our research was made possible by a grant of the Berlin Senate (Senatsverwaltung für Wirtschaft, Arbeit und Frauen) and the European Union (EFRE). This grant, together with consultant fees and funding from the Freie Universität Berlin enabled us to study the development of the cluster – and some of its networks – over a period of 8 years. We are not only grateful for this funding, but most of all we thank the numerous people within OpTecBB for their time, patience, and trust. Finally, we thank Arnold Windeler who, together with Jörg Sydow, was awarded the grant and supervised the research.

network relations) and reproduce and eventually transform them. Actors also refer to the structural properties of the particular organizations they represent. This is especially the case in early stages of network and cluster development when these lack such structures. Structural properties at an organizational level may include organizational competencies or procedures that network(ed) actors draw upon in (inter-organizational) practice. In addition actors may also refer to structural properties at a cluster or field level (e.g., industry expertise or cluster rules of engagement).

What follows from these insights is a reflexive multi-level approach to network management, and respectively to network consulting in clusters. Such an approach necessarily requires a processual view of the development of networks and clusters in which structures are conceived as being dependent on the continuous reproduction or transformation by individual and organizational actors by means of social practices. Thereby continuity and change are apprehended as to be produced and reproduced by network and cluster management. Insofar this approach adds to the line of research on inter-organizational networks that focuses on network processes (e.g., Doz et al., 2000; Ring & Van de Ven, 1994).

With regard to consulting, this approach combines elements of an expertocratic methodology with those of an interventionist strategy. The *expert* knowledge was based upon a thorough review of organization and management research on inter-organizational networks (e.g. Gulati, 1998; Borgatti & Foster, 2003; Provan et al., 2007) as well as of cluster research in the realm of economic geography, economics and sociology (e.g., Porter, 1998 a,b; Tallman & Jenkins, 2002; Sugden et al., 2006). The *interventionist* knowledge was feed by the reading of the very few practice-based studies that develop an interventionist process perspective on developing networks and/or clusters (Cummings, 1984; Gray, 1990; Chisholm, 1998; Huxham & Vangen, 2005). Combining these two knowledge bases with our own experience in empirical network and cluster research (e.g. Sydow & Windeler, 1998; Sydow & Lerch, 2007) and with the knowledge of local industry experts allowed us to

develop a process framework that was not only “type-adapted” but was also accepted by the actors in the network and the cluster.

Consulting on Cluster development

Despite fundamental reservations against a linear perspective on the development of networks and clusters (see Sydow & Lerch, 2007, for details), our framework assumes a multi-stage approach to the developmental process, starting with ‘initiation’ and ending for the time being with “innovation” before a new development cycle may start again (see Figure 3 for details). Not going into to much detail here, the first stage includes the initiation of e.g. relationships and networking in general. The second stage is supposed to focus on the intensification of novel and existing relationships and relational webs. During the following stage activities are intended to consolidate and stabilize these relations and webs. Then, the respective practices are to be routinized and finally to be improved and innovated again so that new relations and networking activities are initiated. However, the thematic focus of the developmental activities at each stage on one of these stage-issues does not imply that no other activities, intended to be at the focus of other stages in the developmental process, could be followed.

During the early stages of network and cluster development the exploration (March, 1991) of possibilities and the prospects of collaborative projects are necessarily in the foreground of developmental activities. Increasingly, as time passes, reflexive network and cluster development more and more aims also at the exploitation of opportunities. Especially, collaborative innovation projects are assumed to lead increasingly to marketable products that produce a cash flow that, at least in part, may be used for developing the network or cluster further.

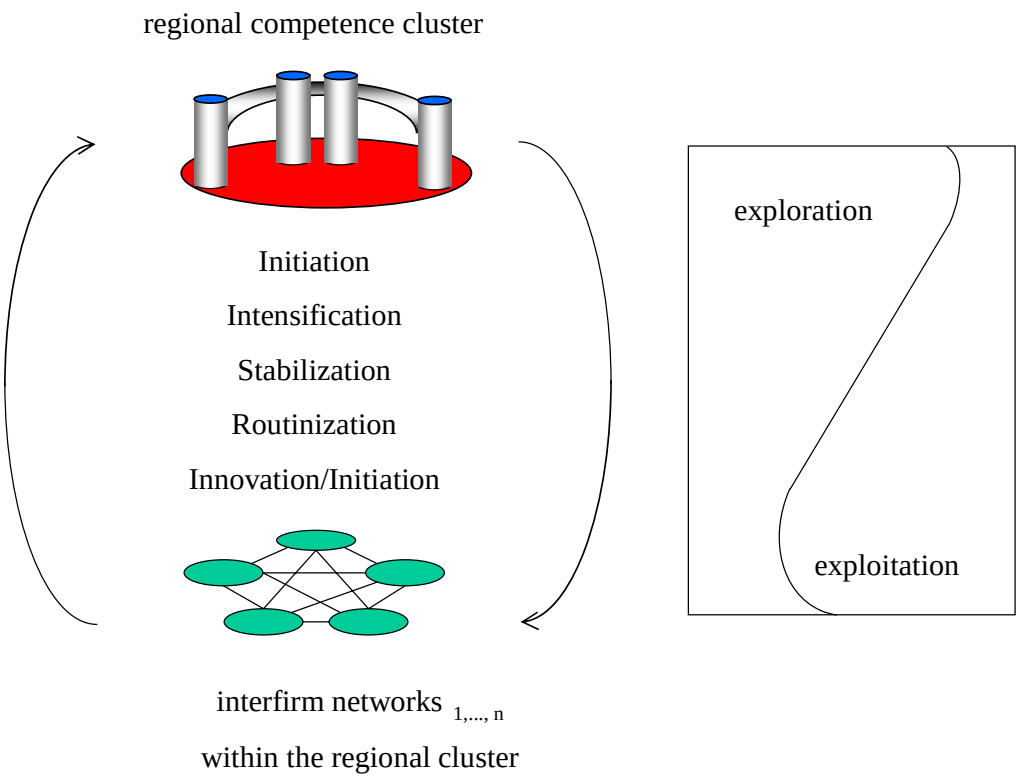

Figure 3: Reflexive network and cluster development process in five phases

Finally, the idea of a reflexive multi-level approach to network consulting in clusters includes the feedback of information derived from the evaluation during and at the end of each stage and to provide for opportunities for the network and cluster members to discuss the results and to come up with new ideas on how to develop their networks and as a result the entire cluster.

The German OptecNet program aimed at developing regional optics clusters by means of inter-organizational networking. However, the program did not prescribe how actors should coordinate their network and cluster development activities. As indicated above key actors in the field of photonics contacted the authors with the request to consult on the network and cluster development. The developed framework was adopted immediately and implemented over the following years. The creation of a network administrative organization sustained the process of network coordination and, together with the developmental plan, was a

requirement to taking part in the OptecNet initiative and to receiving governmental funding for five years.

The developmental plan also envisioned several central processed that needed to be implemented at single stages or during all stages of the developmental process. These included: (1) regular strategy meetings of all OpTecBB members; (2) a series of events called “members introduce themselves” in which one cluster organization invited other cluster members to present its competencies and technological infrastructure; (3) the installation of network brokers and network mentors; and (4) a data base with network member profiles and competencies of network members. While at the beginning of the network and cluster development process exploration was at the centre of most activities (e.g. a number of explorative workshops in form of a competence, cooperation and market forum) activities during later stages were aimed at exploiting these opportunities (e.g. concrete innovation projects).

However, instead of assuming a deterministic development of the network or cluster, this multi-stage approach was used only as a “tool for reflective practice” (Huxham & Vangen, 2005). That is, network/cluster members as “knowledgeable agents” (Giddens, 1984) are assumed to very well be able to reflect on the appropriateness of a specific model or tool for their purposes. Despite their assumed ability to reflexive monitor their actions as well as their contextual conditions and consequences, they are never considered as being able to fully control the outcome of their practices that, at least in part, are carried out under unacknowledged conditions that may even result from unintended consequences of intended actions (Giddens, 1984). That means that knowledgeable network and cluster agents use the framework delivered by consultants for their purpose and adapt it if necessary. Even though not all the ideas laid out in the original developmental framework were implemented by the OpTecBB board, the network administrative organization, and its organizational members, the quality of interaction and communication in the cluster increased considerably (cf. Lerch, 2009).

Consulting on Network Development in Clusters

Right from the start of the coordinated cluster development process technologically focused sub-groups or networks were implemented to foster vertical and horizontal networking between cluster organizations and to enhance knowledge exchange and innovation processes. According to the developmental framework these OpTecBB sub-groups were supposed to being headed by a representative of both the economic and the science sphere so that the different logics of these groups of actors were taken on and institutionalized in the networks.

One of these networks is the XRA-Tech network which operates in the field of uv- and x-ray technology (see again Figure 2). The network currently comprises 14 organizations, 7 firms and 7 research institutes. The initial XRA-Tech network formation process was rather open-ended, as several distinct technological fields (ultraviolet, extreme ultraviolet, soft x-ray and hard x-ray technologies) were discussed by the actors in this OpTecBB sub-group. In a series of three explorative workshops during the early developmental stage of OpTecBB and the network, intended to identify technologies in which the cluster and the groups wanted to collaborate in order to generate innovations, one actor in particular (located in the hard x-ray community) communicated his understanding of the relevant technologies and how innovations might be generated. He also introduced the idea of coordinating the hard x-ray actors by means of a roadmap and began to develop this roadmap, while also inviting the relevant regional actors to participate in the process.

The network governance structure that emerged was a dual authority structure, consistent with the blueprint laid out in OpTecBB's cluster development plan: One head of the network, representing the industrial side, was a former director of the transfer oriented Institute for (x-ray) Scientific Instruments within the former East German Academy of Sciences. After reunification he had founded his own company (focusing on hard x-ray technologies) after the institute and the Academy were liquidated. He had, and still has, close connections to researchers and firms in this industry. The other head, representing the science side, is one

of the directors of the Boltzmann-Institute for Nonlinear Optics and Spectroscopy, the successor organization of the East German Central Institute for Optics and Spectroscopy of the Academy of Sciences. He was equally well connected to the scientific community. However, he had been socialized in the West and had been heavily involved in lobbying for optics at different political and scientific levels. The member firms of the XRA-Tech network are mostly spin-offs of the liquidated Academy of Sciences or newly founded small enterprises, all of which are active in x-ray analytic technologies. Their staff comes mostly from organizations that were part of the former Academy of Sciences located in Berlin-Adlershof, particularly from the Institute for Scientific Instruments. The other members are world class x-ray and synchrotron research organizations previously located in West-Berlin.

Managers of these networked companies and representatives of research organizations are mainly faced with two problems in the inter-organizational development process and in their networked innovation activities. First, managers have to coordinate the collaborative activities among actors originating from and belonging to different societal spheres. In the particular case of the XRA-Tech network one finds more or less transfer oriented representatives of research organizations on the one hand and managers of companies more or less open to collaborative research and development on the other. While each sphere exhibits its own typical sets of rules and resources, the network needs to be managed based upon a more or less common understanding. The difference becomes visible in looking at the different incentive structures in research institutions and in companies. While a researcher is gratified for early wide spread publication of new research results entrepreneurs are reimbursed by income flows resulting from (patent) protected research results in form of sales for (new innovative) products (e.g., Berneman, 1995; Polt et al., 2001; Bercowitz & Feldman, 2006). In the process of researching the development of the XRA-Tech network one of the authors was asked to support the network to come up with a concept for a collaborative, technology transfer-oriented application laboratory. Network consultants are not only able to inject lacking knowledge about possible concepts for technology transfer process into the network but to increase capacities for network

management and development. Due to network managers' involvement in their own organizations, their own capacities to engage in networking activities are usually quite limited. More often then not this hinders the development of a network, especially if made up of small or medium-sized enterprises. Here consultants can extend such capacities of network organizations and the network as a whole.

A second central task of representatives of networked organizations in the XRA-Tech network is the development, establishment, and advancement of diverse and effective dyadic relations and more complex relational webs with often rather different network members within the regional cluster but also with organizations from outside the local context. Network management and coordination of activities in inter-organizational relations here involves the requirement of network managers to balance between a number of tensions and contradictions like trust and control, cooperation and competition, etc. Consulting networks in clusters should include enhancing the reflexivity of network management with respect not only to particularly important functions but also with regard to these tensions and contradictions. In any case, consultants and network members need to be aware of the recursive relationship between network management and network development. For on the one hand network management, intentionally or unintentionally, contributes to the development of a network over time. On the other hand network managers – and hence their consultants – have to be aware of the influence of network development on network management practices (Sydow & Windeler, 2003; Sydow, 2005).

With regard to (economic) performance, an important goal of consulting networks in a cluster would be not only to strengthen the competitive position of the networked organization (in terms of relational and structural embeddedness, for example) but also to support the development of structural properties of individual inter-organizational relationships (e.g. multiplexity) or whole inter-organizational networks (e.g., network density) that are believed to foster innovation. While such properties may only be loosely coupled with economic success or exhibit different than linear relationships (see Uzzi, 1997), they are an immediate

outcome of network/cluster consulting that, by definition, targets the development of networks of relationships.

Recursive Interplay between Network and Cluster Development

With respect to the multi-level approach promoted throughout this paper the development process should take into account at least two levels: the network level and the cluster level (see again Figure 3). What is more, the development of relationships on one level is likely to recursively influence the development on the other. In the case under consideration, the development of OpTecBB provided a context that made collaboration within sub-groups like the XRA-Tech network more likely. In turn, the effective development of this particular network had a positive impact upon the development of the entire cluster. This recursive interplay can be shown in some more detail, for members of the XRA-Tech network actually began to interact with other photonics companies and research organizations in Berlin-Brandenburg, many of them members of OpTecBB, more intensively, generating innovations or simply buying and selling products. More importantly, the development of the XRA-Tech network was presented and discussed on the cluster level in the annual strategy meetings of all OpTecBB members. In addition two of the central XRA-Tech network organizations continued to have representatives on the board of OpTecBB. Hence single network organizations and the XRA-Tech network itself contribute in a number of ways to the development of OpTecBB and the regional cluster.

OpTecBB on the other hand is important for the development of the XRA-Tech network. First, the XRA-Tech network, even though single relations existed before, was initiated in the course of the foundation process of OpTecBB in which technologically focused sub-groups were initiated as part of the coordinated photonics cluster development program. Second, OpTecBB serves as a lobby group to politicians at different levels and as such was able to provide additional resources for the network. For example OpTecBB activities resulted in the

appreciation of optical technologies as a viable future technology in Berlin-Brandenburg resulting in additional funding for R&D projects in this technological field. In addition, OpTecBB supports its members in identifying sources of public funding for their R&D projects and assists in formulating grant proposals at the national and European level. Third, OpTecBB acts as a communication platform for its members and offers a frame for networked activities in the sub-groups.

The evaluation of the network and cluster development process conducted by the authors identified that the network management practices within the XRA-Tech network have been perceived by other OpTecBB members to be exemplary. Having the recursive multi-level network and cluster development approach in mind 'network good practices' were recommended for discussion at the cluster level during cluster strategy meetings. In fact, the XRA-Tech network roadmap process, among other identified good practices, was presented at one of the OpTecBB strategy meeting. The discussion that followed the presentation provided ample opportunities to learn from the XRA-Tech network resulting in other sub-groups or networks to introduce a roadmapping or at least a more structured approach to network coordination. The idea of roadmapping was even picked up at the cluster level resulting in a master plan for the entire optics field in Berlin-Brandenburg.

Conclusions and Directions

By offering first insights into these multi-level processes, the paper contributes to the emerging research on network consulting, that is consulting inter-organizational networks, in general and on consulting such networks in regional clusters in particular. Based upon our insights gained from a collection of reports from a variety of network(ed) consultants and research and consulting a network in an emerging optics cluster in particular, we identified several differences between consulting networks and consulting organizations. These differences have to be acknowledged by consultancies that wish to extend their service

domain to network consulting. Moreover, we have unpacked important particularities of network consulting in regional clusters. Against this background we advocate in the main part of the paper a reflexive multi-level approach to network consulting in clusters. This approach focuses on developing networks of relationships and takes the recursive interplay between the development of the cluster and single networks within the cluster into account. While the organizational level as well as the field level would make a multi-level approach to network consulting in clusters more complete, it was at least possible to included them here as contexts. Nevertheless a full-blown multi-level approach to (analyzing) consulting networks in clusters would have to include these two levels as well.

Given that our investigation of network consulting in regional clusters is based upon only one cluster embedded in one particular field (i.e. optics in the Berlin-Brandenburg region in Germany) plus one single network embedded within the cluster (i.e. the XRA-Tech network) we should restrain from drawing wide-ranging conclusions from our case study. More important than providing valid and reliable findings on network consulting in clusters at this point in time we want to draw the attention of consulting researchers on this peculiar ‘object’ of consulting and to stimulate network researchers to reflect their insights with respect to network consulting. Without doubt, more consulting as well as more network research is needed before resolute conclusions can be drawn for network consulting in clusters. But a beginning has been made.

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